

**Sanitation Promotion in Developing Countries:
Why the Latrines of Benin are Few and Far Between**

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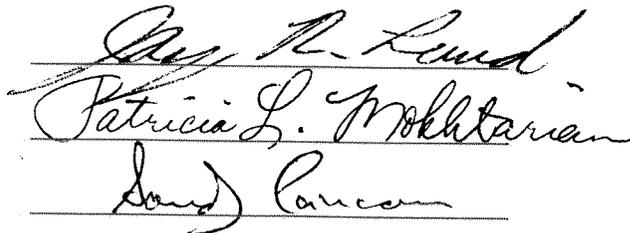
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ABSTRACT

This dissertation examines the decision of private households to install a pit latrine in rural Benin, West Africa. A conceptual framework for understanding sanitation choices in developing countries is derived from behavioral and consumer choice theories. Cultural foundations of consumption and defecation-related beliefs and behavior are integral parts of this explanatory framework.

Findings from a qualitative investigation of household behavior in rural Benin are synthesized to construct a schematic model of the decision to adopt a latrine. The model asserts that the key conditions for latrines to be chosen in rural Benin are the presence of at least one active *drive* or dissatisfaction from among the 11 found to motivate adoption (concerning prestige, well-being, and two particular situations), and the absence of *constraints* on adoption among 13 related to awareness, physical implementation, and psycho-social issues. Lifestyle and village environment influence the presence of drives.

Latrine adoption and other data for 520 villages in the study area are analyzed in models of village-level adoption to test hypotheses from the qualitative work about the factors that arouse desires for latrines. Village-level conditions and characteristics that stimulate demand for improved sanitation are identified.

Finally, data on the adoption behavior of 320 households are collected in a survey, analyzed, and used to develop regression and logit models of preference for latrines, stated intention to adopt, and observed choice to install a latrine. These models indicate that the most important motives for adoption are distance to open defecation and prestige, in particular a desire to express new experiences and a new lifestyle acquired outside the

village. The most important constraints are lack of finance, misunderstanding of latrines, and poor latrine design and performance. The research methodology and results have widespread implications for assessing sanitation demand and for developing demand-responsive and marketing approaches to promote improved sanitation in developing countries.

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CHAPTER 1 INTRODUCTION

Promoting improved sanitation in developing countries continues to be an uncertain endeavor. Despite focussed attention to the problem during the International Drinking Water Supply and Sanitation Decade (1981-1990) fairly little progress was made (UNICEF 1989; USAID 1990; WHO 1996a). While an estimated 750 million more people were served by facilities for excreta disposal, population growth in developing countries during the decade offset much of this gain. The problem has only grown, as population expands and coverage rates stagnate, challenging our approaches and resources. Today, according to the World Health Organization, more people are without basic access to excreta disposal facilities than in 1990, close to three billion (WHO 1997).

The substantial and strategic contribution made by improved sanitation to disease reduction and mortality, particularly for diarrhea, ascariis, dracunculiasis, hookworm, schistosomiasis and trachoma, especially among children, is well documented in epidemiological studies (Feachem et al. 1983, Feachem 1984; Esrey et al. 1985; Aziz et al. 1990; Esrey et al. 1990; WHO 1996b). As the problem of inadequate sanitation grows, awareness also grows of potentially greater benefits of improved sanitation for general well-being, quality of life, and environmental protection (Esrey 1996; UNICEF 1998).

Why then has so little progress been made? One increasingly popular reason is the failure of past supply-side approaches, patterned after or tacked on to public or communal water supply projects, to achieve sustainability and attract sufficient interest from intended beneficiaries (Carincross 1992; USAID 1993; Lafond 1995; Water Supply

Sanitation Collaborative Council 1995; Black 1998). These supply-side approaches have disregarded the complex characteristics of improved sanitation as a private good in developing countries, the adoption and maintenance of which requires a substantial financial investment at the household level and a significant change in personal and domestic hygiene practices. These characteristics are compounded by the innovative and culturally exotic nature of excreta disposal facilities to populations in many developing countries.

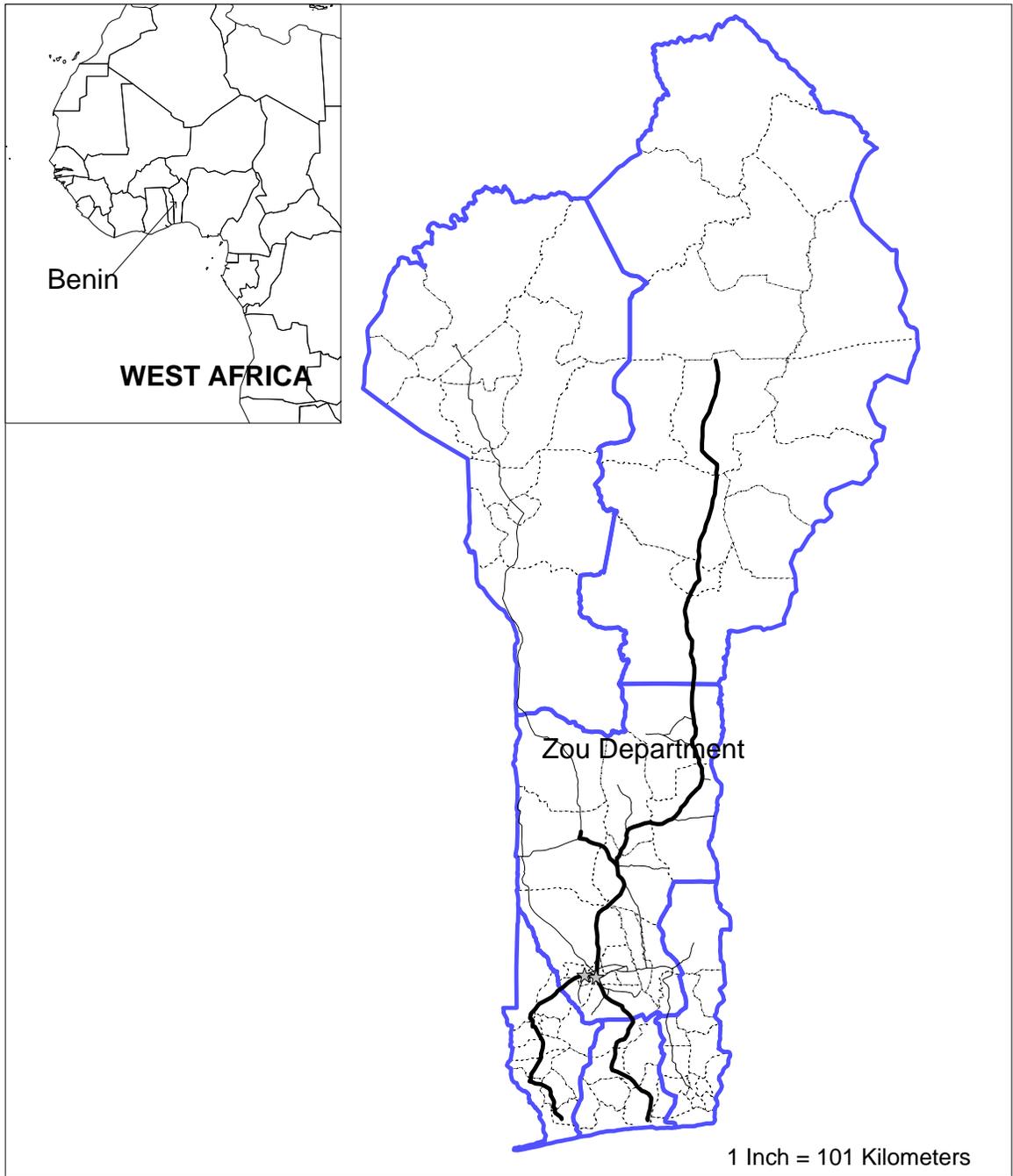
Practitioners, experts, and international agencies concerned with the lack of sanitation progress now advocate demand-responsive approaches to successfully expand and sustain sanitation investments (Ikin 1995; UNICEF 1997; Wright 1997; McCommon et al. 1998; Black 1998). To promote improved sanitation, for which expressed demand often appears weak, marketing strategies are advocated. However, demand-responsive approaches that satisfy consumers and the application of marketing methods to stimulate demand necessitate knowing how consumers make sanitation choices and identifying the most important factors that generate or suppress demand. Such knowledge is widely lacking because there have been few scientific studies of sanitation demand in developing countries. The few studies available are limited to contingent valuation (CV) surveys of the willingness of urban consumers to pay for proposed sanitation projects (Whittington et al. 1993a; Altaf 1994).

This dissertation examines the decision of private households in rural Benin (see location in Figure 1-1) to install a pit latrine. The rural context for sanitation demand differs in important ways from the urban context, in the choices of feasible technologies, in the availability of traditional defecation sites, and in the level of consumer familiarity

with improved sanitation, among others. The cultural foundations of consumption patterns and of dangers associated with feces and defecation are critical elements for understanding this decision. Theory from consumer behavior, innovation adoption, and cultural anthropology are applied to construct a conceptual model of this decision from qualitative findings. Quantitative data on latrine adoption behavior at the village and household level are then obtained from existing databases and from a household survey. These data are analyzed to test hypotheses about the motives for and barriers of latrine adoption derived from the qualitative and conceptual work and develop mathematical models of individual choice and village demand for latrines. Implications for marketing and communications strategies, for delivery and support of construction-related services, and for latrine design are derived from the findings.

With this case study research, this dissertation seeks to fill gaps in understanding of sanitation demand in developing countries, particularly for rural contexts. The work also demonstrates an alternative method to contingent valuation for assessing sanitation demand, based on behavioral analysis and discrete choice theory (Ben-Akiva and Lerman 1985). These contributions provide policy and programmatic direction for implementing demand-responsive and marketing approaches to sanitation promotion.

The research focuses on villages of Zou Department in Central Benin, shown in Figure 1-2, where the household level of latrine adoption is 5% to 7% (INSAE 1994a; UNICEF 1994; UNICEF 1996). Installed latrines are nearly 100% privately financed and locally built (Alihounou et al. 1995). There is a marked variability in adoption levels across villages (Table 1-1). A distinct pattern of spatial diffusion is visible in Figure 1-2 with adoption spreading outwards from several major population centers and along road



-  Department
-  Sub-prefecture
-  Major paved roads
-  Secondary roads
-  Cities of Abomey and Bohicon

FIGURE 1-1. Map of Benin

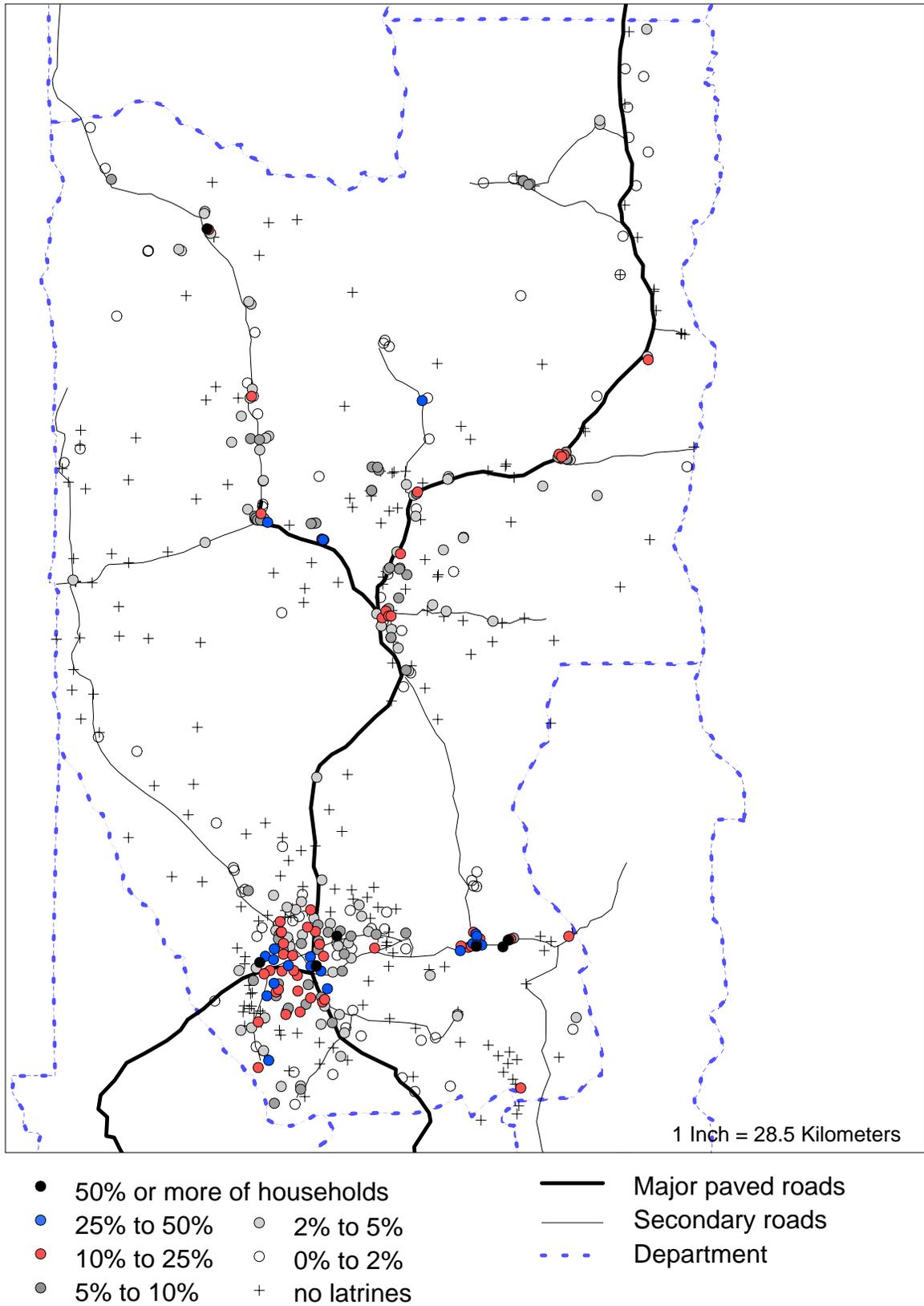


FIGURE 1-2. Latrine Adoption in Villages of Zou Department, Benin, 1993

networks. No regional program to promote sanitation had been undertaken at the time these data were collected. Thus, the small amount of adoption in Zou Department can be characterized as the spontaneous behavior of private households in a decentralized process of latrine diffusion. As such, the area is an ideal place to uncover the more fundamental processes at work in creating demand for improved sanitation. Furthermore, latrine adoption data are free of the confounding effects of external interventions on behavior (i.e., subsidies, incentives, mass marketing, construction support, or other such organized promotion).

TABLE 1-1. Household Latrine Adoption Rates^a in Rural Villages of Zou Department, Benin, 1993.

Latrine Adoption Rate (% of households)	Number of Villages	Percentage of Villages
0%	205	39%
0 to 2%	87	17%
2 to 5%	95	18%
5 to 10%	68	13%
10 to 25%	47	9%
25 to 50%	14	3%
greater than 50%	4	1%
All	520	100%

^a Data from *Etude de Milieu 1993, National Guinea Worm Eradication Program, Ministry of Health, Government of Benin (UNICEF 1994)*.

The progression of the dissertation follows the actual stages of the research with later chapters building on the analysis and findings of earlier ones. Some familiarity with the theoretical and qualitative work of the first two chapters is needed to comprehend the modeling results of later chapters. However, Chapters 3, 4, and 5 have been written as manuscripts and can stand alone. An overview of each chapter is presented next.

Chapter 2 reviews literature from social psychology, consumer behavior, quantitative modeling of choice behavior, diffusion of innovations, and cultural

anthropology to develop a research framework for understanding sanitation choice behavior in developing countries. This framework is used throughout the research to guide the investigation, from the design of initial qualitative fieldwork and the interpretation of findings, to the development of indicator variables and the structure of quantitative models.

Chapter 3 describes the first qualitative phase of the case study investigation. Findings from in-depth open-ended interviews with adopters and non-adopters in the study area are presented and synthesized to construct a conceptual model of latrine adoption choice. The key determinants of choice to adopt are identified and include 11 different *drives* or desires motivating adoption, the influence of lifestyle and village environment in shaping these drives, and 13 factors acting to constrain or facilitate choice. The resultant conceptual model provides a framework and tool to guide assessments and investigations of sanitation choice behavior in any given situation.

Chapter 4 describes the second phase of the investigation based on village-level data. Latrine adoption and other data, including a geographic information systems database, were obtained from agencies in Benin. These data are analyzed with regression models to identify village characteristics and conditions that promote demand for latrines. In doing so, the analysis seeks to test hypotheses from Chapter 3 about the factors that arouse *drives* for latrines. The findings are used to classify Zou villages into homogenous groups with respect to significant demand-generating factors (market segments) for a regional latrine marketing strategy.

Chapter 5 describes the survey of household latrine adoption behavior conducted in the study area as part of the third phase of this investigation. Attitude measurement is

used to quantify the presence of hypothesized *drives* and *constraints* shaping preference, intention, and choice to adoption latrines in rural Benin. The survey results are presented and differences by gender, occupation (farmer and non-farmer), and adopter status are examined. These data provide the basis for the analysis in the next two chapters.

Chapter 6 applies factor analysis to reduce the large set of interrelated attitude measurements from the survey to a smaller conceptually meaningful set of drive and constraint factors. The analysis reveals interrelationships among attitudes and beliefs, and improves understanding of the values underlying the operative drives and constraints of latrine adoption in the study area. It also produces a more parsimonious set of composite explanatory variables with improved statistical properties for developing mathematical models of choice behavior in the final analysis.

Chapter 7 develops mathematical models of preference for latrines, stated intention to adopt, and observed choice in installing a latrine from the household survey data. Independent variables represent drive and constraint factors from the original qualitative work. The intent of the modeling effort is to identify the relationships of these explanatory variables to the three progressive indicators of adoption. Both linear regression and binary logit modeling techniques are used. Socio-demographic variables are added to the final models to test for any unmeasured effects associated with difference lifestyle groups.

Chapter 8 concludes the dissertation with a summary of major insights for understanding sanitation demand in rural Benin and generally in developing countries, followed by a synthesis of policy and methodological conclusions.

CHAPTER 2

UNDERSTANDING LATRINE ADOPTION AND SANITATION CHOICE IN DEVELOPING COUNTRIES

1. INTRODUCTION

This chapter's purpose is to develop a research framework for this project and for understanding sanitation choice. It is helpful to begin by listing some important observations about the adoption of private latrines by rural households in developing countries such as Benin:

- Adoption of latrines is best described as a household consumer decision made, in most cases, by the head of household.
- By standards of cost and income, a latrine is usually a costly major investment.
- In most developing countries, using a latrine is a significant departure from prevailing rural defecation habits and adopting one further entails changing the management of feces.
- Defecation and feces are almost universally associated with cultural notions of taboo, pollution, dirt, and/or danger.
- In rural areas where extensive bush land and fields provide free alternative open defecation sites, latrines are perceived as a luxury more than a necessity.
- Latrines are an innovation entering many rural societies through urban and foreign contacts and/or by externally directed sanitation programs.

These observations suggest fundamental questions to consider in understanding latrine adoption behavior and sanitation choice in developing countries. For example: what determines human preference and behavior in a given situation; why do consumers

buy specific goods; how do they choose among alternatives; are the answers to these questions similar for consumer innovations; how do innovations spread through a society; what is the role of culture in consumer and sanitation behavior; and, what are the foundations for culture's role. If we can begin to answer questions like these, we may be able to more clearly understand the failures of past sanitation programs and overcome them in the future. To actually measure the answers to such questions for a specific sanitation adoption choice, we need appropriate measurement, modeling, and statistical techniques for quantitative analysis of both individual and aggregate behavior.

In this chapter theory and research from social psychology, consumer behavior, quantitative modeling of choice behavior, diffusion of innovations, and cultural anthropology are presented to provide conceptual and methodological approaches for understanding sanitation choice. This theoretical background will be used to inform the research process, interpret and analyze the case study data, and construct a conceptual framework and quantitative model of consumer sanitation choice behavior for latrine adoption in rural Benin.

The rest of this chapter is organized into six sections. The next section considers three conceptual models of behavior and consumer decision processes. How these models can be mathematically implemented is shown in section 3. Key ideas from diffusion theory on the adoption and spread of innovations are presented in section 4 and examined in the context of latrine adoption in rural Benin in section 5. Section 6 explains the basis for the strong role culture plays in latrine adoption and sanitation choice behavior. The chapter concludes with a summary in section 7.

2. MODELS OF BEHAVIOR AND CONSUMER DECISION PROCESSES

Although models of behavior and individual decisions abound, only three models are presented in this section. These were chosen because they complement each other in contributing to a general understanding of discrete choice behavior and have been operationalized and tested in part if not in full. Building on the first two presented, the third model conceptualizes the decision process for an innovation adoption problem comprising a choice situation where alternatives in the decision-maker's choice set (the options that are both feasible and known to the decision-maker during the decision process) are functionally non-comparable and likely to differ for each decision-maker. Latrine adoption by rural households in Benin, as revealed in the next chapter, is the result of choice among functionally non-comparable alternatives which differ for each individual. As will be seen, these two features of complexity in choice are important for understanding latrine adoption and may be true in many other sanitation choice situations in developing countries.

The first model presented is Fishbein and Ajzen's theory of reasoned action, a predictive model of attitude-behavior relations. It is perhaps the most popular general model describing the motivational forces affecting a person's behavior (Fishbein 1967; Fishbein and Ajzen 1975; Ajzen and Fishbein 1980). The model has been used and tested across a broad range of topics, research fields, and cultures (see Triandis and Fishbein (1963), Fishbein and Ajzen (1977), Sheppard et al. (1988) and Kim and Hunter (1993a, 1993b) for examples and reviews). Engel, Kollat, and Blackwell have developed a general model of the consumer choice process when selecting among alternatives (Engel et al. 1968, 1978). This second model encompasses Fishbein and Ajzen's

relations but goes beyond correlation and prediction to postulate cognitive mechanisms linking key elements of choice to the final choice outcome. Although the overall structure remains hypothetical, the model is consistent with general knowledge and many of the individual mechanisms have been tested empirically. Furthermore, it represents one of the most comprehensive theories for guiding research on consumer behavior.

Most choice models assume all consumers face a set of comparable alternatives, often the same set for everyone, for example, brand choice situations, water source choice, travel mode choice, etc. To address this problem, Mokhtarian and Salomon's (1994) model incorporates the formation of an individual's choice set into a standard consumer decision framework (such as Engel, Kollat, and Blackwell's model) and addresses how non-comparable alternatives are compared and evaluated. They propose a set of mechanisms and factors that lead to the presence or absence of an innovation in an individual's choice set. Their model allows one to distinguish different forms of rejection, each with different implications for promoting adoption.

2.1 Fishbein and Ajzen's Model

Fishbein and Ajzen's theory of reasoned action from social psychology links behavior with several psychological antecedents (Fishbein 1967; Fishbein and Ajzen 1975; Ajzen and Fishbein 1980). The factors influencing behavior are shown in the model of Figure 2-1. *Behavioral intention* (BI), a person's subjective likelihood of engaging in a given behavior, is the immediate determinant of behavior. BI results from *attitude* toward the behavior or act (A_{act}) and *subjective norm* (SN). A_{act} is a person's overall favorable or unfavorable evaluation (a predisposition or feeling) about performing the behavior. SN is the perceived social pressure to (not) perform the behavior, reflecting

a person's motivation to comply with the attitude of various reference groups and family. According to the theory, A_{act} and SN, each weighted by their relative importance for a given behavior, jointly determine BI. No other variables act directly on BI.

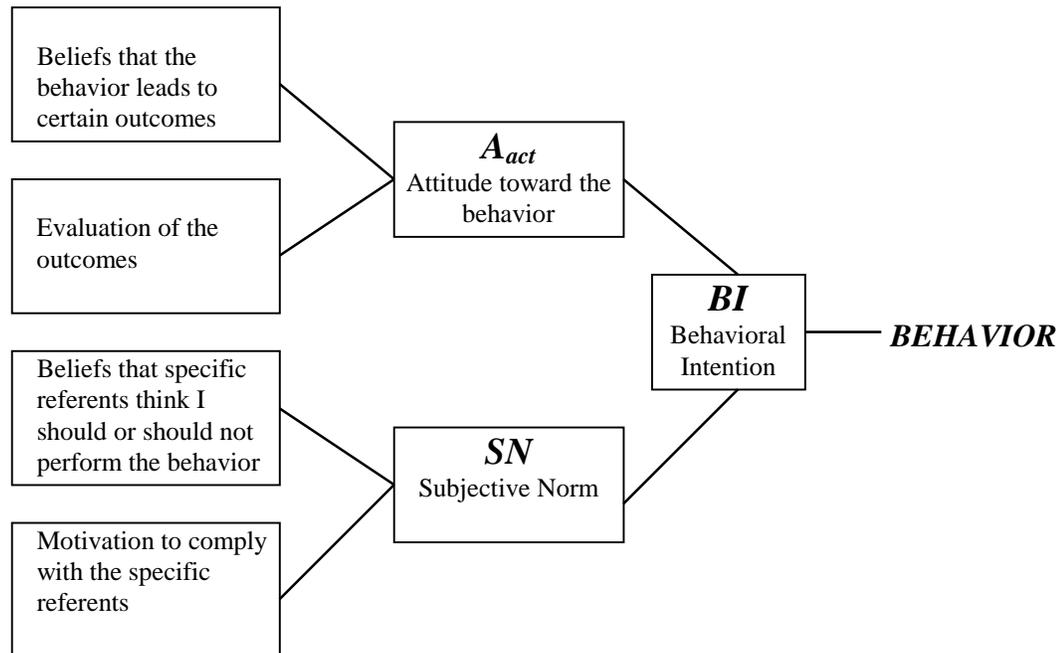


FIGURE 2-1. Fishbein and Ajzen's (1980) Theory of Reason Action

Both A_{act} and SN are constructs of underlying sets of beliefs. *Behavioral beliefs* are the perceptions (sometimes called cognitive attitudes) about attributes of a behavior, in terms of the consequences and outcomes of carrying out that behavior. A belief is weighted by the person's evaluation of its outcome, along a good-bad or negative-positive dimension. A person's overall attitude toward a behavior is the composite evaluation of these behavioral beliefs. Thus, while two people may hold the same beliefs about the outcomes of a behavior, their attitudes will differ to the degree that their evaluations of the goodness or badness of these outcomes differ. Alternately, two people may have the

same attitude (i.e., they both hold a positive feeling about a behavior), but hold different beliefs about the outcomes (i.e., about the extent to which the behavior possesses certain attributes). *Normative beliefs* treat the likelihood that important reference people or groups would approve (disapprove) of performing a behavior. Each normative belief is weighted by a person's degree of motivation to comply with this referent. The composite effect of all relevant referents is subjective norm.

The theory's predictive power for behavior is limited by three necessary conditions: 1) the intention measure must match the behavior in terms of action, target, context, and time; 2) the amount of time between measurement of intention and observation of behavior should be small to reduce the possibility of changes in intention; and 3) most important, the behavior must be under volitional control so that circumstances do not affect ability to act (Ajzen and Fishbein 1977; Ajzen 1985). The model deals well with the fundamental motivational predictors of intention when behavior is volitional. However, it ignores a host of other factors such as skills, abilities, knowledge, time, financial situation, availability, and access to other inputs, and so on, needed to perform a behavior not under a person's full control. Anticipation of these enabling factors can affect intention while unanticipated changes in their condition can cause behavior to diverge from intentions. To correct this limitation, Ajzen introduced the concept of *behavioral control* and proposed a third determinant of intention and behavior called *perceived behavioral control* (PBC) (Ajzen 1985; Ajzen and Madden 1986). PBC is a person's perceived ease (difficulty) of performing a behavior and reflects a set of underlying beliefs about resources and opportunities.

Two variants of Ajzen's proposed theory of planned behavior are shown in Figure 2-2. The first assumes that PCB affects behavior indirectly through intention (solid arrow). The second assumes that PCB affects behavior both indirectly through intention and directly (dashed arrow) to the degree that it reflects *actual control*. When a

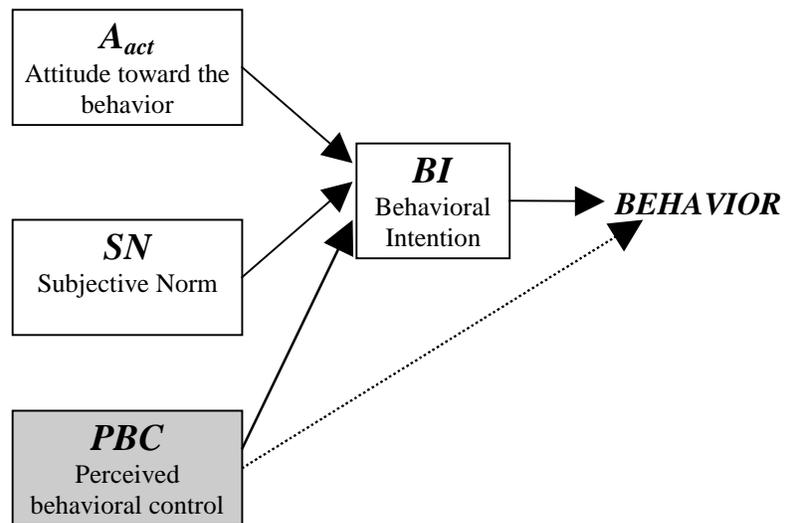


FIGURE 2-2. Ajzen's (1985) Theory of Planned Behavior: Version 1 with solid arrow, Version 2 with dashed arrow

person has some direct experience with a behavior, PCB appears to represent actual control and version two is operative (Ajzen and Madden 1986; Prislin 1993). Past experience can also change the relative contributions of attitude, subjective norm, and perceived behavioral control to a person's intention (Beale and Manstead 1990; Prislin 1993). In these studies, previous experience with a behavior was shown to lessen the influence of subjective norm on intention while either enhancing the role of attitude for more controllable behaviors, or the role of PBC for less controllable ones. It is also likely

that PBC affects intention in interaction with attitude and subjective norm given that each motivational element of intention is a necessary but not sufficient condition for forming that intention. For example, a person might believe that they could perform a behavior (positive PBC) yet they must also be inclined to do so (i.e., have a favorable attitude or positive subjective norm). Or while a person may hold a favorable attitude toward a behavior, if they believe they lack the resources or opportunities to perform it, they are unlikely to form a strong intention to engage in that behavior.

2.2 Engel, Kollat, and Blackwell Model

While the previous model identifies the basic factors influencing human preference and behavior, the Engel, Kollat, and Blackwell (EKB) model describes, more comprehensively, the decision process of consumers when choosing between discrete alternatives. The EKB model seeks to explain how a decision is reached, not just simply what the decision is. As shown in Figure 2-3, five sequential steps (shaded boxes) comprise the decision process for consumer behavior (Engel et al. 1978). These steps integrate concepts from earlier cognitive models of consumer psychology developed by Howard (1963) and Nicosia (1966) and include: 1) problem recognition (the state of arousal that activates the process); 2) search (sources and processing of information used to form beliefs and attitudes about alternatives); 3) alternative evaluation (criteria and rules for forming a preference); 4) choice; and 5) outcome (post-decision evaluation and action). These steps are described next.

Problem recognition occurs when dissatisfaction from a perceived difference of sufficient magnitude between an ideal or desired state and the actual state leads to the arousal of a *drive* for change. A person's internal motives are the primary determinants

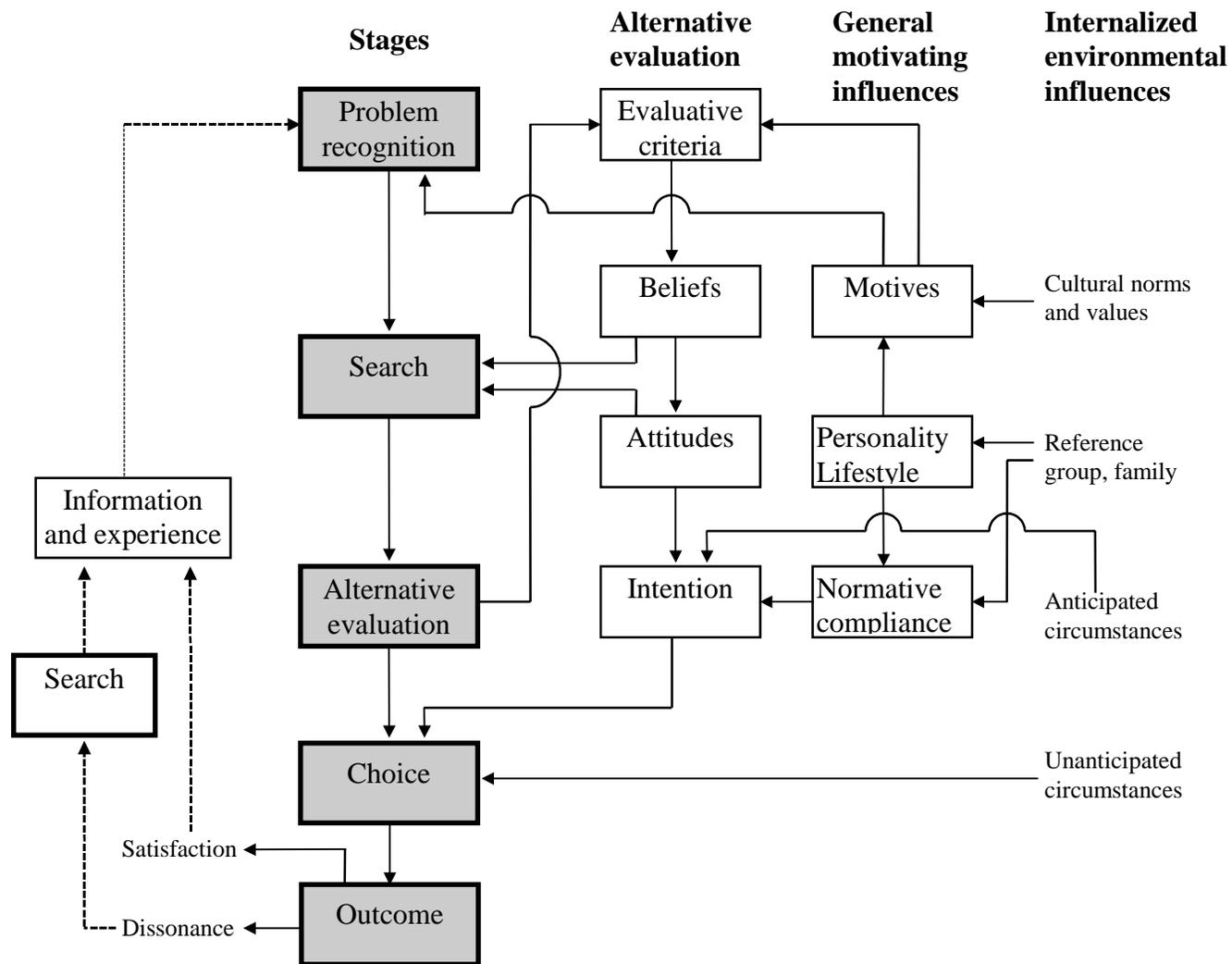


FIGURE 2-3. Decision Process Stages of the Engel, Kollat, and Blackwell Model (Engel et al. 1978)

of a desired or ideal state. These derive directly from very basic values reflected in *lifestyle*.

Lifestyle, often used interchangeably with personality, has been defined as a “pattern of enduring traits, activities, interests, and opinions that determine general behavior and thereby make one individual distinctive in comparison with another” (Engel et al. 1978, p. 558). Lifestyle conveys the notion of a single concept to capture the wholeness of the individual and his/her pattern of behavior. Engel et al. describe it as the result of personality differences in the way individuals internalize environmental influences (economic and demographic effects, cultural norms and values, social class, reference group and family influences) over time. Another characterization describes lifestyle as the highest level of choice in a hierarchy of decisions where higher levels relate to longer-term choices about the overall type or pattern of activity a person seeks to engage (Salomon and Ben-Akiva 1983). All lower level decisions, such as sanitation choice, are short-term manifestations of the lifestyle and reflect efforts to satisfy the lifestyle choice. In western culture, Salomon and Ben-Akiva propose that lifestyle choice involves long-term decisions about family, work, and leisure. In other cultures, family and work are also likely to be fundamental domains of lifestyle. In either lifestyle definition, motives, as a reflection of lifestyle values and goals, are not open to change in the short or medium term by persuasive activity. Motives must be recognized as boundary conditions for product development efforts and consumer marketing.

Generally, drives are aroused internally through the felt presence of an unmet need. However, sometimes drives can be stimulated externally when new information or experiences alter the perceived adequacy of the actual state or highlight the motivational

satisfaction of some ideal state. External sources that can change the perception of the ideal state include other consumer decisions when one purchase makes another necessary, normative expectations of reference groups, and advertising promotion designed to appeal to dominant motives (Engel et al. 1978; McCracken 1988a). Changes in such circumstances as income, family situation, occupation, and so on, can cause a change in perception of the actual state.

Problem recognition triggers the decision process and activates search. In this state individuals are open to and actively seek information about alternatives for satisfying their aroused drive. *Active memory* selectively filters information in the search (see Figure 2-3) by paying particular attention to stimuli relevant to satisfying drives, by blocking out or ignoring others judged irrelevant to drives, inconsistent with existing beliefs and attitudes, or incongruent with values and lifestyle, and by distorting how information is perceived to make it more consistent with existing beliefs and attitudes (Festinger 1957; Bruner 1958). New information or experience entered in long-term memory from perceptual filtering of external stimuli may change beliefs, leading in turn to changes in attitudes and intentions.

Information sources in the search are categorized by Engel et al. (1978) as impersonal (mass media), marketer (advertising, personal selling and point-of-sale influence) and personal (family, friends, co-workers, etc.). Mass media and marketer sources tend to be used to disseminate general information in the early phases of a decision process when little is known about alternatives. Personal sources are most preferred for evaluative information used to make a decision and are consequently most

influential to choice outcomes. Communication sources and information channels are further discussed in section 4 of this chapter on innovation adoption and diffusion.

At some point enough information is available to evaluate the alternatives identified for choice. In Figure 2-3, alternative evaluation progresses through four linked elements labeled “evaluative criteria”, “beliefs”, “attitudes”, and “intention”. Evaluative criteria are the desired outcomes of choice and directly reflect a person’s motives. Like motives, they too are not easily changed. Beliefs are the key informational link between criteria and alternatives. In accordance with Fishbein and Ajzen, attitudes are formed directly from these beliefs and their evaluation, and in turn determine intention. The EKB model maintains normative compliance (subjective norm) and adds anticipated circumstances (similar to PBC) as two other determinants of intention.

How beliefs are combined to arrive at an overall attitude toward each alternative is called the decision rule. In the theory of reasoned action, weighted beliefs are simply summed to compute attitude. This is called expectancy-value (functionally equivalent to utility-maximization) and is an example of a compensatory rule whereby a high rated attribute or outcome can compensate for a low rated one (Bettman et al. 1991). There exist other types of compensatory and non-compensatory rules (e.g., dominance, lexicographics, and satisfaction) where a weakness on one attribute is not compensated by strength in another (see Slovic et al. (1977), Svenson (1979), and Bettman et al. (1991) for a review of decision rules). Although probably used in some consumer decision situations, non-compensatory rules are more difficult to estimate empirically than compensatory rules used in most applied choice behavior research.

Choice and its outcome are the last stages in the EKB decision process of Figure 2-3. Unforeseen events or changes in circumstances, such as access to inputs, opportunity, or money, may become obstacles or facilitators for choosing a given alternative. These unanticipated circumstances may cause observed choice behavior to deviate from intention. Outcomes of choice are satisfaction and dissonance. Satisfaction strengthens pre-choice beliefs through the confirmatory information and experience of choosing and using an alternative. Dissonance is psychological discomfort or tension from having two or more related beliefs contradict or be inconsistent. It arises when post-decision experience is not consistent with prior beliefs about the chosen alternative or when rejected alternatives also have desirable attributes. Dissonance leads to search for information to confirm one's choice and devalue the desirability of unchosen alternatives.

In situations of repeat, routine, or habitual choice, both search and alternative evaluation may be bypassed because existing beliefs and attitudes, or past solutions, are adequate for evaluating or choosing. However, because sanitation choice in developing countries is a technically complex major investment and entails a new idea or innovation with a high degree of uncertainty, it is likely to employ all the processes in the EKB decision model.

Fundamental principles for sanitation marketing strategies and product development can be logically deduced from the EKB model. First, because a person's motives cannot be influenced or changed, and these determine the evaluative criteria for choosing among alternatives, a consumer's motives and evaluative criteria should be the starting point of a demand-driven program. Specifically, a successful sanitation product

design should possess features that closely match the consumer's evaluative criteria, and marketing messages should feature true benefits with respect to the drive(s) motivating a desire for change.

Second, not all consumers are identical nor do they share the same motives. Thus, market segments of homogeneous consumer groups should be identified and targeted. Heterogeneities in motives and evaluative criteria are rooted in lifestyle. One approach to identify lifestyle-based market segments is to group consumers by their attribute preferences (evaluative criteria) for a given product category (Engel et al. 1978).

Third, an important goal of promotional information is to form or change a consumer's beliefs about the degree to which an alternative possesses a given attribute so as to influence attitudes and intention. Three different ways of influencing attitude are suggested by Fishbein and Ajzen's model: 1) change the strength of an existing belief; 2) change the evaluation of an existing belief; and 3) add a new belief-value element to the composition of attitude. However, messages to influence attitude should not try to drastically change existing beliefs because of the way existing beliefs and attitudes filter out inconsistent or incompatible stimuli.

Finally, because information filters are indifferent to outside stimuli as long as problem recognition has not occurred, marketing efforts to trigger problem recognition (stimulate drives) are difficult. It may be more productive and efficient to promote the benefits of a product in terms of motive-satisfying characteristics, or the inadequacy of a present solution, to consumers who already have aroused drives and are likely to be open to or seeking information.

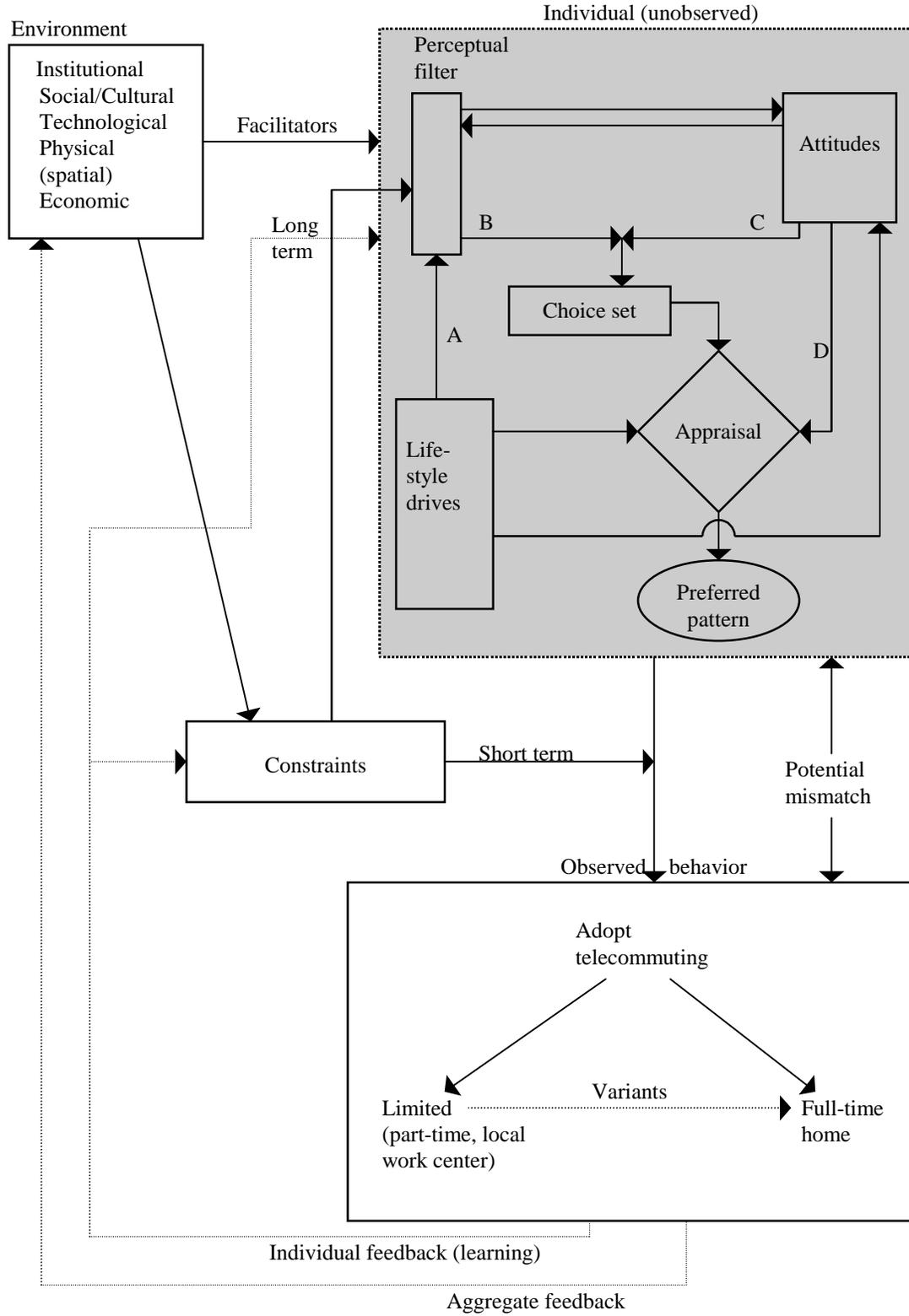


FIGURE 2-4. Mokhtarian and Salomon's (1994) Schematic Model of the Telecommuting Decision Context

2.3 Mokhtarian and Salomon Model

Mokhtarian and Salomon (1994) have developed a model to conceptualize the individual decision to telecommute (the use of telecommunications technology to work at or near home instead of commuting to a conventional work place). Key elements of the decision process are drives, constraints, and facilitators (constraints acting in the opposite direction). Drives directly reflect underlying lifestyle preferences or goals (i.e., motives in the EKB model) and are so labeled in Figure 2-4.

Interestingly, an individual's alternatives in this decision problem are neither functionally similar nor from a fixed set, but depend on the individual's aroused drive(s). While telecommuting appears to be a transportation-related behavior from a planning and policy perspective, from an adopter's perspective it can fulfill very different needs, ranging from those related to travel and commuting stress, to others related to family, work, leisure, and ideology, depending on one's lifestyle preferences. To explain an individual's decision to adopt a specific alternative when everyone is not evaluating the same set of functionally equivalent alternatives, the Mokhtarian and Salomon (MS) model addresses how alternatives get included in an individual's choice set and how they are comparatively evaluated.

Factors acting as constraints or facilitators are categorized as external or internal, based on whether or not they can be externally influenced by policy, technological solutions, promotional activities, and so on. Examples of external factors are cost, technical requirements, awareness, and understanding. Internal factors are generally psycho-social in nature and are not easily influenced by external changes (e.g., risk aversion, household dynamics, normative approval). Constraints or facilitators are

theorized to act at three different points in the decision process: formation of the choice set, appraisal of feasible alternatives when forming a preference (intention), and as post-preference modifiers of choice.

The process starts (arrow A) with the arousal of a drive that activates the perceptual filter to pay attention to and search out information about drive-satisfying alternatives (analogous to problem recognition and information search in the EKB model). The perceptual filter operates like active memory in the EKB model. Information about feasibility and relevance to needs is screened through the perceptual filter when identifying an alternative and deciding if it is entered into the choice set (arrow B). At the same time, existing beliefs and attitudes (jointly called attitudes in Figure 2-4) moderate the perceived levels of attributes for feasible alternatives (arrow C). Lack of awareness and misunderstanding can prevent an alternative from being recognized or entered in the choice set. If one or more constraints is perceived as permanent and prohibitive or *binding*, then the alternative in question is rejected from the choice set as infeasible.

At appraisal in the MS model, each alternative in the choice set is tested for how well it satisfies the drive(s) and evaluated in terms of attributes and attitudes (arrow D). Non-binding (permanent but not prohibitive) constraints make a feasible alternative less desirable. The presence and strength of facilitators (constraint factors acting positively) increase the likelihood of adopting the behavior. Finally, constraint factors perceived as temporary or removable will not affect formation of the choice set nor appraisal but enter the decision process to cause actual behavior (choice) to diverge from preferred behavior

(intention). Either intention is delayed and the no-action alternative is chosen or a second best alternative is selected.

As alternatives become more non-comparable, consumers represent attributes at higher levels of abstraction to allow comparisons within attributes (Johnson 1984). With knowledge of motives (or drives) and the use of more abstract motive-based attributes, the process of choice among non-comparable alternatives has been shown to closely resemble the decision process that consumers use when choosing between comparable alternatives (Bettman and Sujan 1987).

According to the MS model, rejection of a behavior is the consequence of conditions occurring at five different points in the decision process. These conditions are:

- No drive is active to initiate the choice process.
- The behavior is not recognized as relevant to aroused drives when identifying alternatives for the choice set due to lack of awareness or misunderstanding.
- The behavior is perceived to be permanently infeasible and rejected in forming the choice set because one or more constraints is binding.
- The behavior is less preferred than another alternative in the choice set because of negative attitudes, poorly rated attributes or insufficient drive satisfaction in the comparison process.
- Temporary constraints cause actual behavior to diverge from preferred behavior.

2.4 Model Implications for Understanding Latrine Adoption and Sanitation Choice

Neglect of the evaluative criteria and underlying motives of consumers is behind much of the failure in the design and promotion of sanitation facilities. Most latrines have been designed without knowing or clearly understanding these two important factors

of choice. Rather, latrine designs reflect the designer's own criteria, standards, and beliefs, or are simply transplanted from textbooks or another country. Health protection from fecal contamination based on germ theory has been the single benefit assumed by sanitation planners to motivate consumers to choose improved sanitation and dominates the conception and implementation of sanitation programs. Information about the fecal-oral transmission of pathogens and the diseases they cause are conveyed using western medical terminology. These messages are rarely absorbed by third world rural populations because: 1) they do not relate to people's motives; 2) they are too exotic, differing radically from existing beliefs about feces, diseases, and their causation; 3) they often conflict with cultural norms and values; and 4) they are oriented toward prevention rather than positive change (discussed further in section 4). Post-evaluations of sanitation programs have frequently shown that sanitation consumers are seeking other benefits such as status, privacy, or convenience (Elmendorf and Buckles 1980; Perrett 1983; Wijk 1994). Sanitation messages and products that do not appeal to satisfying consumers' motive(s) will neither attract attention and interest nor stimulate them to consider change. Implicit in such promotion is an attempt to change a consumer's evaluative criteria to match that particular product's design which is equivalent to attempting to change a consumer's basic values and lifestyle.

According to these models, motives emanate from a person's lifestyle and will differ across a population to the degree that different lifestyles exist. Sanitation facility design and promotion has failed to recognize the need for targeting product design, promotional activities, and messages to different market segments. Although lifestyles in third world rural societies may not be as differentiated as those of western society, rapid

economic, political, technological, and other changes underway in these countries are undoubtedly provoking lifestyle changes, even in rural areas. Even without social change effects, lifestyles differ by gender, by sub-culture, and with age or stage in the cycle of development of the household in almost all societies. As a factor in marketing strategies involving market segmentation, lifestyle appears most important for consumer products with any of these characteristics (Struse 1977):

- Their function includes “psychological gratification”, the performance of which cannot be evaluated objectively (e.g., prestige, pride).
- They require high decision-making involvement.
- They are relatively expensive.
- They carry symbolic value (e.g., status, group membership, gender definition).

From the observations listed in the introduction to this chapter and from benefits stated by adopters in project evaluations, latrines possess many of the product characteristics for which lifestyle is an important marketing factor.

These models are helpful in developing hypotheses to explain weak demand for improved rural sanitation. For instance, latrines as currently designed and promoted may not appeal to a population’s existing dominant motives for change. Various external or internal constraints may cause many people to perceive latrines as infeasible or unattractive. Sanitation programs have consistently been criticized for promoting sanitation technologies and latrine designs that are neither affordable nor acceptable. These two terms reflect external and internal constraints. However, focusing too much attention on constraints as the cause of weak demand can be misleading because the absence of constraints is necessary but not sufficient for creating demand. Drives must be

active and strong enough to consider adoption. When drives are present, consumers' lack of experience and awareness, or misunderstanding about latrines can cause demand to appear to be weak. The social environment may engender norms against using or installing latrines which are strong enough to hinder demand at the early stages of latrine adoption. Messages and information that clash with existing beliefs and attitudes may stifle interest. Identifying the norms, beliefs, and values that account for psychological resistance to latrine adoption may provide important clues to weak demand.

3. IMPLEMENTING BEHAVIORAL MODELS OF CONSUMER CHOICE

Mathematical models of the behavioral theories and decision processes discussed above have been developed and applied in different research fields. These are most commonly based on operationalizing either the attitude-behavior relations of the theory of reasoned action (or planned behavior) as a linear regression model of individual behavior, or the individual decision process in choice behavior as a probabilistic discrete choice model using utility maximization as the decision rule. Individual probabilistic discrete choice models (disaggregate demand models) are generally estimated using logit (mathematically equivalent to logistic regression in the binary case) or probit analysis methods. These two quantitative approaches to model choice behavior are reviewed next.

3.1 Theory of Reasoned Action Model

The general model equation of the theory of reasoned action (Figure 2-1) is:

$$B \approx BI = w_0 (A_{act}) + w_1 (SN) \quad (1)$$

where:

$$A_{act} = \sum_{i=1}^n B_i e_i \quad (2)$$

and:

$$SN = \sum_{j=1}^m NB_j MC_j. \quad (3)$$

In the theory of planned behavior (Figure 2-2), equation 1 becomes:

$$B \approx BI = w_0 (A_{act}) + w_1 (SN) + w_2 (PBC) \quad (4)$$

where:

$$PBC = \sum_{k=1}^s CB_k. \quad (5)$$

Symbols are defined as follows:

A_{act} = attitude toward the act;

B = behavior;

B_i = strength of behavioral belief i ;

BI = behavioral intention;

CB_k = strength of control belief k ;

e_i = evaluation of behavioral belief i ;

MC_j = motivation to comply with normative belief j ;

NB_j = strength of normative belief j ;

PBC = perceived behavioral control;

SN = subjective norm;

w_0 , w_1 , and w_2 = weights of the relative contribution of each factor to intentions;

i , j , and k = index of behavioral, normative, and control beliefs respectively;

m , n , and s = number of behavioral, normative, and control belief items respectively.

Equations 2 and 3 are the indirect measures of attitude and subjective norm constructed from summing the appropriate sets of weighted beliefs. PCB is measured indirectly as the sum of scores for each control belief (equation 5). Intention is measured directly by

having respondents score one or two intention statement items. Attitude, subjective norm, and PCB also can each be measured directly by scoring one or two general statement items to verify correspondence with indirect measures.

Different types of attitude scales (described later in this section) are used to score statements of belief, evaluation, attitude, subjective norm, intention, and so on. Behavior is measured by direct observation, or less accurately by self-reporting. The relative contributions (w_0 , w_1 , and w_2) of attitude, subjective norm and perceived behavioral control to intention in equation 1 or 4 are the regression coefficients of a multiple linear regression analysis of a sample of respondents' scores and behavior. Significance tests, correlation, and regression coefficients provide a measure of the importance of each variable in the model and its strength to predict intention and behavior. By comparing statistics and statement scores for subgroups of adopters and non-adopters, much can be learned about the differences in beliefs, attitudes, subjective norms, and perceived behavioral control to explain differences in behavior. External variables (e.g., demographics, personality, etc.) can be examined for empirical correlation with the behavioral model variables and outcomes.

3.2 Probabilistic Discrete Choice Model

The most common and tractable way that individual choice behavior has been operationalized in applied research is with probabilistic discrete choice models based on random utility theory (Ben-Akiva and Lerman 1985; Meyer and Kahn 1991). Derived from a decision-maker's evaluation of an alternative's attributes, utility is a scalar index of the overall attractiveness of an alternative. The choice problem is characterized as an individual decision maker who, faced with a set of feasible discrete alternatives, selects

the one that yields the most utility (utility maximization decision rule). A decision-maker's preferences (the rank of each alternative's utility) are assumed to be consistent and their order preserved under any mathematical transformation.

Mathematically, one proceeds in the following manner: Each alternative, i , in decision maker n 's choice set, C_n , has a unique utility, U_{in} , which is a function of the vector of attributes for alternative i as viewed by individual n (\mathbf{Z}_{in}) and a vector of socio-demographic characteristics of n (\mathbf{S}_n). Thus,

$$U_{in} = U(\mathbf{Z}_{in}, \mathbf{S}_n). \quad (6)$$

This formulation is flexible enough to account for heterogeneous alternatives, and decision-makers who have different choice sets, evaluate different attributes, and face individualized values for a given attribute of a given alternative. Some of these differences might reflect taste variations across a population, another label for personality or lifestyle differences which are often modeled with socio-demographic variables.

The inability to fully observe an individual's true utilities, or fully understand and measure their inputs, means that we must resort to probabilistic approaches that consider the modeled utility of each alternative (U_{in}) to be a random variable. Random utility is expressed as:

$$U_{in} = V_{in} + \varepsilon_{in} \quad (7)$$

where V_{in} is the observable (systematic) component of utility and ε_{in} the unobservable or random component. Manski (1977) gives four distinct sources of randomness in the modeler's inability to determine an individual's true utility: unobserved attributes, unobserved taste variations, measurement errors and imperfect information, and instrument (or proxy) variables.

Random utility models estimate the probability that each alternative will be chosen for an individual. The probability of individual n selecting alternative i is equal to the probability that U_{in} is greater than or equal to the utilities of all other feasible alternatives in n 's choice set, expressed as:

$$\begin{aligned} P_n(i | C_n) &= \Pr [U_{in} \geq U_{jn}, \text{ all } j \in C_n, j \neq i] \\ &= \Pr [V_{in} + \varepsilon_{in} \geq V_{jn} + \varepsilon_{jn}, \text{ all } j \in C_n, j \neq i]. \end{aligned} \quad (8)$$

The systematic component of utility, V_{in} , is treated as a linear-in-parameters function of combinations of the attributes of alternative i for individual n (the elements of vector \mathbf{Z}_{in}) and the characteristics of individual n (the elements of vector \mathbf{S}_n). This function is expressed as:

$$V_{in} = \beta_1 x_{in1} + \beta_2 x_{in2} + \beta_3 x_{in3} + \dots + \beta_k x_{ink}. \quad (9)$$

For each alternative i and individual n , \mathbf{x}_{in} is a distinct vector of combination attributes ($\mathbf{x}_{in} = \mathbf{h}(\mathbf{Z}_{in}, \mathbf{S}_n)$). β is the vector of k unknown parameters for each of the k elements of the vector \mathbf{x} . By defining elements of \mathbf{x} appropriately (e.g., using dummy values or variables), alternative-specific variables can be included in an alternative's systematic utility function. Thus, the attributes and the parameters or weights on attributes need not be the same for every alternative. Additionally, as in regression analysis, any real transformation of the elements of \mathbf{Z}_{in} and \mathbf{S}_n can be included in \mathbf{x} (such as polynomial, logarithmic, exponential, interaction products, etc.). Finally, if different groups of individuals (lifestyle or other market segments) are anticipated who have different parameter weights on attributes, a separate model can be estimated for each such subgroup to allow an entirely different vector β of parameters. Alternately, some of the elements of \mathbf{x} can be defined to reflect the systematic ways that preferences or tastes in

the population at large are expected to vary with some known socio-demographic characteristic.

The assumptions that the random components of utility (ϵ 's) for each alternative are independent and identically distributed, and have a Gumbel distribution with location parameter η (absorbed without loss of generalization into V) and a scale parameter $\mu > 0$ (taken for convenience to equal one), produces, from equation 8, the logit model:

$$P_n(i) = \frac{\exp(V_{in})}{\sum_{j \in C_n} \exp(V_{jn})}. \quad (10)$$

This results from the fact that the distribution of the difference between two independent Gumbel variates with the same scale parameter μ is logistically distributed. Substituting the linear-in-parameters version of V_{in} from equation 9 into equation 10 yields:

$$P_n(i) = \frac{\exp(\beta' \mathbf{x}_{in})}{\sum_{j \in C_n} \exp(\beta' \mathbf{x}_{jn})}. \quad (11)$$

Equation 11 is valid for choice sets of either two (binomial) or more (multinomial) alternatives. The parameters, β_k , of the logit model are estimated using a maximum likelihood estimation procedure on a sample of individual observations. Each observation consists of an indicator variable of the observed choice, and a vector of attributes and combination alternative-individual variables for each alternative. Numerical optimization techniques are used to find the parameter estimates that maximize the log-likelihood function. Various statistics are available to test significance of the logit coefficients and goodness-of-fit of the model or set of models to the observed data.

Certain properties limit the situations for which the logit model can be applied. These include the property of independence of irrelevant alternatives (IIA) which arises from the assumption that the random disturbance terms of each alternative's utility are independent and identically distributed (IID property). The IIA property means that the ratio of choice probabilities at the individual level for any two alternatives is unaffected by the systematic utilities of any other alternatives. In a choice set of more than two options (multinomial logit), when two alternatives systematically share unobserved characteristics due to their being in a similar category of options, compared to other alternatives in a choice set, their disturbance terms are likely to be correlated, meaning that the IIA property does not hold. This leads to erroneous logit forecasts of individual choice probabilities if a model having the IIA property, such as multinomial logit, is used. However, at the population level, if socio-demographic heterogeneities are captured, aggregate logit forecasts and the assumption of IIA become more reasonable (Ben-Akiva and Lerman 1985).

One very useful feature of logit models is the ease with which elasticities of demand (or choice) can be calculated. Formulae can be derived from the logit model for disaggregate, aggregate, direct, and cross elasticities to predict changes in individual probabilities and aggregate shares of choosing an alternative from modifying the level of some independent variable (Ben-Akiva and Lerman 1985). An alternate way to predict changes in choice behavior as a function of changes in independent variables is the incremental multinomial logit model. This model computes the effect of a incremental change in systematic utility, attributable to the incremental change in the affected variable(s), on the existing individual choice probabilities (Ben-Akiva and Lerman 1985).

Other assumptions about the joint distribution of the random disturbances (ϵ 's) in equation 8 lead to different model forms, some of which are computationally intractable. Those that have been solved include the linear probability model for binary choice based on assuming a uniform distribution for the difference of the random terms ($\epsilon_{in} - \epsilon_{jn}$), and the probit model for both binary and multinomial choice based on assuming that the joint probability distribution of disturbance terms is multivariate normal.

3.3 Measurement of Variables

Techniques used to measure beliefs, attitudes, subjective norms, intentions, and other such factors in these models are broadly called attitude measurement. Attitude measurement uses ordinal scales to assign a numerical rating to any of these qualitative variables. These ratings are then used in quantitative models. Several different types of scales and their variations are commonly employed. The best known are semantic differential, Likert, and Thurstone scales, and adaptations of these (Summers 1970; Sudman and Bradburn 1982; Aacker and Day 1990).

Semantic differential (SD) uses bipolar adjective pairs on either end of a seven-point scale (Osgood et al. 1957). Beliefs or outcomes are evaluated on a good-bad SD scale. Attitudes towards an alternative or behavior are expressed by rating word pairs that correspond to positive-negative dimensions of affect (e.g., agreeable-disagreeable, healthy-unhealthy, etc.). Likert-type scales are five or seven point disagree-agree scales or unlikely-likely scales for rating attributes, outcomes, beliefs, intentions, opinions, etc. (Likert 1932). The Likert scale has been adapted to measure frequency of behavior (e.g., complying with expectations of referents), intention, activity, or expected outcome, and the importance of an attribute, advantage, or disadvantage of an alternative. Qualities

(e.g., level of satisfaction with a product) can also be directly quantified using numerical scales of 1 to 5 or 1 to 10. Thurstone scales, sometimes called rational scales, consist of a set of statements relating to a given value or object that have been arranged by large panels of judges to compose an equidistant scale of attitude towards the object (Thurstone 1932).

To reduce a large number of measured belief or attitude statement items to a smaller set of underlying dimensions that reflect attributes at higher levels of abstraction, or to create a general index of attitude toward an alternative, factor analysis has been effectively used (Koppelman and Pas 1980; Mokhtarian and Salomon 1997). Not only does this link specific attribute items to motives or drives, or provide an overall measure of attitude toward each alternative, it also creates a more manageable set of variables (factor scores) for model development and testing while retaining much of the richness of the full data set. Using factor scores from factor analysis can also reduce collinearity problems and improve model interpretability. Furthermore, the approach may more closely resemble the way consumers reduce masses of attribute information into a simpler structure of variables actually used to make a decision.

The operationalization of lifestyle poses a more difficult problem. Traditional marketing techniques identify lifestyles by measuring a large set of attitudinal data in what are called “activities, interests, and opinions” (AIO) studies. For a given product or behavioral category, AIO profiles and demographic variables of people making similar choices are then used to define lifestyle groups. This technique is called psychographics (Wells 1974).

For planning studies in many fields, AIO measurements are generally unavailable for the population of interest. They are not considered standard population variables nor are they typically general enough to be relevant to a broad range of behaviors. Most studies segment populations along one or two basic socio-demographic variables, often with very limited success because these variables, singly or combined arbitrarily, have little inherent explanatory power for such a multi-dimensional concept as lifestyle. Salomon and Ben-Akiva (1983) proposed and successfully tested a multivariate approach to identify lifestyle groups to create more effective market segments. They use available socio-economic and demographic characteristics to construct proxy variables for long-term lifestyle aspirations covering the basic domains of family, work, and leisure (see the discussion of lifestyles in section 2.2). Then, cluster analysis using these lifestyle indicator variables is employed to search for natural groupings in the data that can be recognized as distinct lifestyle groups. These groupings are then tested for their ability to improve model estimation compared to a pooled (non-segmented) model or to traditional schemes for market segmentation.

3.4 Cross-cultural Applicability

Cross-cultural and developing country research using the mathematical models presented in this section show that they can be successfully and fruitfully applied in other cultural contexts (see Lee and Green (1991) and Durvasula et al. (1993) for cross-cultural applications of Fishbein and Ajzen's model; see Mu et al. (1990), Hounsa et al. (1993), Madanat and Humplick (1993), and Akin et al. (1995) for applications of discrete choice modeling to health and water supply behavior in developing countries). Qualitative investigations are often required to develop culturally appropriate statement items and

measurement scales for collecting observations to use in quantitative models. The difficulty of using attitude measurement scales may be particularly acute among populations of illiterate non-western cultures where people have little experience quantifying their beliefs, feelings, preferences, intentions, and so on, and where surveying must use face-to-face interviewing. Careful instructions and special methods may be needed to help respondents use such scales correctly. In Benin, attitude measurement scales were successfully adapted by having respondents use the greenness of leaves to express the strength of their attitudes in an adoption study of oral rehydration to treat infant diarrhea, based on Ajzen's theory of planned behavior (Hounsa et al. 1993).

4. INNOVATION ADOPTION AND DIFFUSION

Diffusion theory is a body of empirically derived generalizations about how innovations spread in time and space through a social system. An innovation (a new idea, practice, or object), by definition of its newness, is surrounded by uncertainty. Information is essential for reducing that uncertainty. Diffusion theory focuses on the processes and channels by which an innovation is communicated over time among the members of a social system. Particular attention is given to the function of different kinds of information (*informative* or awareness information, *evaluative* or subjective influence information, and *technical* or implementation-related information) and their channels at different stages of the decision process and for different adopter categories. The theory addresses: how early adopters differ from late adopters in their use of communication channels and their personal characteristics; how the perceived attributes of an innovation affect its rate of adoption; how the cumulative rate of adoption takes off when interpersonal networks of communication become activated; and how distance in

geographic and social terms, acting as a communication barrier between potential adopters, determines the spatial and social pattern of diffusion across a region and system. The following review is based on the conceptual foundations of diffusion theory by Rogers (1983) and elaborated by Gatignon and Robertson (1985).

Rogers' stages of an individual's innovation decision closely parallel the steps in the EKB and MS decision process models. Informative knowledge, about the existence of the innovation, how it functions, what it does, what needs or problems it meets, and so on, is gained in the initial awareness stage of the decision process. Mass media, advertising, and other such impersonal communication channels can effectively and rapidly transmit informative information on a wide scale to potential adopters. An important function of mass media is to stimulate interest in the innovation by arousing relevant needs (i.e., drives). If an individual does not perceive the innovation to be relevant to needs and consistent with attitudes and beliefs, he or she will have no motivation to seek further information. This situation is similar to rejection from lack of awareness, misunderstanding, or lack of a drive in the MS model.

In the subsequent persuasion stage, an overall favorable or unfavorable attitude (feeling) towards the innovation is formed, similar to formation of preference and intention in the choice behavior models. Interpersonal two-way communication is needed to ask questions, seek out normative evaluations of the innovation from one's reference group, and vicariously test the innovation through the experiences of adopters in one's social network. The most influential sources of interpersonal evaluative information are one's peers and opinion leaders. These peers and leaders are generally sufficiently similar in terms of demographic characteristics, beliefs, social status, and so on (i.e., lifestyle),

for information to be effectively exchanged between transmitter and receiver. Such *homophilous* communication is usually necessary for persuasion to occur. If few of one's network peers or none of one's personal opinion leaders have adopted, the information needs for evaluation of an innovation and formation of a preference remain unmet. Social modeling or the imitation of what those in one's social network have successfully done is an important feature of innovation adoption (Tarde 1903). Opinion leaders are, by definition, the most socially connected in a community or network. Thus, once they adopt, adoption rates tend to accelerate, setting-off a self-generating diffusion process displayed in the take-off of the diffusion curve (Coleman et al. 1966; Tarde 1969).

Information on the technical feasibility of adopting an innovation is gathered in the decision stage after persuasion has occurred. Consumers use a variety of impersonal, personal, and marketer channels for this kind of information. When possible, small-scale trial is used to test the feasibility and consequences of an innovation. When trial is not directly possible, other substitutes can be used (demonstrations, adoption by others who are peers or personal opinion leaders, money-back-guarantees, etc.). If adoption is chosen, implementation occurs. Uncertainty still exists and technical assistance to get, install, and use the innovation is needed. Re-invention, or the active modification and adaptation of the innovation by the adopter may occur during implementation.

Confirmation is like the post-decision outcome stage in the EKB model where dissonance plays a large role. So called "change agents" actively promoting an innovation may be needed to supply supportive messages to adopters. Discontinuance or later adoption (for those who rejected the innovation at the decision stage) are two eventual actions of the confirmation stage.

One aspect that distinguishes innovators from the majority of potential adopters is their greater use of mass media and *cosmopolite* channels (i.e., information sources outside their immediate community or social system). Innovators' social networks may be more extensive (in space) and have more *heterophilous* (opposite from homophilous) links within and beyond the boundaries of the social system than non-innovators. Bass (1969) characterizes innovators not in the typical terms of earliness of adoption but in terms of exclusive use of sources of influence external to the immediate social system. In contrast, the majority of adopters, and especially later adopters, are less cosmopolitan and more heavily dependent on interpersonal channels within their immediate community for all types of information. Innovators may also depend less on the subjective evaluations of near-peers than other groups and less on the experience of others in making their decisions than non-innovators because they are less influenced by these factors (Midgley and Dowling 1978). Robertson and Gatignon suggest that consumers highly dependent on normative influence may take longer to adopt because of the time needed for the greater amount of norms-related communication to occur before it is clear that a majority of friends support the innovation.

Research on innovators across consumer product categories shows they tend to have the following characteristics: higher income, higher education, younger, more socially mobile, more favorable attitudes toward risk, greater social participation, and higher opinion leadership (Robertson et al. 1984). Rogers' extensive review of innovation adoption studies covering fields other than consumer products, shows the following characteristics tend to be positively related to innovativeness: higher social status, commercial rather than subsistence economic orientation (perhaps related to risk-

aversion), more favorable attitude toward education and science, membership in highly interconnected systems, and cosmopolitanism. However, innovator characteristics vary for different categories of innovations.

The speed of diffusion is also affected by the characteristics of innovations. Rogers postulates five generic attributes affecting speed: relative advantage, compatibility (i.e., consistency with existing values, needs and experiences of potential adopters), complexity, trialability, and observability. To these Gatignon and Robertson have added perceived risk. Innovations whose relative advantage is prevention (e.g., seat belts, malarial bednets, etc.) pose problems for diffusion. Motivation to adopt is weaker for preventive innovations because the desired consequences of the innovation are uncertain and involve avoiding some unwanted future event which may or may not occur whether one adopts or not. Thus, promoting latrine adoption, sanitation improvements, and hygiene behaviors as preventive measures for diarrhea and other fecal-oral illnesses is less likely to be successful than promoting them as making certain tangible and positive changes in a person's life.

Characteristics of the social system will affect diffusion rates. For example, systems where individuals have higher mass-media exposure, where opinion leaders operate in more highly connected networks, and that are more homogeneous in population characteristics, will have higher rates of adoption. These characteristics enhance communication processes in the spread of innovations.

Social change is a significant feature of innovation diffusion both as a force behind and a consequence of adoption. As an innovation enters a new social system, its meaning, function, and other attributes are uniquely defined and often changed by its

members in the act of adoption (Linton 1936; Southall 1961; Rogers 1983). While it may be possible to predict the more objective aspects of form and function of an innovation in the way of life of a social system, it is extremely difficult to predict the subjective meaning a receiving culture will attach to the innovation in the process of its diffusion. In developing countries, innovations from the West have taken on completely new and unexpected meanings (Wallendorf and Arnould 1988; Arnould 1989). The adoption of new ideas, behaviors, or objects can be an act to manifest certain social and economic changes underway while simultaneously altering the structure of that social system (McCracken 1986; Arnould 1989).

5. LATRINE DIFFUSION IN RURAL BENIN

In this section the characteristics of the present spread of latrines in rural Benin are examined in the context of diffusion theory and what these suggest for understanding individual latrine adoption behavior and aggregate diffusion.

1. The decision to adopt a latrine requires high cognitive processing.

Impersonal and mass media channels of information will be less effective throughout the individual's decision process under high cognitive processing which occurs for products with the following characteristics (Gatignon and Robertson 1985):

- They require high learning such as new technologies or products having a major or discontinuous effect on established consumption patterns.
- They have high transaction and/or direct costs of adoption.
- They have high social relevance from being symbolically defined by social referents or from dependence on social acceptance.
- They involve a multi-person unit in the adoption decision.

At present, latrines in rural Benin possess all of these characteristics. Latrines are an unfamiliar complex technology that entails a major shift in defecation behavior and a large investment of time and money. Although adoption is the household head's decision, in many cases members of the household and the extended family are involved. As discovered in the next chapter, latrines' social relevance and meaning in the present cultural context of rural Benin may be more important than their functional value.

2. The type of diffusion underway is spontaneous and decentralized.

Currently no central organization, coordinated program, or managed change agents are actively promoting the adoption of latrines in rural Benin and no standard latrine design exists. (The World Bank has just started to implement such a program in two of six departments of Benin.) Adopters are defining their needs themselves by drawing on the social, cultural, and physical context of their daily lives. When diffusion is spontaneous, social structure changes often drive adoption by creating the needs, motives, and cultural meanings assigned to an innovation. The next section provides a more detailed discussion of the cultural dimension of consumption and the role of social and economic change. The likelihood of re-invention is high under these circumstances as adopters are generally freer to adapt the innovation to their own situations.

When spread is decentralized, innovations diffuse through horizontal networks of peers in a pattern dominated by the "neighborhood effect" (Rogers 1983). The time to and probability of adoption for a given individual or adopting unit can be expressed as a function of the distance between this individual and the nearest adopter (Hagerstrand 1967). More recent research has extended Hagerstrand's geographic definition of distance as a barrier to information flow about innovations, to include a social definition

of distance created by socio-economic differences (heterophily) (Rogers and Kincaid 1981).

3. *Socio-economic and lifestyle differentiation are increasing in rural Benin.*

Greater heterogeneity in a social system slows the diffusion rate and lowers the maximum penetration of an innovation in the market (Gatignon and Robertson 1985). Market fragmentation into segments and differentiated lifestyles reflect social system heterogeneity. Increased heterogeneity reduces interpersonal contacts and their effectiveness due to the action of social distance. Penetration is reduced by the size of the market segment(s) to which the innovation is relevant and appealing.

Pre-colonial Fon society, with the exception of a small royal elite minority, was quite homogeneous in terms of lifestyle for the vast majority of individuals who were subsistence farmers of the peasant/commoner class. Colonialism and independence have unleashed major economic and political changes and created the urban sector. These changes have transformed the structure of rural society through the decline of the royal class and the increasing differentiation of lifestyle's ingredients, namely occupations, economic and social status, family structures, and so on. In research on innovation diffusion in rural economies under transformation in West Africa, Arnould (1989) reveals how as "market-mediated differentiation" of social segments in these systems accelerates, consumption symbolism and the rate of adoption of innovative goods among new segments increases.

4. *Communication in rural Benin is largely inter-personal as mass media sources and advertising are virtually non-existent.*

Awareness or informative information, in a mass media deprived system, is transmitted through interpersonal contacts or direct personal experience. Early in

diffusion, opportunities to gain awareness and gather informative knowledge may be lacking or very limited. Information transmission through interpersonal contacts can take both a verbal and visual form. For innovations carrying symbolic value (i.e., communicating a new social meaning) visual influence from personal contact may be more effective than verbal influence in creating initial awareness (Gatignon and Robertson 1985).

When mass media and other impersonal sources are lacking, a person's social network and mobility pattern are likely to be important factors in how soon or fast exposure to and awareness of latrines is gained, especially in the early phase of adoption. Both these factors are closely linked to and may even be largely defined in the concept of lifestyle as described in this chapter. When interpersonal channels are used for both informative and evaluative information, diffusion research in less developed countries suggests that personal networks for transfer of informative information may be different than those used for evaluative information, especially when seeking social influence or normative information (Burt 1973). Arnould (1989), in his research on innovation adoption in rural Niger where media penetration is also very low, shows that opinion leader traits vary by stage in the decision process.

5. Diffusion is at a very early stage with only 5% to 10% of households adopting latrines.

Adopters early in diffusion are likely to be dominated by innovators. Under spontaneous diffusion in a media deprived system, rural innovators are probably getting their information from interpersonal contacts with external sources (i.e., external to their rural village social system) inside or outside the country. These contacts are likely to be more heterophilous, involve travel or mobility, and reflect membership in more extensive

social networks than their village peers. Heterophilous information across system boundaries proved critical to consumer innovation diffusion in several documented cases in West Africa (Wallendorf and Arnould 1988; Arnould 1989).

Proximity and access to major urban centers, where latrine adoption and use are more widespread, may play an important role in the early pattern of spread. This hypothesis is tested in Chapter 4. Many rural households have family members and relatives in urban centers in Benin or neighboring countries. Occupational, social, and income diversification may account for new rural lifestyles, some with greater urban contact than others. Rapid changes in consumer patterns and social structure typical of today's third world societies including Benin entail expressive needs, some of which innovators may seek to fulfill in latrine adoption (Belk 1984; Arnould 1989). Innovator characteristics, like those presented earlier, are likely to be important to identify in latrine adoption at this stage in rural Benin.

6. *Diffusion is operating at two system scales in rural Benin where the regional system is composed of village units and the village system is composed of household units.*

In many ways, each village in rural Benin is a unique social system. Villages are likely to differ, like individuals, in innovative-ness and communication processes for latrine adoption. For example, norms of behavior in some villages may be more oriented toward change than in others. The innovative-ness of a village's opinion leaders may reflect such differences. At the regional scale, the first villages to adopt may be analogous to the first individuals to adopt being those who are socially and/or physically closest to the source of the innovation. On the other hand, if latrines are socially relevant to a particular market segment (or lifestyle), then its greater presence in a village may cause latrines to be more rapidly and fully adopted there. Once opinion leaders have

adopted, spread in a village may accelerate to the extent that communication flows within that village are not hampered by social distance, fragmented social networks, or other such system characteristics.

6. CULTURAL DIMENSIONS OF LATRINE ADOPTION BEHAVIOR

Culture-based explanations of consumption and defecation-related beliefs have been largely ignored and unknown by sanitation planners and managers working in developing countries. Such ignorance often makes interpretability of sanitation survey results, program outcomes, and consumers' behavior difficult, and produces a preponderance of superficial or trivial explanations that fail to advance understanding. The cultural dimensions of latrine adoption reveal hidden and complex aspects of sanitation behavior which are extremely important contributions to: 1) deepening understanding of how and why socio-cultural factors shape consumers' sanitation choices; 2) widening the range of strategies that can be designed to influence those choices; and 3) explaining apparent inconsistencies in, and improving design and interpretability of knowledge, attitude, and practice (KAP) studies on sanitation and hygiene behavior.

6.1 Consumption and its Cultural Meaning

Understanding demand in terms of consumer behavior moves beyond the economic variables of price and income to uncover the origins of why people want certain goods. Anthropology reveals how material objects and their consumption are integral parts of a culture's social processes. McCracken (1986) reminds us that goods, beyond their obvious utilitarian and commercial values, also have cultural meaning value to

consumers. The ability of goods to carry and communicate collective and personal cultural meaning is an important and overlooked aspect of consumer behavior. Culture creates an invisible system of distinctions to organize the phenomenal world in terms of cultural categories and cultural principles (McCracken 1988a). The most important of these are categories of person (categories of status, class, age, gender, occupation, and group) which make up the social structure of a community. The cultural meaning of material objects resides in their ability to immediately communicate to an observer and transfer to a consumer or owner invisible categories, especially those of person (Sahlins 1976; Douglas and Isherwood 1979; McCracken 1986). Without material objects, cultural categories and principles have no tangible presence and remain unsubstantiated in the world.

One culturally universal function of consumption is the attachment people have to objects as expressions of self-concept and as signs of one's connection to or differentiation from other members of society (Wallendorf and Arnould 1988). Arnould (1989) demonstrates how consumer adoption of culturally alien objects (consumer innovations) in rural West Africa serves to define and encode new life experiences, new personal values, and emerging status groups. He traces these regional phenomena to political and economic changes arising from western and capitalist penetration in the region. A group seeking to create a new definition of itself, or a revision of the cultural category to which it belongs, uses the symbolic properties of goods to aid in this process by first dispensing with old consumer goods that carry the group's conventional definition and then adopting the goods of other groups (or novel goods) to take possession of their

meaningful properties (McCracken 1988a). Thus, social structure change generates new distinctions of cultural categories that the material world is called upon to substantiate.

Other evidence to suggest a cultural meaning in the value consumers place on latrines is their character as a housing feature. In American culture, housing and its furnishing are one of the most obvious and significant ways individuals make material claims to social distinction. Much ethnographic research on modernizing cultures, both western and non-western, documents how changes in housing form, style, and furnishings are significant expressions of economic and social change during economic development, reflecting changes in value systems, cultural codes, and cosmologies (Wilk 1989). In most homogeneous pre-capitalist subsistence village economies, size of housing was the only variable of difference, according to Wilk. New economic opportunities, cash economies, and wage labor often lead to increased wealth and income differentiation, changes in consumption patterns, and diversified occupations. Housing diversity, both in style and materials, especially by adopting foreign forms and styles, becomes an important portrayal of this process of increasing differentiation of status, wealth, class, and occupation.

Luxury goods, as part of Veblen's (1899) theory of conspicuous consumption, also invoke the communicative aspects of consumption in the context of social relations. Goods considered luxuries carry prestige and are often used as weapons to exclude others from high-status groups (Douglas and Isherwood 1979). In this perspective, one sees "consumption as an arena for the settling of competing claims to status and power" (Orlove and Rutz 1989, p.30).

The engineering perspective views sanitation improvements as purely utilitarian, providing health protection from fecal contamination. However, in rural areas of developing countries like Benin, latrines as a consumer innovation, a luxury good, and a feature of housing style are evidence that culturally symbolic value for consumers may be a significant influence on adoption behavior. Thus, to understand any cultural meaning of latrines, one must also consider social structure changes underway.

In much of West Africa, including Benin, before colonialism and capitalist penetration, membership in either the commoner or royal class was strictly defined and regulated. Young men were completely dependent on fathers and elder kinsmen for production and consumption decisions. Then, new and growing wage labor and cash production opportunities offered an alternative way to achieve material satisfaction. As a consequence, traditional class and domestic relations of production and exchange broke down, the power of the royal class diminished, and categories of class and hierarchies of status became open to challenge and less enforceable. Young men's opportunities for independence in both consumption and production decisions arising from these same events created a new generational identity (Arnould 1989). These changes were expressed in the increasing appropriation by some members of the commoner class of consumption goods, dress styles, customs, and so on, that had once belonged exclusively to the royal class (Degbelo 1995). Changes in the social structure arising from colonialist and capitalist market penetration in West Africa have engendered new forms of social differentiation based on material wealth and expressed in new consumption patterns (Amin 1973; Sender and Smith 1986; Arnould 1989). Much research in non-western settings has identified wage labor migration as a major conduit for the introduction of

novel consumer goods such as western-style clothing, cigarettes, radios, house forms, and furnishings (Gregory 1982). Migrants' town-based experiences of the wage labor economy introduced them to a different cultural construction of the world represented in the multitude of new consumer goods.

If adoption of latrines is driven in part by desire for their symbolic cultural meaning, then the transfer of that meaning to the owner in the process of adoption might be an important aspect of drive satisfaction. McCracken (1986) describes various "rituals" which allow consumers to claim possession of the meaning of a consumer good as their own. When consumers devote time and energy to cleaning, discussing, comparing, showing off, photographing, and displaying an object, they are attempting to draw out and appropriate the qualities invested in it. Personalization of an object is another possession ritual whereby an individual transfers meaning from his own world to the newly obtained good, thus bending its collective meaning to fit his particular experience. This may be particularly important when novel objects are adopted by individuals trying to establish membership in newly emerging social groups seeking to define themselves differently from traditional categories. Personalization helps individuals express personal differentiation, or link themselves competitively to reference groups (Wallendorf and Arnould 1988; Arnould 1989).

6.2 Defecation Beliefs and Practices in a Cultural Context

"Unlike animals, defecation behavior is culturally conditioned and socially regulated." (Kochar 1994, p. 245). This is especially apparent where western science's germ theory of diseases is remote and irrelevant. To understand the cultural meanings of beliefs associated with defecation and feces, it is helpful to start with the ideas of dirt, dirt

avoidance, and defilement from a cultural perspective. Douglas (1966) argues that a culturally universal notion of dirt exists, shared by modern western culture, especially before it was transformed by the discovery of bacterial transmission of diseases. To quote her (1966, p. 35):

“... we are left with the old definition of dirt as matter out of place. This is a very suggestive approach. It implies two conditions: a set of relations and a contravention of that order. Dirt then, is never a unique, isolated event. Where there is dirt there is system. Dirt is the (symbolic) by-product of the systematic ordering and classification of matter, in so far as ordering involves rejecting inappropriate elements.”

The relativity of dirt in relation to ordered systems can be seen in the following examples Douglas gives of our own notions of dirt. When shoes are placed on the dining table they are dirty but by themselves are not. While food itself is not dirty, cooking utensils in the bedroom, or food stains on clothing are dirty. When objects or ideas are not in their proper place or context, they tend to confuse or contradict classifications. For example, clothing lying on chairs, bathroom items in the living room, or upstairs things downstairs are “dirty and polluting”. In destabilizing the normal scheme of classifications, dirt must be rejected.

Culture constitutes the world in terms of a system of categorical distinctions that divide phenomena (plant, animal, human, spirits, etc.) according to definite principles. The result is an ordered world with clear rules of behavior and social relations. When one strays outside or between defined categories, into territory that defies the principles of organization, disorder threatens the system and its assumptions. This is the notion of dirt and the source of its rejection, avoidance, and dangerous power according to Douglas. Ambiguities and anomalies also are dangerous because they create disorder. Such ideas and matter are located at the margins of or in transition between categories, causing

categories and principles to be blurred. A culture must confront situations that defy its assumptions of basic existence or lose the trust and conformity of its members.

In her reviews of ethnographic studies around the world, Douglas identifies five ways that a culture deals with ambiguous or anomalous events. Each is an attempt to maintain confidence in and enforce conformity with the culture's underlying system of ideas, values, moral code, and social relations. The five ways are:

- reducing ambiguity by arbitrarily picking one or the other interpretation, thus restoring the integrity of categories and their accompanying principles;
- physically controlling or eliminating the anomaly's existence, sometimes by killing;
- creating rules of avoidance of anomalous things, thus visibly and publicly upholding the definitions and structure of ideas that are threatened by it;
- labeling anomalous events or objects as dangerous, so as to remove them from public debate and put them above dispute; and
- using ambiguous objects as symbols in ritual to enrich meaning, call attention to other levels of existence, and harness their dangerous powers for positive or negative purposes.

Body parings and excrements exist somewhere undefined between the categories of body and non-body. They come from the margins of our bodies. They are no more part of the human body but are not yet something else, held in limbo until they dissolve, rot, or disintegrate to the point when their physical identity is gone. In many cultures, such things as nail clippings, hairs, feces, and so on, and bodily functions occurring at body margins, are considered dangerous, unclean, polluting, taboo, or shameful for reasons unrelated to notions of bacterial hygiene.

Dangers associated with these objects and functions involve withdrawal of blessing, misfortune, affliction, loss of power, and negative consequences to social relations. Rules of behavior and moral codes are prescribed to void these dangers. In contrast, purity and cleanliness imply a respect for the proper order of things and compliance with moral codes which bring prosperity, power, blessings, and good fortune. The intertwining of illness and misfortune in African cultures is the subject of much research (Jacobson-Widding and Westerlund 1989). In agricultural subsistence economies, good physical and mental health may be critical for survival and prosperity, and illness or weakness can lead to poverty and death. Thus, it is not surprising to find that beliefs about feces and defecation as dirty, bad, defiling, polluting, and dangerous are united with notions of weakness and illness as representing misfortune, withdrawal of blessings, loss of power, and social tension involving relations and obligations among categories of persons. According to the ideas put forth by Douglas, culture sets up these consequences of dangerous objects and violating taboos to organize and maintain collective society, in particular the distribution of power, responsibility, and obligations among its members.

Sanitation-related KAP studies in developing countries often uncover a surprisingly strong awareness of the danger of feces to health. However, the hygiene behaviors that would logically be expected to accompany such awareness are largely absent (Alihonou et al. 1995; UNICEF Lagos 1995). Probing further to understand the dangers of feces for health and defecation practices, one finds that certain moral values or social rules are involved. Illness from feces is more likely to be diagnosed and differentiated by the violation of social interaction that caused it than by any precise set of

symptoms. The dangers of pollution from feces are the consequences of transgressing the order of society. Pollution rules exert social pressure on members to conform and maintain that order. At times, defecation rules concern internal relations in the extended household or external relations in the community. In a situation in Kenya, a latrine must be located outside the extended family compound, reducing its convenience, because using it in the presence of in-laws is a taboo equivalent to undressing before them (Almendorf et al. 1994). In developing countries the belief that young children's feces are not dangerous, taboo or polluting is not surprising when one recognizes that young children are largely exempt from a culture's social obligations and moral codes.

7. SUMMARY

In this chapter, theoretical structure, methodological issues and conceptual material for examining and modeling the adoption of latrines by rural household heads in Benin has been explored. The ultimate context of this exploration is a search for better strategies to promote improved sanitation through an enhanced understanding of sanitation choice behavior. This final section summarizes the major ideas of this chapter from social psychology, consumer research, diffusion of innovations, and cultural anthropology.

Individual behavior and decision process models of choice from social psychology and consumer research suggest that the diagnosis and prediction of latrine adoption and other sanitation choice behavior involving discrete alternatives require knowledge of the following elements of each person's choice:

- drives (perceived differences between ideal and actual states that produce dissatisfaction) for such a change in behavior and the internal motives generating them;
- attitudes (feelings) towards the behavior and beliefs (perceptions) about attributes and consequences of engaging in that behavior which underlie these attitudes;
- any social pressure as determined by normative beliefs about engaging in the behavior;
- alternatives competing with the behavior and their attributes; and
- perceptions of circumstances, opportunities, resources, and any other factors needed to implement the target behavior.

Drives, alternatives identified as competing choices, and evaluative criteria for comparing alternatives derive from a person's internal motives. With accurate knowledge of consumers' internal motives, latrines can be designed to possess features that closely match consumers' evaluative criteria, and messages can be developed to promote benefits of latrine adoption in terms of consumers' reasons for seeking change. Lifestyle, as a basis for internal motives, can explain individual differences in latrine adoption or other sanitation behavior. Conceptually, lifestyle captures the overall type or pattern of activity and set of values a person aspires to fulfill in making choices. Empirically, socio-demographic factors can be constructed and combined, such as in cluster analysis, to distinguish different lifestyles. Because neither lifestyle nor motives can be changed by external intervention in the short- or mid-term, market segmentation for product design and marketing may prove to be a necessary strategy where lifestyle differentiation is an important facet of choice.

The decision process model by Mokhtarian and Salomon (1994) of choice among functionally non-comparable alternatives makes several important contributions to understanding latrine adoption behavior. These are: including the process of choice set formation in the choice process; defining the role of drives and constraints in the evaluation of non-comparable alternatives; distinguishing external and internal constraints; and developing linkages between drives and lifestyle. These features clarify rejection, particularly from a policy perspective, and improve quantitative modeling (Mokhtarian and Salomon 1996a, 1996b). The model proposes the following five different mechanisms of rejection to explain lack of demand for latrines and other new sanitation behaviors:

- No drive for latrine adoption is sufficiently aroused to activate the choice process.
- Latrines are not recognized as relevant to aroused drives when identifying alternatives for the choice set due to lack of awareness and misunderstanding.
- Latrine installation is excluded from the choice set as impossible because one or more factors related to feasibility is perceived to be prohibitive and permanent, thus acting as a *binding* constraint on adoption.
- Negative attitudes induced by psycho-social factors acting as constraints, poorly rated attributes for drive satisfaction, or low level of feasibility make latrines less preferred than a competing alternative in the choice set when comparisons are made.
- Latrines are the preferred choice but the temporary presence of constraint factors causes an individual to choose another alternative or do nothing.

Two methods for mathematically modeling choice behavior have been presented in this chapter. Both require extensive use of attitude measurement techniques to collect

quantitative observations on individual choice behavior. More sophisticated probabilistic discrete choice methods have good computational features for identifying the importance of different mechanisms of rejection and predicting changes in adoption behavior for policy interventions. They will be used in Chapter 7 to quantitatively model households' choice to adopt a latrine in rural Benin as part of this research project.

Diffusion theory provides useful insight into how information about innovations is communicated to explain the behavior of early and late adopters and the speed and penetration of an innovation in a social system. In rural Benin, latrine adoption and diffusion in its present early and spontaneous stage can be characterized by the following hypotheses:

- The pattern of diffusion in time and space is controlled by interpersonal communication where physical and social distance are the main barriers to information flow.
- Impersonal and mass media channels of information may be ineffective in influencing an individual's choice to install a latrine given the high cognitive processing involved in the adoption decision.
- Visual rather than verbal influence during personal exposure to latrines is more important for creating awareness of and interest in latrines if their cultural meaning (symbolic value) is a significant attribute for adoption.
- Early adopters have more heterophilous contacts with sources external to their village, either inside or outside Benin, and are therefore likely to have higher mobility and travel or be members of more extensive social networks than their village peers.

- Diffusion is occurring at two scales, a regional one composed of villages and a village one composed of households. The first villages to adopt may be analogous to the first individuals to adopt being physically and socially closest to the source of latrines (i.e., urban centers).

Insights from anthropology about the meaning of consumption and the foundations for universal associations of pollution, taboo, danger, and dirt with defecation and feces have been examined in this chapter. These insights explain how latrines take on new cultural meaning in developing countries and confront or even violate culturally and morally complex defecation rules and beliefs. Careful understanding of these two cultural dimensions may be critical for recognizing and interpreting consumers' reasons for adopting or rejecting latrines and other new excreta-related behaviors, both in Benin and in other developing countries.

CHAPTER 3

MOTIVES AND BARRIERS OF LATRINE ADOPTION IN RURAL BENIN

ABSTRACT

Findings from a qualitative investigation of the individual decision to install a pit latrine by household heads in rural Benin are synthesized to construct a conceptual model of latrine adoption choice. The model asserts that the key conditions for latrines to be chosen in rural Benin are the presence of at least one active *drive* or dissatisfaction from among the 11 found to motivate adoption, and the absence of factors acting as *constraints* on adoption among 13 related to awareness, physical implementation, and psycho-social issues. As the number and strength of latrine adoption drives increase, an individual's motivation for change is likely to increase. Drives represent prestige, well-being, and situational motives. Prestige-seeking drives to affiliate with the urban elite and to express new experiences and lifestyle acquired outside the village appear to be the most important. A well-being drive to protect health and safety has two distinct components only one of which includes a concern to protect family members from infectious diseases. The majority of health and safety concerns consist of personal protection from supernatural dangers, or family protection from mundane injuries and accidents.

To the degree that latrines satisfy drives better than competing alternatives and psycho-social constraints are absent, they will be preferred. Alternatives competing with latrines in this choice problem for many of the drives motivating latrine adoption have nothing to do with defecation, and often consist of housing improvements. If latrines are preferred, the presence and strength of implementation-related factors acting as

facilitators increase the likelihood that adoption will be chosen. Temporary constraints can seriously delay actual adoption, although preference and intention are strong. The most widespread barrier to adoption in rural Benin appears to be lack of cash or credit to finance latrines. Misunderstandings, high cost, and fear of disrupting social relations are other important barriers among non-adopters.

The quality and quantity of past latrine exposures influence choice through the beliefs and attitudes they create about latrines. Latrine exposure in institutional or public settings may be unimportant and may even be counter-productive for encouraging latrine adoption. This research suggests that drives depend on internal motives associated with individual lifestyles and can be aroused by social and physical conditions of the village environment. Demand-led approaches for sanitation promotion emerging from this work are discussed. These findings should contribute to general understanding of sanitation choice and be conceptually useful in demand studies when designing demand-led programs in other developing countries and contexts.

1. INTRODUCTION

A growing consensus among sanitation experts and planners recognizes that demand for excreta disposal facilities, such as latrines, is often weak in developing countries and must be stimulated through marketing techniques and promotional strategies. In an effort to improve the effectiveness of sanitation sector investments and raise coverage levels, recommendations call for traditional supply-led programming to be replaced by demand-led approaches (Cairncross 1992; Lafond 1995; Water Supply and Sanitation Collaborative Council 1997; Wright 1997; UNICEF 1998). Understanding how consumers make sanitation choices in developing countries and the factors that

generate or suppress demand is necessary before strategies that promote demand, and services that respond to consumer preferences, can be designed. This chapter's purpose is to contribute conceptually and qualitatively to such an understanding with a case study.

Findings are described from a qualitative investigation of the decision to install a pit latrine by rural household heads in the Republic of Benin, West Africa. A conceptual model of this choice decision is developed. This exploratory research is the first part of a three-phased case study of latrine adoption whose objective is to identify more effective strategies for promoting sanitation in developing countries based on behavioral analysis of demand. In-depth ethnographic-style interviews with individual household heads and a design inventory of installed latrines were conducted to gather information about motives and barriers of latrine adoption, and the beliefs (perceptions), attitudes (feelings), and experiences related to that decision. The proposed conceptual model and research results suggest new ways of thinking about sanitation choice in developing countries with important implications for demand-led programming.

Section 2 of this chapter reviews general theory from Chapter 2 on individual choice behavior and decision-making from the perspective of social psychology and consumer research. Key concepts from these theories provide the theoretical structure for the investigation and the subsequent conceptual model of latrine adoption choice.

Section 3 describes the case study data and how they were collected and analyzed. The motives found in the study area, and the influence of lifestyle and village environment are discussed in section 4. Understanding several cultural dimensions of sanitation choice was essential for interpreting these findings. Section 5 discusses barriers to adoption uncovered in the research and puts forth some distinctions about their influence on

choice. The role of past latrine experience and information in shaping individual beliefs and attitudes about latrines is presented in section 6. Section 7 incorporates the research findings into a conceptual model of the individual decision to install a latrine and discusses the model's policy implications. The validity of key relationships among elements in this proposed model will be statistically tested in subsequent chapters using secondary village-level data (Chapter 4) and primary household data (Chapters 5 through 7) on latrine adoption in the study area. The chapter concludes with a summary of findings from this first qualitative research phase.

2. UNDERSTANDING LATRINE ADOPTION AND SANITATION CHOICE BEHAVIOR

Fundamentally, all individual behavior, including that of consumers, is *driven* by the satisfaction of personal needs or motives. When rural consumers in developing countries decide to adopt a latrine or other sanitation service, they are almost always choosing among discrete alternatives. Engel, Kollat, and Blackwell (EKB) have defined five sequential steps comprising the consumer decision process for choosing among discrete alternatives in their model presented in Chapter 2 (Engel et al. 1978).

In the first step, problem recognition occurs when dissatisfaction from a perceived difference between an ideal (or desired) state and the actual state leads to arousal of a *drive* for change. A person's internal motives are the primary determinants of a desired or ideal state and derive from very basic values reflected in *lifestyle*. Internal motives can be thought of as lifestyle goals. Salomon and Ben-Akiva (1983) characterize lifestyle as the highest choice in a hierarchy of decisions where higher means longer-term choices about the overall type or pattern of activities a person seeks. They suggest that lifestyle

choice in western culture involves a set of long-term decisions about family, work, and leisure. In developing countries, family and work are also likely to be fundamental domains of lifestyle. Because of their dependence on lifestyle, motives are not open to change in the short or mid-term by persuasive activity. Consequently, they form the boundary conditions for consumer marketing and product development efforts. However, drives can be stimulated externally when new information or experiences alter the perceived adequacy of an individual's actual state, or highlight the satisfaction of some ideal state, in terms of internal motives that exist in the population. This is the crux of marketing.

Drives activate search, the next step in the EKB model, during which individuals become open to and actively seek information about alternatives for satisfying their aroused drives. Information is acquired through a mechanism called filtering, whereby stimuli from the outside is selectively processed by ignoring, rejection, distorting, and preferring some over others (Festinger 1957; Bruner 1958). The principles of filtering are consistency with existing beliefs and attitudes (avoidance of dissonance), relevance to drive satisfaction, and congruity with values and lifestyle. These principles should also guide the development of promotional messages and marketing strategies. Search may result in new or modified beliefs about new or existing alternatives.

When sufficient information is acquired, evaluation of alternatives proceeds through four linked elements culminating in *intention* in the EKB model. These links are causal, based on attitude-behavior relations of the theory of reasoned action from social psychology (Fishbein and Ajzen 1975). Evaluative criteria, or the attributes and outcomes that an alternative must possess to be preferred and chosen over other

alternatives, arise from the internal motives driving that choice (Engel et al. 1978). Thus, a person's criteria for choice will vary from others' to the degree that they have different drives. *Beliefs* about attributes and outcomes are the informational link between criteria and alternatives. *Attitudes* toward alternatives are formed from the strength and evaluation of these beliefs. While beliefs, or perceptions, are factual information as viewed by the individual, attitudes involve affect or feelings of (dis)liking arising from the personal evaluation of those beliefs. In latrine adoption, for example, two people may both believe the vegetation at an open defecation site is dense but one may like the privacy it provides (has a positive attitude toward the site) while the other dislikes the discomfort it causes (has a negative attitude toward the site). An individual's intention to engage in a behavior or choose an alternative is fundamentally determined by the positive or negative synthesis of attitudes toward that alternative. In addition, compliance with social norms can affect intention if such compliance is valued by an individual. Furthermore, when the behavior or choice is not volitional, beliefs about circumstances, opportunities, and resources needed to act (perform the behavior or implement a choice) will influence intention separately from attitudes (Ajzen 1985; Ajzen and Madden 1986).

Investigating *preference*, based on individual feelings toward alternatives, separate from *intention* which proceeds from it but also incorporates the influences of social normative beliefs and circumstantial factors, can improve the interpretation, understanding, and prediction of choice behavior for policy-making (Koppelman and Pas 1980; Mokhtarian and Salomon 1996a). For example, a person might believe that they could perform a behavior yet they must also be inclined to do so (i.e., have a positive attitude and preference toward it). On the other hand, while a person may hold a

favorable attitude toward a behavior and even prefer it to another, if they believe they lack the resources or opportunities to perform it, they are unlikely to form a strong intention to engage in that behavior (Ajzen 1985).

The resulting choice is the observable behavior emerging from the decision process and will deviate from intention to the degree that unanticipated circumstances, opportunities, and resources intervene after intention to modify choice. Learning and experience, the outcomes of choice, eventually feed back into problem recognition to stimulate successive choice decisions. To summarize, beliefs about attributes and outcomes of latrine adoption and its alternatives as they relate to the drive(s) motivating choice will shape attitudes which determine preference. Preference, jointly with normative compliance and perceptions about circumstantial and situational factors, will determine intention to install a latrine, to choose a competing alternative, or to do nothing.

Apart from doing nothing, what alternatives in developing countries compete with latrine adoption in the choice process? On first examination, latrine adoption looks like merely a choice among alternative defecation sites. However, one needs to separate the choice to use a latrine, repeated at each defecation occasion, from the choice to adopt or install one, a one-time, long-term, high consequence consumption decision. This investigation shows that latrine adoption typically results from choice involving alternatives having nothing to do with defecation (construction of a rain-water cistern or cement block house, purchase of plush salon furniture, painting living room walls with colored paint, cementing the interior house floor, and so on). Furthermore, these alternatives vary between individuals.

Decision process theory suggests that, in the decision to adopt a latrine, a more complex choice is actually being made among functionally different or *non-comparable* alternatives whose only common feature is potential to satisfy the same aroused drive(s) (Mokhtarian and Salomon 1994). As alternatives become more non-comparable, consumers tend to represent attributes at higher levels of abstraction. These more abstract attributes closely reflect the internal motives on which drives are based, to allow comparisons of alternatives within attributes in a process similar to that used when choosing among comparable alternatives (Johnson 1984; Bettman and Sujan 1987). By including the formation of an individual's *choice set* of possible alternatives in their decision process model (for telecommuting adoption in the United States), Mokhtarian and Salomon (1994) more fully define the role of drives and *constraints* (factors blocking adoption) in identifying and evaluating non-comparable alternatives. Their model explains five potential modes of rejection that can explain lack of demand for latrines:

- No drive for latrine adoption is sufficiently aroused to activate the choice process.
- Latrines are not recognized as relevant to aroused drives when identifying alternatives for the choice set due to lack of awareness and misunderstanding.
- Latrine installation is excluded from the choice set as impossible because one or more factors related to feasibility is perceived to be a permanent and prohibitive or *binding* constraint.
- Negative attitudes induced by psycho-social factors acting as constraints, poorly rated attributes for drive satisfaction, or low level of feasibility make latrines less preferred than a competing alternative in the choice set when comparisons are made.

- Latrines are the preferred choice but the temporary presence of constraint factors cause an individual to choose another alternative or do nothing.

From a policy perspective, dissecting an individual's choice process to understand the steps and conditions needed to reach an adoption decision is extremely useful. Specific factors that intervene in the choice process to constrain latrine adoption can be further classified in terms of ability to design external policies to reduce or eliminate them (Mokhtarian and Salomon 1994). For example, factors of awareness, understanding, and those related to the physical feasibility of latrine adoption, such as cost or technology, are likely targets of policy action. When these factors are acting in a positive direction they become *facilitators* of adoption. Psycho-social factors, which include normative influence, reflect conditions internal to the individual and society. They are hypothesized to act mainly on attitudes that shape preference and may be more difficult to change by public policies, private programs, or technology in the short- or mid-term.

For this investigation, interviews were designed to uncover the following key elements that are hypothesized, according to the choice decision theories above, to explain an individual's decision to install a latrine in rural Benin:

- drives motivating a desire to install a latrine (perceived differences between ideal and actual states);
- beliefs held about the attributes and consequences of adopting that are important to choice and to the drives motivating it;
- feelings toward latrines and preference to adopt;
- beliefs about normative consequences and compliance; and

- perception of the circumstances, opportunities, resources, and any other factors needed to install a latrine.

3. THE DATA

For this investigation, 40 individual interviews with household heads were conducted in Fall 1995 in seven villages surrounding the city of Bohicon in the Department of Zou in central Benin. The area was selected because the researcher had extensive experience and contacts working with the local population on guinea worm eradication. Interviews were accompanied by a design inventory and photo of each installed latrine for the 25 adopting households. Findings from the design inventory are presented in Appendix A.

The study area is the heartland of the Fon ethnic group and Voodoo religion. Incomes and access to social services (health care, education, etc.) are low. The majority of the rural population is engaged in agriculture. Commerce, skilled crafts and trades, and cottage industries are other important occupations. Migration and travel within Benin and abroad are fairly common among the rural population. Economic and social differentiation, and changing family structure are growing phenomena in many villages as western influence and capitalism continue to penetrate Benin.

Adoption by rural households of pit latrines is rare and comprehensive data are limited (see Chapter 1). The vast majority of the rural population defecates in the open. In Fall 1995, when this study was done, no systematic regional or national program to promote rural latrine adoption had ever been implemented. However, a World Bank-sponsored program was being prepared. Those latrines that exist represent mostly spontaneous adoption of locally adapted designs. Survey data in 1993 and 1996 for Zou

Department indicate a rural household adoption (installation) rate of between 5% and 7% (see Chapter 1). Latrine use rates are higher because neighbors and relatives sometimes share facilities. In the 1993 data, household adoption rates varied greatly across the 520 villages surveyed: 39% had no latrines, 48% had adoption rates of 0% to 10%, 9% had adoption rates of 10% to 25%, and 4% had adoption rates over 25% (see Chapter 1).

Village differences suggest two situations for rural demand: one where preference for latrines appears to be non-existent and/or major constraints prevent acting on it; and the other where varying levels of desire exist and some kind of latrine is being used to satisfy that demand. Furthermore, spatial clustering of village adoption levels indicates a pattern of diffusion of latrine adoption along road networks and outwards from several major population centers (see Chapter 1, Figure 1-2).

3.1 Interview Method and Sample Selection

A combination of the long interview, a more structured and efficient version of the ethnographic interview, and the depth interview, an unstructured method of probing respondents for deeper levels of information, was chosen for this exploratory work (McCracken 1988b; Sommers and Sommers 1991). A list of open-ended questions covering the topics in Table 3-1 was prepared as a guide. The style of interaction aimed to give interviewees a more collaborative role as informants in the research process (Mishler 1986). Success in gaining generally excellent collaboration on a socially awkward and unusual topic is attributed to efforts to give informants some control over the interview, create trust, stimulate their interest, and validate the importance of their contribution. Generally, interviews lasted one and a half to two hours. They were translated between the researcher speaking in French and the informant speaking in Fon.

Two local community workers were trained and employed to translate. Each worked separately in different villages.

TABLE 3-1. Topics Covered During Informant Interviews

	Adopters	Non-adopters
1 latrine visit, photos, and inventory of design and construction	√	
2 history of decision to install latrine and build it, including any problems or difficulties	√	
3 reasons for design and construction choices	√	
4 sources of information, influence, help with decision, design, construction, maintenance, etc.	√	
5 users and usage of latrine, maintenance, and repair history	√	
6 personal histories of experience and exposure to latrines, including first and subsequent experience	√	√
7 personal and household satisfaction with latrine and why	√	
8 alternatives available for defecation	√	√
9 qualities of a good and bad place to defecate and why	√	√
10 advantages, disadvantages, problems, and importance of latrines and alternatives, both personal and household	√	√
11 first and subsequent latrines/adopters in the village, who, why, and impressions	√	√
12 knowledge of and experience with latrines/adopters outside of village	√	√
13 how and why present defecation site(s) is (are) chosen, for self and household members		√
14 habits and patterns of site use by self and household members		√
15 advantages, satisfaction with present site		√
16 disadvantages, concerns, problems with present site		√
17 what do neighbors, others in village do and why	√	√
18 ever considered installing a latrine, why or why not		√
19 latrine design/style preferences and feasibility		√

In many ways, each interview was a case study of an informant's experiences and personal framework of meaning related to latrines, defecation, and feces. Informants tended to provide context to their answers in the form of autobiographical narratives. Specific questions were used to confirm the presence or absence of a belief, attitude, motive, or barrier that had not been spontaneously expressed by the informant. At the end of the interview, informants were asked if they would be willing to provide their name and some general information (socio-demographic data) about themselves.

Automatically offering confidentiality in the beginning was judged to be inappropriate for the form and context of these interviews because it would have created suspicion and contradicted the value expressed for the unique experiences and personal contexts of each informant's views and opinions (Mishler 1986).

Given the qualitative and exploratory nature of this investigation, prior information to design a statistical sample was lacking. Instead, villages and informants were selected to obtain a wide range of individual perspectives on latrine adoption in the study area. Diversity rather than statistical validity was the objective of sampling.

Criteria used to select villages were:

- diversity in size, density, occupations, infrastructure development, administrative importance, and distance/access to Bohicon, the likely local center of latrine diffusion;
- good contacts for the researcher to gain rapid entry and collaboration in the village (i.e., respected village health workers, cooperative village chiefs, and experienced government extension agents known to the researcher);
- travel logistics for the researcher and translator given time constraints; and
- existence or not of project-sponsored latrines.

Latrine adopters in a village were interviewed first to provide some initial understanding of the situation to guide an appropriate approach for addressing non-adopters. Adopter informants were selected for diversity and convenience (informant availability and approval by the village chief in some cases) from a list prepared by the village health worker of year and type of latrine installed, owner's occupation, age, and sex. Non-adopters were selected from a list of household heads jointly suggested by the

village chief and health worker to represent a variety of neighborhoods, ages, sexes, and occupations. In several villages, no adopter informants were available during the scheduled visits. Generally, more interviews were conducted in larger villages. The sampling of individuals and villages proceeded until the material gathered in new interviews contributed no new information to the range of perspectives already encountered.

3.2 Sample Description

Descriptive characteristics of the seven sample villages and 40 informants are given in Tables 3-2 and 3-3. Table 3-2 shows that sample villages have rather diverse characteristics. Smaller villages tend to be more agricultural, have less infrastructure development, lower population growth, lower densities, and be farther from a primary or secondary road. Larger villages tend to have more infrastructure development, higher population growth, higher densities, an administrative role, be on a primary or secondary road, and be less agricultural, although this last characteristic is less consistent than others.

Informants consisted of 33 men and seven women. Most had no formal education. Average age at interview was 51.4 years. Regarding occupations, informants were farmers, merchants, skilled tradesmen (taxi or truck drivers, repairmen, masons, etc.), educated elite (holding odd temporary jobs requiring French literacy, buying and re-selling consumer goods, employed by government, or unemployed), or processing food and other agricultural products as cottage industries.

TABLE 3-2. Descriptive Characteristics of Seven Sample Villages for Qualitative Interviews

Village	Informant Interviews	Population in 1992	Population Growth ^a	Non-Agricultural Population	Non-Agricultural Households	Infrastructure Index ^b	Nearest Road ^c	Nearest Urban Center ^d	Administrative Role ^e	Housing Density
Adame	5	733	- 8%	41%	42%	1	0 km, T	7 km	none	low - med.
Adjoko	3	1051	+ 26%	21%	22%	2	2.8 km, P	9 km	none	very low
Djidja	10	5120	+ 74%	14%	22%	7	0 km, S	24 km	Subprefecture seat	high - very high
Djohounta	3	407	+ 31%	10%	25%	0	1 km, P	8.5 km	none	low
Hellou	4	1742	+ 75%	25%	35%	3	1.5 km, P	8 km	none	low
Kpassagon	9	2418	+ 43%	33%	43%	5	0 km, P	6 km	Commune seat	med. - high
Mougnon-Kossou	6	1604	+ 50%	30%	37%	5	0 km, S	8.5 km	Commune seat	low - med.
Average		1868	+ 52 % ^f	25%	32%	3.3		10.1 km		

^a Population growth between 1979 and 1992, except for Djohounta where data is for 1988 and 1992

^b The index indicates the number of modern infrastructure items (out of 9) present in the village from among the following: electricity, piped water, hand pump water, school, clinic, public transportation (bush taxi), farmer cooperative, regional market, high school

^c Letters P, S, and T refer to the type of nearest road as primary (paved), secondary (unpaved but maintained), and tertiary (unpaved and not maintained)

^d The travel distance to Abomey or Bohicon from each village

^e Administrative divisions in hierarchical order are Department, Sub-prefecture, Commune and Village

^f Excluding Djohounta

TABLE 3-3. Descriptive Characteristics of Informants (N=40)

Characteristic	Category	Number or Statistic
Gender:	Number of men (adopters)	33 (19)
	Number of women (adopters)	7 (6)
Average age:	All informants (N=38)	51.4
	At adoption (N=25)	36.1
	Non-adopters (N=15)	48.1
	Intending to adopt (N=7)	46.1
Average age at first latrine exposure:	Adopters (N=25)	19.4
	Intending to adopt and adopters(N=32)	19.6
	Non-adopters not intending to adopt (N=8)	28.1
Religion:	Voodoo	19
	Protestant Sects	6
	Catholic	9
	None	1
	m.d. ^a	5
Education (years):	None	24
	1 to 5 years	7
	6 years or more	8
	m.d. ^a	1
Education (type):	Mission	4
	Public	9
	Adult	2
Occupations:	Farmer	10
	Merchant	8
	New trades	7
	Educated elite	4
	Traditional trades	7
	Food processing	3
	m.d. ^a	1

^a Missing data

Nineteen of the men and six of the women were adopters. The high proportion of adopters is not nor was intended to be representative of the population. Of the 15 non-adopters, seven indicated a desire and intention to adopt in the future.

3.3 Analysis of the Interview Data and Limitations

Directly after each interview, verbatim expressions and notes written during the interview were reviewed, clarified, and expanded together with the translator. Within

several days, a detailed transcript-like report of these notes was typed up following an outline in which each section sub-topic or idea was numbered. A socio-demographic profile was included.

Content analysis of the 40 interview reports was used to identify the range of possible motivating drives and factors constraining or facilitating latrine adoption, along with the key beliefs that accompanied each. Each informant was classified as an adopter, a non-adopter with intentions to adopt (intender), or a non-adopter with no intention to adopt (rejecter). Next a chart was constructed indicating for each informant the following: 1) presence/absence of each drive and its associated beliefs; 2) presence/absence of constraints and/or facilitators in deciding to adopt and in installing a latrine; 3) first latrine use experience, impressions, and evaluation; 4) quantity and quality of subsequent latrine experiences and exposure; 5) sex, age, education, and occupation at interview; 6) age and occupation at adoption; and 7) general attitudes toward latrines. Lastly, information from this descriptive chart was coded and entered into a database to compute frequencies of drives and constraints.

The data collected for this investigation are neither statistically representative nor designed to be so. Frequencies and other simple quantitative analyses that are presented later in this chapter were done to help uncover patterns among elements of latrine adoption choice in order to develop the hypotheses incorporated into the conceptual model. Some interviews were less complete than others due to progressive learning on the part of the researcher, informant time constraints, and less willingness to talk in two cases, both women, where expectations were misunderstood in the initial visit. These initial visits were made by the village health worker and translator, together in most

cases, to explain the purpose and set up an appointment prior to the interview. Tape recording interviews would have been more accurate than taking notes. However, limited time and resources spent on transcribing and translating them would have precluded doing enough interviews to uncover the diversity of perspectives and discern patterns of influence in the study area. Despite such limitations, an anthropological style was preferred over quantitative methods because it provided the opportunity and time to ask for clarifications and get biographical context to explore and verify the meaning of informants' words. This was particularly important to assure that interpretations matched informants' personal understandings as closely as possible.

4. MOTIVES FOR ADOPTION

Research addressing the motivational determinants of rural demand for latrines has been lacking in sanitation studies. However, evidence from some projects points to the importance of socio-cultural considerations, other attributes of technologies besides cost, and consumer preferences, in determining user acceptance or rejection of latrines (Elmendorf and Buckles 1980; Perrett 1983; Whittington et al. 1993b). Furthermore, project evaluations often discover that sanitation consumers are seeking benefits from latrines that have little or nothing to do with health protection or a healthier environment (Elmendorf 1980; Perrett 1983; Goodhart 1988; Murthy et al. 1990; Dodge 1992; Kiyu et al. 1993; Wijk 1994). Prestige is a recurrent desire in many of these studies.

Understanding why people want specific consumer goods requires understanding not just their functional or commercial value to consumers, but also their cultural meaning. Part of an object's meaning resides in its ability to communicate to an observer invisible categories and qualities of person that a culture creates to organize the social

structure of a community (Sahlins 1976; Douglas and Isherwood 1979; McCracken 1986; McCracken 1988a). An example of this property is the importance of image that western consumers attach to the kinds of automobiles and styles of clothing they choose. When an object is an imported innovation, its adoption in a new culture or society is bound to entail new meanings peculiar to the context and process of its adoption (Linton 1936; Southall 1961; Rogers 1983). Arnould (1989) documented the adoption of consumer innovations in rural Niger, bordering Benin to the North, as part of consumers' efforts to define and encode new life experiences, new personal values, and emerging status groups in the region's changing socio-cultural, economic, and political environment. A group seeking "a new definition of itself or a revision of its cultural category" uses the symbolic properties of goods to aid in this process by first "dispensing with those (old) consumer goods that carry the group's conventional definition and then adopting the goods of other groups (or novel goods) to take possession of their meaningful properties" (McCracken 1988a, p.135).

Choosing improved sanitation means changing defecation habits and how feces are managed, behaviors that are "powerfully conditioned by culture and regulated by society" (Kocher 1994, p. 245). Douglas (1966) argues that a culturally universal notion of dirt as matter out of place underlies the linkage made by many pre-industrial cultures of feces and defecation with danger, defilement, taboo, and pollution. Matter out of place confuses or contradicts the normal classification of things and threatens the categories and principles that culture defines to constitute phenomena in the world, create stability and order, organize social relations, and maintain conformity. When a culture's foundations are thus threatened, Douglas reveals from anthropological studies that society

may create rules of avoidance, control or eliminate the source of the threat, label it as dangerous, or even use it ritually to enrich meaning and capture its dangerous powers for good or evil purposes.

Clearly, latrines have the potential to take on new cultural meaning in developing countries and to confront and even violate culturally and morally complex defecation rules and beliefs. Understanding these two cultural dimensions has been critical for recognizing and interpreting consumers' reasons for adopting or rejection latrines in rural Benin. These dimensions also are likely to influence consumer behavior and preferences for new excreta-related sanitation technologies in other developing countries.

Eleven distinct drives listed in Table 3-4 constitute the reasons identified from the interviews for wanting to adopt a latrine. They have been grouped into three categories: prestige-related, well-being, and situational. The main beliefs and attitudes associated with each drive are summarized in Table 3-5. Factors of lifestyle and village environment that are hypothesized to explain the formation of drives among informants are listed in Table 3-6. The frequency of expressed drives among informants is shown in Table 3-7 and is compared for different categories of informants based on hypothesized lifestyle factors and village type. The rest of this section describes these findings in detail, as derived from the interview results.

TABLE 3-4. Drives Motivating Latrine Adoption in Rural Benin

Prestige-related Drives	Well-being Drives	Situational Drives
1. affiliate with the urban elite 2. express new experiences, habits, lifestyle 3. elevate inter-generational status, leave a legacy 4. aspire to Fon royal status	1. cleanliness 2. personal health and safety protection from supernatural dangers 3. family health and safety protection from mundane dangers and infectious diseases 4. convenience and comfort	1. ease restricted mobility (illness, old age, Voodoo religious rituals) 2. increase rental income

	5. privacy (visual, social, informational)	
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4.1 Prestige-related Drives

Four different prestige related or status drives for wanting to install a latrine were identified with different spheres of social, economic, and cultural life in rural Benin. The first two discussed below were more frequently expressed among informants than the last two.

P1: Affiliate and identify with urban elite (avoiding embarrassment)

Informants expressed this drive as a desire to avoid shame and embarrassment from having to direct important visitors out in the open to defecate. Important visitors are members of the urban-based modern elite (i.e., government officials, white collar workers, and big businessmen) and might be friends, business relations, relatives, or in-laws. In displaying ownership of a latrine, a person seeks to gain the honor, social acceptance, and respect of these visitors. Consumer goods, household possessions, and housing style can be powerful instruments for the social communication of their owner's status, identity, or group affiliation within a culture (Douglas and Isherwood 1978; McCracken 1986, 1988a; Wilks 1989). For this drive, a latrine's value is as a material symbol of the owner's affiliation with the urban elite.

TABLE 3-5. Drives and Associated Beliefs and Attitudes Motivating Latrine Adoption in Rural Benin

Category	Drive	Associated Beliefs and Attitudes
Prestige	P1: affiliate/identify with urban elite	<ul style="list-style-type: none"> <input type="checkbox"/> need a latrine for receiving guests unaccustomed to the bush when they visit and attend ceremonies <input type="checkbox"/> avoid shame/embarrassment when important visitors have to use the bush <input type="checkbox"/> concern for hospitality related to perception of practical difficulties and accidents for visitors using the bush <input type="checkbox"/> avoid damage to intra-village social relations and status from visitor mistakes while defecating
	P2: express new experiences and lifestyles	<ul style="list-style-type: none"> <input type="checkbox"/> to achieve the "good life" one must have a latrine <input type="checkbox"/> a latrine is important for a man to feel his home is properly established <input type="checkbox"/> latrines are so obviously better than the bush that once discovered cannot be rejected <input type="checkbox"/> dissatisfied with the bush and habituated to latrines as a consequence of city living experiences and lack of regular contact with the bush <input type="checkbox"/> wanting to transplant the amenities of an urban lifestyle to the village
	P3: elevate postmortem inter-generational status within the family/clan	<ul style="list-style-type: none"> <input type="checkbox"/> concern for obligations to/from descendants and future generations <input type="checkbox"/> concern for postmortem status in context of voodoo ancestor worship <input type="checkbox"/> a latrine is a lasting monument and legacy to your descendants who will be sure to honor and respect your name for as long as it lasts
	P4: aspire to Fon royal class status	<ul style="list-style-type: none"> <input type="checkbox"/> desire to imitate habits and customs traditionally exclusive markers of Fon royalty and be recognized as having "royal" style and class <input type="checkbox"/> deserves or wishes to be treated and respected as the royal class <input type="checkbox"/> to avoid being seen or having to use the bush to defecate is a mark of royalty for a man, his sons and wives
Well-being	WB1: cleanliness	<ul style="list-style-type: none"> <input type="checkbox"/> perceived overload or excessive amount of human feces surrounding house, or at habitual defecation sites <input type="checkbox"/> difficulty finding a place to defecate free of feces <input type="checkbox"/> smell of feces vaporizing along the paths and in the yard <input type="checkbox"/> areas around house are used by a large family group, and/or by lots of client-visitors <input type="checkbox"/> no pigs or dogs to clean up feces <input type="checkbox"/> perceived presence of too many flies attracted to feces around the place <input type="checkbox"/> desire for greater order and control over the home environment and its members

TABLE 3-5. Continued

Category	Drive	Associated Beliefs and Attitudes
Well-being	WB2: protect personal health and safety from supernatural dangers	<ul style="list-style-type: none"> <input type="checkbox"/> it is dangerous to look at or smell the feces of an adult <input type="checkbox"/> fear of supernatural illnesses caused by smelling or seeing others' feces <input type="checkbox"/> fear of encountering a snake <input type="checkbox"/> belief that a snake is a sign of impending death in the family <input type="checkbox"/> fear of voodoo sorcery, magic, and dead spirits present in the night <input type="checkbox"/> fear of enemies stealing your feces for sorcery against you <input type="checkbox"/> perception that feces sorcery is practiced in the area <input type="checkbox"/> perception that you are envied or threatened by enemies
	WB3: protect family health and safety from mundane dangers and infectious diseases	<ul style="list-style-type: none"> <input type="checkbox"/> concern for family members getting bit by snakes, scorpions, other dangerous insects in the bush <input type="checkbox"/> avoid accidents from children using the bush (i.e. getting lost, encountering feces, using a "taboo" spot, stepping on thorns or glass) which involve lost time, extra expense, and social conflict <input type="checkbox"/> avoid dangers from robbers, prowlers, and accidents in using the bush at night <input type="checkbox"/> avoid germ-transmitted diseases like worms, diarrhea, etc. spread by feces left in the open or by defecating in the open <input type="checkbox"/> avoid germ-transmitted diseases spread by flies to food from feces
	WB4: convenience and comfort	<ul style="list-style-type: none"> <input type="checkbox"/> avoid the long distance needed to reach defecation sites <input type="checkbox"/> avoid exposure to the elements (dew, strong sun, and especially rain) when going to/from sites <input type="checkbox"/> have a reliable, close, and easy place to go when ill or aged <input type="checkbox"/> avoid trouble with neighbors by defecating on their land mistakenly <input type="checkbox"/> avoid the many discomforts of the bush (i.e., getting scratched, stung, stepping on thorns, walking through mud and trash, dirtying your clothes) <input type="checkbox"/> perception of decreasing availability of defecation sites within a reasonable distance <input type="checkbox"/> unaccustomed to being in the bush, bush perceived as a disagreeable place to be avoided <input type="checkbox"/> accustomed to using latrines elsewhere

TABLE 3-5. Continued

Category	Drive	Associated Beliefs and Attitudes
Well-being	WB5: visual, social, or informational privacy	<ul style="list-style-type: none"> ❑ difficulty finding defecation sites with enough visual privacy, especially for women ❑ avoid being observed going off to defecate in the bush ❑ perception of separateness or outsider feelings in relation to village social structure and composition, (i.e., kin, clan, language, tribe, lifestyle, etc.) ❑ desire to restrict access to information about oneself and family by limiting contact with neighbors and other villagers ❑ uncomfortable mingling ❑ desire for privacy about possessions, activities, wives, etc. ❑ perception of increasing numbers of strangers/outside in the village ❑ perception of increased anonymity and competition in village
Situational	S1: ease restricted mobility	<ul style="list-style-type: none"> ❑ to much difficulty walking or squatting to defecate in the bush because of physical impairment from old age or long-term illness ❑ desire a permanent solution for participants in voodoo ceremonies to defecate while confined to convent grounds ❑ perceived inherited obligation to maintain convent grounds and host ceremonies
	S2: increase rental income	<ul style="list-style-type: none"> ❑ desire to increase rental income by providing access to a latrine ❑ renters demand a latrine and are willing to pay the extra rent

Concern for hospitality toward visitors is instrumental in this drive through the host's perception of certain practical difficulties and accidents that can occur when an outsider, unfamiliar with the village's physical environment and defecation rules, is sent out into the bush to defecate. Should an important visitor experience discomfort, quite likely given urban toilet habits, or real harm while defecating in the bush, tenuous social linkages could be damaged. Likewise, the host's relations and status within the village could be damaged should his visitors unknowingly offend in the choice of a place to defecate.

P2: Express new experiences and a new lifestyle (achieving the “good life”)

This drive seeks to retain and transplant to the village a new lifestyle (knowledge, experience, habits, values, etc.) acquired while living in cities or abroad. Latrines symbolize this new lifestyle and serve to differentiate their owner from others in the village who have not had these experiences or gained this new knowledge (McCracken 1986; Arnould 1989). Informants expressing this drive referred to latrines as important for a man to feel “good” or “settled” in his home, and as a necessity if one wishes to enjoy the comforts of the “good life”. Who, they say, can refuse a latrine when it is something so obviously better than the bush. Informants also emphasized that they had become unaccustomed to or uncomfortable defecating in the open as a consequence of their experiences using latrines while living outside the village.

It is common for some young men in Benin to leave the village for several years to find more lucrative work opportunities in towns and cities or abroad to acquire the wealth needed to marry. Upon returning to establish a household, they seek to affirm the changes they have undergone, and apply their new experiences and knowledge, by

adopting new ways to live and work. It is at this point that the desire and decision to build a latrine is seriously considered.

The emergence of new occupational opportunities reflects a diversifying economy and provokes lifestyle changes from the traditional patterns associated with subsistence-dominated farming. Examples of these new livelihoods among informants were driver (truck, bush-taxi, motorcycle-taxi), mechanic (car, motorcycle, bicycle), specialized repairman (sewing machine, generator, radios, watch, boombox, shoes, and so on), machine operator (generator, video, or mill), embalmer, sign-painter, and welder. In almost all of these cases, the informant had learned his trade or skills away from the village in towns, cities, or abroad. Traditional non-agricultural skilled occupations such as tailor, carpenter, mason, blacksmith, distiller of palm wine, and healer, may also feel this drive if they apprentice outside the village.

P3: Assure postmortem ancestral status among descendants (leaving a lasting legacy)

This drive involves prestige and status in a more traditional sphere of life. Here a latrine serves as an inheritance for descendants and satisfies a desire to provide a lasting legacy to them. Voodoo beliefs regarding ancestors and obligations between the dead and the living motivate this desire. For instance, an ancestor's good name is remembered and honored by future generations each time they benefit from the ancestor's inheritance. Honorable remembrance assures a person's entry into and status among the world of the dead (Tingbe-Azalou 1988). Other lasting legacies (a piece of land, a new cement-block house, a well or other permanent source of water, solid walls around the family or collective compound, or a Fon palace-style entry gate) occupy a similar purpose under

this drive. A latrine's durability and unambiguity about the identity of its benefactor become paramount concerns for an individual motivated by this drive.

P4: Aspire to Fon royal class status (emulating royal practices)

This drive also involves prestige and status in a more traditional sphere of rural life and entails a desire for oneself and one's family to be perceived as having qualities of the Fon royalty. As such, a person displays and appropriates some of the status, privileges, and access to resources and wealth that historically belonged only to this elite class.

Among the formerly exclusive markers of royalty in Fon society is one in which the King, his sons, and sometimes his wives, should never leave or be seen outside the walls of the palace except for very special occasions, under official escort and elaborate fanfare. Consequently, the royal family never defecated in the open, but used pits covered with wood boards dug in the palace compound. A household latrine is suggestive to some people of an evolved "royal" pit, and a man and his sons who no longer have to defecate in the open are, in a way, acting "royal".

Emulation by commoners of royal customs, dress, and other royal habits of the Fon has apparently been underway since the early decades of this century (Degbelo 1995). Adopting latrines is another example of such emulation under this drive. Arnould (1989) documented a similar breakdown of historical class divisions accompanied by the appropriation of royal customs by commoners in rural Niger during this century. He traced these events to political and economic changes under colonial development which provided new avenues and access to wealth accumulation. Such opportunities released an individual from the hierarchically rigid agricultural networks of labor exchange and strict

conformity to class that had sustained the social privilege and economic power of the royal classes in traditional West African society. At present, Fon royalty have lost much of the privilege and authority they once held to the new urban elite. Therefore, this drive may only apply to older more rural-oriented individuals engaged in traditional spheres of work and economic exchange.

4.2 Well-being Drives

Five drives for latrine adoption relate to well-being as it is affected by perceived conditions of the environment. These include drives for cleanliness, health and safety involving two different orientations, convenience and comfort, and privacy.

WB1: Cleanliness

A drive for cleanliness is associated with the perception of an *overload* or excessive amount of human feces in the household's immediate surroundings and at sites used for defecation. Feces, especially adults' feces, are considered very dirty, and sometimes dangerous, especially when they are still recognizable. A strong dislike of or discomfort from seeing or smelling human feces relates to the belief that these two exposure mechanisms can cause physical or psychological illness. Flies, observed in relation to feces, food, and dead things, also are considered dirty. The increased presence of flies from feces overload was expressed as a concern for food preparation and storage by informants. In some cases, parallel to a desire for cleanliness was a desire for order, control, and organization of the home environment and family behavior. Some informants spoke of cleanliness in terms of family prestige or an inherited trait from their ancestors.

Conditions giving rise to a perception of feces overload in the environment are its use by a large family group or by many frequent client-visitors who come to the home for other services (grain mill, blacksmith, traditional healing, and so on), and no mechanism for feces removal, because free-roaming pigs or dogs who routinely eat feces are unavailable or unacceptable to this household. Negative consequences of feces overload were its strong smell along paths leading to the compound or in the yard and house, and difficulties finding a “clean” place to defecate free of feces. Two different causes were given for a shortage of clean defecation sites close to home: increasing construction and density in the neighborhood or village, and intensified land cultivation practices in and around the village which reduce or eliminate periods when defecation is permitted on cultivated land.

Sensitivity to exposure to feces in the environment appears to be related to personality, basic values, and beliefs. Serious concern for physical and mental health from smelling or seeing feces can arouse a health and safety drive for latrines, discussed next.

WB2: Personal health and safety (based on supernatural phenomena)

This drive is one of two distinct health and safety-related drives for latrine adoption. It is oriented toward personal protection from supernatural dangers. It contrasts with the second health and safety drive oriented toward family protection from mundane dangers and infectious diseases (i.e., disease transmitted by germs as understood by Western medicine). Voodoo-related supernatural beliefs among the Fon, uncovered in the interviews and confirmed by Degbelo (1995), about:

- encountering a snake while defecating as a sign of impending death in the family;

- bodily parings, issues, and excrement as items of personal vulnerability that your enemies can steal and use in witchcraft (sorcery) to weaken you;
- smelling or seeing feces, especially others', as the cause of physical and mental illnesses related to bad social relations; and
- the dangers of encountering supernatural forces or ancestral spirits at night;

each contribute to a desire to install a latrine for greater personal protection of health and safety. Exposure to these threats when defecating in the open creates interest in latrines, as long as latrines are not perceived to create other health and safety concerns.

People who feel that leaving their feces in the open, accessible to enemies, is personally dangerous may have more power and wealth to lose than others. In fact, the concepts of health, power, and wealth are intimately related in Voodoo beliefs. Douglas (1966) provides an in-depth interpretation of the role of body margins, pollution, and defilement in deterring social transgressions and enforcing mutual obligations as mechanisms for social cohesion in the societies she examined.

WB3: Family health and safety (based on mundane dangers and infectious diseases)

A second health and safety drive for latrines involves avoiding the following natural or physical conditions, mundane problems, and infectious diseases:

- getting bit by poisonous snakes or scorpions (this seems to be a concern mostly after such an event occurs while defecating or in the vicinity of habitual defecation sites);
- robbers, prowlers, and other physical difficulties in the night;
- harm to children defecating in the bush from accidents (i.e., snakes bites, injuries, mischief, contact with others' feces, using an unacceptable spot, and getting lost in the bush) and diseases which children are more vulnerable to, combined with a

- perception that these have consequences in lost time and extra expenses (i.e., going to the health center, paying for treatment and medicines) and create difficulties (i.e., conflicts with neighbors) for the head of household; and
- intestinal worms, foot worms (jiggers), diarrhea, cholera, tuberculosis, and other diseases believed to be spread by feces left in the open (smelling and seeing it) and flies contaminating household food through the feces-flies-food pathway.

Informants who spoke of these mundane safety issues and infectious disease concerns expressed a more active attitude toward managing the home environment, taking responsibility for household operations, and addressing the particular needs of different family members. Such a family-oriented attitude contrasts with the previous set of superstitious health and safety concerns that are highly personal in nature.

Disease concerns here integrate western medical information about disease into a traditional framework of understanding which attributes the dangers of feces to their bad odor and repulsive sight, similar to that noted in the nineteenth century United States (Tarr et al. 1984; Bloom 1993). Blending traditional and scientific notions of disease and feces creates some distortion and ambiguity about transmission routes in rural Benin, and consequently, about which environmental conditions and practices are dangerous and should be avoided. In several cases, preventing infectious diseases by using a latrine was firmly attributed to being able to avoid seeing or smelling others' feces when defecating in the bush.

WB4: Convenience and comfort (avoiding distance)

Convenience and comfort reflect problems with the physical environment of the bush for defecating and consist of desires to:

- avoid the long distance needed to reach defecation sites;
- avoid exposure to the elements (morning dew, rain, and strong sun) and discomfort from getting scratched or stung, stepping on thorns, walking through mud and other trash, dirtying one's clothes, and so on;
- avoid trouble with neighbors in the village by mistakenly defecating on their land, considered a taboo in most villages; and
- have a reliable, close, and easy place to go when one is aged or has diarrhea or other illness.

These needs can arise from two sources. The most important is a perception of the decreasing availability of good defecation sites within a reasonable distance of the house. The other is having become accustomed to using latrines, and unaccustomed to being or working in the fields or bush, such that the natural wild state of the bush becomes more noticeable and disagreeable. Conditions in the bush that cause inconvenience or discomfort for some may be more strongly perceived as issues of health and safety for others, such as snakes, insects, thorns, trash, plants, exposure to others' feces, and conflicts.

WB5: Privacy (visual, social, or informational)

A drive for privacy is characterized by several components. The first is a need to avoid being seen uncovered or defecating, especially for women by the opposite sex. This is rarely a problem between husband and wife, less of a problem among the same family or clan, but becomes important with some categories of male and female persons. Reduced availability of defecation sites can increase the possibility of being seen while defecating and stimulates a drive for *visual* privacy. To overcome visual privacy

problems when no latrine is available, informants identified going farther away until a more private site was found or choosing a different time of day or night when fewer people are about.

The second component is a desire to keep personal activities and family life private by avoiding going out in the bush and publicly mingling in the village. A person who is an outsider and feels a sense of separateness or difference (of clan, ethnicity, values, or lifestyle) from the dominant social structure of the village may seek *social* privacy by using a latrine. Outsiders might typically be women transplanted to the village for family-related or marriage reasons, government workers, and other non-native residents.

The third component is a desire for *informational* privacy by a person, not necessarily an outsider, who seeks to restrict access to information about their situation, especially regarding wealth and other resources, and to limit contacts with their subordinate family members by neighbors and others in the village, even relatives. Here informants referred to changes in social structure and increased heterogeneity within the village, and to a greater presence of strangers or outsiders, even within the context of their extended family. These remarks indicate that certain kinds of changes in the population composition of the village and its social dynamics, like those involved in the process of urbanization, may cause a person to feel this need for greater privacy (Wirth 1938). The desire for informational privacy might also be influenced by changing lifestyles and overlap with aspects of the first two prestige drives (P1 and P2).

4.3 Situational Drives

Restricted mobility and owning rental housing create two particular situations that lead to a desire for latrines. These two drives are distinct from social or environmental factors and reflect largely functional and commercial purposes for latrine adoption.

S1: Situations of restricted mobility

Three situations of temporary or permanent restricted mobility can provoke a need for latrines: old age, illness, and Voodoo ceremonies that confine participants inside a convent. Infirmity, blindness, chronic diarrhea, and other symptoms of old age or illness can stimulate the search for a fixed place to defecate very close to the house. For some Voodoo ritual occasions, priest, priestesses, initiates, and other groups must remain for days, weeks, and even a month inside convent compounds. While confined, defecation is done in a temporary hole in the ground, spanned by wood boards without a superstructure (similar to the defecation pits used by royalty). When the occasion ends, the hole is covered and traces of its location removed. Space constraints, pits cluttering convent grounds, and an inherited obligation to maintain and preserve these religious facilities contribute to a person's interest in building a convent latrine.

S2: Increasing rental income

For rural landlords who rent housing (a small, but perhaps important group of early latrine adopters), providing access to a latrine can nearly double the monthly rental income for a typical three room unit. In the village of Djidja, for example, a landlord can recover the capital cost of a latrine in three to four years from rent on two or more units, charging the standard premium for access to a shared latrine (1,500 CFA/month on a base rent of 2,500 CFA/month, or US \$3 for the latrine per month per unit in 1995). The rental market in a rural village is almost entirely salaried government employees

(administrators, school teachers, extension agents, medical personal, etc.) who are posted to the village for multi-year assignments. As members of the urban elite and outsiders, these renters are willing and able to pay the premium for a latrine, and often negotiate with the landlord to have one installed if the property lacks one. When the rental unit adjoins the landlord's home, the latrine may be shared by both households.

4.4 Frequency of Drives

Frequency of the 11 drives expressed among the 40 informants is shown in the first column of Table 3-7. In subsequent columns, frequency is given for subgroups of informants segregated by several lifestyle factors and two village environments that are hypothesized in Table 3-6 to influence drives. The number and percentage of informants in each sub-group expressing each drive is displayed. The total number of informants in a sub-group is given at the bottom of each column. Although not a random sample, informants were arbitrarily selected within the categories of latrine adopter and non-adopter and may, therefore, reasonably represent how drives relate to informant characteristics.

The first column of Table 3-7 suggests that latrine installation at present in rural Benin is strongly motivated by prestige involving complex and multiple dimensions related to several different spheres of life. In fact, 24 out of 40 informants, all male, expressed at least one prestige drive. Some individuals had several drives operating to various degrees, while others had only one obvious drive in their choice to install a latrine. Persons motivated by prestige to adopt a latrine typically emphasized only one prestige dimension. In a few cases, a desire for affiliation with the urban elite was strongly coupled with the need to express new experiences and lifestyle different from

those of the village. Six informants demonstrated from their statements and responses that none of the 11 drives for latrine installation was felt. All were non-adopters and when carefully probed, these individuals admitted they had no real intention or plan to install a latrine in either the near or distant future despite sometimes holding neutral or some positive attitudes toward latrines.

4.5 Influence of Lifestyle and Village Environment on Drives

Examination of concerns operating in each of the drives to install a latrine and an analysis of informant profiles suggest that differences in an individual's lifestyle and in physical and social characteristics of the village environment may explain differences in the presence of some drives among informants. Two drives, restricted mobility and increasing rental income, are particular situations that do not seem to have inherent correlation with factors of lifestyle nor with environmental conditions in the village. Table 3-6 summarizes the individual lifestyle factors and village environmental conditions that are hypothesized to influence drives for latrine adoption.

TABLE 3-6. Factors Influencing the Presence of Drives for Latrine Adoption

Individual Lifestyle Factors	Village Environment Factors
<ol style="list-style-type: none"> 1. gender 2. lifecycle stage (age and household structure) 3. occupation 4. education 5. social linkages 6. mobility and travel 7. wealth and income 	<ol style="list-style-type: none"> 1. availability of open defecation sites (building density, intensity and extent of land cultivation, defecation rules for agricultural fields) 2. pig raising practices and dog ownership 3. village social structure (clan, ethnic, class, and occupational heterogeneity) 4. road access 5. proximity to major urban centers 6. commercial and/or government administrative activities 7. aggregate level of latrine adoption in village ^a <p>^a Influence acts through latrine information and exposure</p>

Different lifestyle orientations appear to have different prestige and status needs. Profiles of the informants who stated the four prestige-motivated drives point to gender, age, occupation, mobility and travel, and social linkages as possible elements of lifestyle differences. These elements are socio-demographic factors that can be used jointly to distinguish lifestyles, but often are inadequate to explain behavioral and attitudinal differences when used alone (Wells and Guber 1966; Salomon and Ben-Akiva 1983).

TABLE 3-7. Frequency of Drives for Latrine Adoption Expressed by 40 Informants

Drive	Overall	Gender		Education (years)		Occupations		
		Men	Women	0	≥ 6	Merchants	Trades	Farmers
Affiliate w/ urban elite	12 ^a 30% ^b	12 36%	-	7 29%	2 25%	5 62%	1 14%	2 20%
Express new experiences and lifestyle	13 32%	13 39%	-	6 25%	4 50%	-	7 100%	2 20%
Intergenerational status and legacy	4 10%	4 12%	-	2 8%	1 12%	1 12%	-	1 10%
Aspire to royalty	3 7%	3 9%	-	3 12%	-	1 12%	-	1 10%
Cleanliness	5 12%	4 12%	1 14%	4 17%	-	1 12%	-	-
Personal health and safety	8 20%	7 21%	1 14%	7 29%	-	2 25%	1 14%	2 20%
Family health and safety	13 32%	12 36%	1 14%	4 17%	4 50%	4 50%	3 43%	1 10%
Convenience and comfort	12 30%	9 27%	3 43%	6 25%	3 37%	4 50%	1 14%	1 10%
Privacy	4 10%	1 3%	3 43%	3 12%	-	1 12%	1 14%	-
Restricted mobility (age, illness)	3 7%	2 6%	1 14%	3 12%	-	-	-	2 20%
Restricted mobility (Voodoo convent)	2 5%	2 6%	-	1 4%	1 12%	-	-	-
Increase rental income	5 12%	3 9%	2 29%	3 12%	2 25%	-	2 29%	-
No drive expressed	6 15%	5 15%	1 14%	6 25%	-	-	-	5 50%
Number of informants	40 100%	33 100%	7 100%	24 100%	8 100%	8 100%	7 100%	10 100%

^a Number of informants in column expressing drive

^b Percentage of informants in column expressing drive

TABLE 3-7. Continued

Drive	Overall	Mobility and Travel			Village Environment	
		Youth	Occupational or Social	None	Small off-road ^a	Large on-road ^b
Affiliate w/ urban elite	12 ^c 30% ^d	8 32%	7 47%	5 45%	4 27%	8 32%
Express new ex- periences and lifestyle	13 32%	10 40%	8 53%	2 18%	5 33%	8 32%
Intergenerational status and legacy	4 10%	3 12%	-	1 9%	2 13%	2 8%
Aspire to royalty	3 7%	2 8%	1 7%	1 9%	-	3 12%
Cleanliness	5 12%	4 16%	1 7%	1 10%	1 7%	4 16%
Personal health and safety	8 20%	3 12%	2 13%	3 27%	4 27%	4 16%
Family health and safety	13 32%	10 40%	5 33%	2 18%	3 20%	10 40%
Convenience and comfort	12 30%	10 40%	6 40%	1 9%	3 20%	9 36%
Privacy	4 10%	2 8%	2 13%	-	2 13%	2 8%
Restricted mobility (age, illness)	3 7%	-	1 7%	2 18%	-	3 12%
Restricted mobility (Voodoo convent)	2 5%	1 4%	-	1 9%	-	2 8%
Increase rental income	5 12%	3 12%	3 20%	1 9%	-	5 20%
No drive expressed	6 15%	1 4%	1 7%	4 36%	5 33%	1 4%
Number of informants	40 100%	24 ^e 100%	15 ^e 100%	11 100%	15 100%	25 100%

^a Adame, Adjoko, Djohounta, and Hellou (see Table 3-2)

^b Djidja, Kpassagon, and Mougnon-Kossou (see Table 3-2)

^c Number of informants in column expressing drive

^d Percentage of informants in column expressing drive

^e Some individuals have both youth mobility and occupational/social mobility and travel

The well-being drives for cleanliness, health and safety, convenience and comfort, and privacy are constructed partially from perceptions of the village environment, in particular some of its physical and social conditions. A person's perception of these environmental conditions is likely to be oriented by values associated with his or her lifestyle. Additional lifestyle factors emerging from well-being-related perceptions are formal education and wealth.

Population density, land pressures, social structure heterogeneity (increased social differentiation), and economic growth and diversification emerged as the most important village conditions for the arousal of well-being drives for latrine adoption. Macro-level economic and political change underway in Benin is reflected in the differential distribution of these changing conditions at the village-level. As macro-processes continue and evolve, these kinds of micro-level village changes will deepen and spread in the rural sector.

Differences in the distribution of drives across sub-groups in Table 3-7 support these hypotheses about the role of lifestyle and village environment in the formation of different drives to install a latrine. The foundations for these hypotheses are elaborated next.

Gender

A fundamental gender difference in the motivation for latrines was apparent in the absence of any of the four prestige-related drives among women informants (see Table 3-7). The seeking of these forms of prestige and status predominantly by men is consistent with the distinct social, domestic, and economic roles and concerns of men and women in the local culture. Among the other drives, female gender did not appear to be a discriminating factor in this limited sample, except possibly in the drive for social privacy by outsiders and in some of the factors (i.e., avoiding dew, branches, mud, and soiled clothes) of the drive for convenience and comfort. Visual privacy, for which a gender difference might be expected, was not explicitly mentioned by any women informants. However, it may have been confused or combined in the language usage and translation of descriptions of social privacy by women outsiders. Some men informants implied that

they were responding to female household members' concerns in stating a desire to install a latrine to avoid encountering snakes in the bush, and robbers and prowlers at night. Conversely, the danger of an enemy using your feces left in the open for sorcery was only stated by men.

Lifecycle stage (age and household structure)

Encompassed in the notion of a person's lifestyle is their present lifecycle stage as defined by their age and stage of household formation (characterized by member composition and structure). Informant profiles reinforce a culturally universal phenomenon that as lifecycle progresses, the focus of needs shifts from hedonic pleasures and material accumulation to preoccupation with and maintenance of intergenerational ties (Erikson 1959; Wells and Guber 1966; Reisman 1986). Young men, at a stage of life where they are establishing their full independence and forming a household, focus on "the accumulation of the functional items needed for independent living and expression of emerging self" (Wallendorf and Arnould 1988, p.540). Informants who expressed desires for self-expression and lifestyle differentiation in wanting to install a latrine were generally younger with a younger household composition both at adoption (average age of 33.7, N=7) and at interview (average age of 37.0, N=6) than all adopters (average age of 36.1 at adoption, N=25) and all informants (average age of 51.4 years, N=38) (see Table 3-3). In this lifecycle stage, an expanding household and the concerns for raising children were evident in the drives for cleanliness and family health and safety among men informants. Unfortunately, women in this lifecycle stage were not interviewed because they are rarely heads of their own household.

Heads of maturing households, with established occupations and some accumulated wealth, may turn their attention to community concerns, collective needs, and public affairs. This shift can be accompanied by a desire to reinforce one's status and social linkages. A need to display affiliation with the urban-based elite might arise when an individual's socio-economic position is linked to this group. Alternately, individuals linked to village-based structures may seek to affiliate with the traditional rural elite (i.e., royalty, Voodoo leaders, established clan leaders).

At a later lifecycle stage in Fon society, men's responsibilities for building a household and raising children are replaced by growing community authority and greater responsibilities and position in the extended family/clan structure. Concerns increase about the success of adult sons and their future families. These senior patriarchs (*Dah* in Fon) are more likely to express desires for intergenerational prestige. Informants motivated by intergenerational prestige were on average older at adoption (50.1 years, N=2) and at interview (67.0 years, N=2) than all adopters and informants (see Table 3-3). Besides having lower status in general than men, it is unclear why none of the older women informants expressed intergenerational prestige as a drive. Old age, in both men and women, also brings an increasing drive for convenience and comfort, and situations of restricted mobility.

Occupation, education, and social linkages

In the influence of work on the formation of drives among informants, four occupational categories were identified. Differences in education and social linkages seem to be closely related to these occupational differences in rural Benin. The four categories are:

- traditional subsistence-based farming;
- merchant activities, including commercial processing and marketing of agricultural products and trading of consumer goods over long distances;
- new skilled trades involving small business enterprises and/or self-employment; and
- educated elite, generally salaried, mostly government-employed.

Each category is discussed in relation to education, social linkages, and associated drives for latrine adoption. In reality, informants often had more than one occupation, one of which they considered primary.

Traditional subsistence-based farmers

Formal education is not generally highly valued by subsistence-based farmers, and their social and economic linkages to the traditional rural elite (Fon royalty and clan chiefs) orient them to identify and affiliate themselves with village-based categories of class, social norms, and consumption. Extensive time spent in the fields and bush shapes farmers' perceptions, making them largely immune to the discomforts and inconveniences of open defecation and potentially appreciative of its benefits.

Furthermore, with few if any linkages to the urban elite and no need to seek symbols of self-expression different from those available within the traditional rural economy, subsistence-based farmers are least likely to feel any drives for latrines. Among informants, this occupational group had the highest frequency of no drives for latrines in Table 3-7.

Merchants

Rural merchants, besides trading agricultural and consumer goods, often invest in commercial agricultural production (e.g., fruit, palm, cashew and wood plantations, and

cotton), grain mills, trucking services, and rural transportation. They develop strong social and business ties to their trading partners, the urban-based merchant elite. They also seek to cultivate good relations with government officials who control resources needed to facilitate their economic activities, and implement regulations and taxes that can constrain them. Such occupational connections underlie their need for symbols of affiliation with these urban elite. As seen in Table 3-7, merchants expressed this drive to affiliate with urban elite more frequently than any other occupational group. Regarding formal education, the older generation of merchants is not likely to have any but the younger generation is, and both aspire to educate their children (perhaps another important symbol, like latrines, of affiliation with the urban elite).

New skilled tradesmen

New tradesmen emerging in an increasingly diversified rural economy appear particularly important as an occupational group with drives for latrine adoption in Table 3-7. Some formal education is helpful, but not essential, to secure apprenticeships needed to develop these skills. In some cases, informants started out pursuing an educational path, but abandoned it for income-generating opportunities, due to family hardship or poor academic performance. Formative experiences living in towns, cities, or abroad where these new trade and entrepreneurial skills are acquired, stimulate a drive for differentiation and new self-expression when these new trades people rejoin their rural villages. As mechanics, repairmen, drivers, transporters, sign painters, modern tailors, welders, embalmers, and so on, their lifestyles no longer involve spending time in the fields or bush. Instead they work in a workshop at home or in a nearby town, operate in new spheres of exchange, and may travel periodically or extensively to cities and even

abroad for their work. Traditional tradesmen (pre-colonial trade or craft occupations) such as masons, carpenters, well diggers, blacksmiths, tailors, and so on, may share some lifestyle aspects with new tradesmen if they apprentice out of the village, travel for their work, or spend little time in the bush. On the other hand, they may share others (education, consumption, and social linkages) with farmers to the degree that they remain in the village, operate in traditional spheres of exchange, and engage in subsistence farming.

Educated elite

Most of the educated salaried elite originate in rural villages and many retire there, where they build an urban-style home, usually with a latrine. While they aim to live and work in town or the city, some may be transferred from village to village, creating rural demand for rental units with latrines. Not all young men and women who begin on this course achieve full membership in this elite. Many of the young men who drop out before completing their studies, or are unable to get a job, join a small group of educated, unemployed youth in the village (called *jeune éduqué sans emploi* in French). They avoid manual labor and identify in every way, through their educational status and tastes, with the urban-based elite. These young men have strong prestige and family health and safety drives for latrines influenced by their urban-orientation and formal education. They prefer latrine designs sometimes well beyond their financial means, but often lack the economic independence to act on this preference.

Mobility and travel patterns

As described above in new trade and merchant occupations, mobility and travel, particularly to urban centers, can provoke the formation of prestige drives to express new

experiences and lifestyle and to affiliate with the urban elite. Mobility and travel also appear to influence perceptions in at least two well-being drives (convenience and comfort, and family health and safety). Two patterns were apparent in mobility and travel among informants: mobility occurring during youth, and occupation or social travel in adulthood.

Each informant who spoke of a strong prestige drive to express new experiences and lifestyle had experienced youth mobility to an urban center in search of new economic opportunities (trades apprenticeships or service jobs) or higher education, prior to forming a household in the village. These young people acquired a broad knowledge of the outside world, tasted its new experiences, whole-heartedly developed attachments to modern consumer goods, and assimilated urban habits while away and then brought all this back to the village. All seven informants with a new trade occupation, and half of informants with six or more years of formal education, indicated a drive to express new experiences and lifestyle in wanting to install a latrine, compared to only 19% of informants with other occupations or 29% with less or no formal education. Among informants with youth mobility, 40% indicated this drive. Youth mobility as a child did not seem to have this drive effect.

Occupational or social mobility and travel occur in adulthood. Merchants travel extensively between village and urban centers to buy, transport, and sell agricultural and consumer goods. Visiting siblings or children to participate at important ceremonies (marriages, births, graduation, deaths, and ancestral anniversaries) or celebrate holidays are social occasions when rural adults travel to cities. These patterns establish an individual's business, social, or familial connections with the urban world and its elite,

and provide exposure to cosmopolitan habits, new knowledge, and the opportunities to act on these. Informants whose economic activities involved a high degree of contact outside the village with the urban elite consistently expressed the affiliation prestige drive (see drive frequencies for merchants and occupational/social mobility and travel in Table 3-7).

Exposure to western ideas and the urban world, through mobility and travel, or education, also seemed to influence informants' desires for convenience and comfort, and family health and safety concerns. Table 3-7 compares the frequency of these drives for informants with and without youth mobility or occupational/social mobility and travel, and compares informants with higher levels of school education (six or more years) to those with no formal education (0 years). Knowledge of infectious diseases, ideas about flies and feces, and becoming unaccustomed to open defecation were attributed by many informants to their urban experiences. Some young men who had traveled abroad seemed to casually discard or even belittle the importance of supernatural phenomena related to personal health and safety, perhaps because these beliefs no longer fit with their evolving identities and the western, scientific knowledge they had assimilated in their travel experiences. Rather than a sign of acculturation, attitude change through school, church, and city contacts in West Africa, and such skepticism about the supernatural among younger men may actually display a "native empiricism" and complex adaptive process at work whereby an individual seeks to achieve consistency in a changing social context by reorganizing traditional and exotic beliefs to fit with present needs (Dawson 1969; Gable 1995).

Wealth and income

In rural Benin, a person's wealth and income are not always temporally correlated because of the erratic patterns of cash flow in most non-salaried occupations.

Accumulation of material possessions, housing quality, and household expenditures on certain categories may be better indicators of wealth than current household income, which is more difficult to measure. Information gathered in the interviews was not sufficiently detailed to discriminate levels of wealth but a lack of wealth would seem to stifle prestige and other drives for latrine installation. Without sufficient wealth to provide basic needs for food, shelter, and health, latrine adoption pales in importance. Wealthier individuals can afford the material symbols and luxuries of prestige and status. Their basic needs are met, freeing up time and resources for leisure, the enjoyment of comforts and greater convenience, in addition to seeking further economic productivity. Furthermore, considering the cost of a latrine, some threshold of wealth may have to be passed before an individual is able to accept latrines as relevant or compatible to their lifestyle (McCracken 1988a).

A rough assessment of housing quality and consumer possessions, either seen during the interviews or solicited at the end, indicated that lack of wealth (poverty) was a factor in a person expressing a cost constraint on adoption. Shortage of income or cash was stated as a constraint in other cases where wealth was apparently adequate. For one informant, cost was perceived as so excessive relative to his wealth and lifestyle (a subsistence farmer) that latrines were a completely inconceivable acquisition within his lifetime. His insistence that he did not want a latrine, despite liking the idea, displayed a strongly felt lifestyle incompatibility. Some adopters and intenders, driven by prestige in

particular, stated that the cost of a latrine was unfortunate but not a constraint on their preference and subsequent action to install one. No matter what the cost, they felt the need for a latrine and would pursue that objective until it was achieved. High cost or lack of cash for these and many other adopters caused delays on the order of years from the time a decision to adopt was made to the start of construction, and from the start of construction to completion, to amass enough cash.

Higher wealth was more common in some occupations than in others. Generally, merchants were the wealthiest and subsistence farmers the poorest. Individuals in all categories varied in their wealth but all non-farmers were generally better off than pure subsistence farmers.

Physical characteristics of the village environment

The decreasing permanent or seasonal availability of “good” defecation sites around the village is a critical factor in the convenience and comfort drive. It also is associated with aspects of drives for cleanliness, personal health and safety, and visual privacy. “Good” according to informants meant clean, visually private, safe, and appropriate. The permanent elimination of defecation sites is a direct effect of growth in population and economic opportunity within the village causing construction density to increase and conversion of open land to private or public non-agricultural uses to accelerate. A seasonal reduction of defecation sites reflects pressures to increase agricultural returns from land within and near the village for several reasons: part-time farmers being unwilling or unable to use land farther away; population pressures on open lands in surrounding vicinities; new agricultural opportunities and technologies that encourage multiple cropping; and the successive intergenerational sub-division of family

lands into smaller and smaller inheritances. Intensified cultivation during the rainy season around the village shortens or eliminates periods between harvest and subsequent plowing when it is generally socially acceptable to defecate in agricultural fields. This effect is moderated by the strength of village norms against defecation in cultivated fields and their application to different types of fields depending on ownership and type of crop.

The perception of cleanliness and feces overload, and concerns for the smell and sight of feces also reflect pig raising practices in the village. Some villages have a collective rule against free roaming pigs during the rainy season to avoid crop damage. During six to seven months of the year, feces are left around these villages. Where defecation sites are already limited in the rainy season, this can worsen feces overload. Other villages may have no such rules or expect individuals to take responsibility for their own pigs. Some villages may not practice pig raising and have no mechanism to remove feces. As villages evolve from an agricultural, clan-based, collective organization of their landscape and social relations to an increasingly diverse, dense, and individual-based competitive one, free roaming pigs can be perceived as a nuisance or as inefficient use of resources. Here individuals may invest capital to build enclosures for more land-intensive pig raising.

Social characteristics of the village environment

Several aspects of a village's social character relate to latrine adoption drives for personal health and safety, family health and safety, social and informational privacy, and prestige. Clan heterogeneity or conflict within a village can lead to greater envy, distrust, and competition. In Benin, these are ingredients for flourishing Voodoo sorcery that engender perceptions such as dangers in the village from leaving feces out in the open,

witchcraft and evil forces at night, and activity by supernatural agents (Ngokwey 1994). The presence of sorcerers and evidence of sorcery are important stimuli for these beliefs. Greater size and diversity, increased threats of taxation, and increased exposure to outsiders may engender feelings of anonymity, needs for privacy, threats of prowlers and robbers at night, inability of village political structures to function cohesively, greater misunderstanding and conflicts, and greater competition for property and resources. Such an environment also may stimulate competition for power and needs to display status symbols or membership in new kinds of social or economic groups and organizations. These conditions and socio-behavioral responses have universal recognition in urbanism's way of life as population settlements become larger, denser, and more heterogeneous (Wirth 1938).

Smaller stable villages, relatively untouched by economic and political changes, are more likely to have clan homogeneity and strong blood ties among inhabitants. These conditions help to establish and maintain well-defined rules of interaction. On the other hand, greater integration into regional administrative and economic structures diversifies a village's population in terms of occupations, ethnicity, clan, language, religion, and so forth. It also may stimulate population and economic growth. Proximity to major roads, easy access to urban centers, importance in the regional government administration, infrastructure development (schools, medical facilities, water, electricity, regional or local market, etc.), and economic development (population size, occupational diversity, population growth, etc.) are measurable variables that coincide with many of the changes to a village's social character affecting latrine adoption drives. Some of these variables also correspond to the physical changes that decrease availability of open defecation sites.

These variables are used in Table 3-2 to describe the sample villages in which interviews were conducted. According to the physical and social conditions represented by these variables, the seven sample villages were grouped into *small off-road* (smaller, predominantly agricultural, less dense, politically un-integrated, off a main road, and with little infrastructure) and *large on-road* (larger, occupationally diverse, denser, politically integrated, on a main road, and with more infrastructure) villages to examine differences in the frequency of drives among informants by village type. Table 3-7 suggest that drives for cleanliness, family health and safety, and convenience and comfort may increase in large on-road villages compared to small off-road ones and lends support to the hypothesis that village environment influences the formation of drives for latrine adoption.

5. BARRIERS TO ADOPTION

Overemphasis on cost to explain weak demand for sanitation improvements in developing countries can lead to a single-minded promotion of least-cost technologies. Information is lacking about other barriers to adoption and their importance relative to cost. According to earlier theoretical discussion of choice behavior, barriers to choosing latrines can be distinguished according to: 1) the type of constraint they represent (awareness, psycho-social, or implementation-related); 2) where they intervene in an individual's decision process (before or after formation of the choice set, preference, or intention); and 3) whether they can be reduced or eliminated by policies, programs, technology, or other external interventions (external versus internal constraints). When constraint factors act in the opposite direction, they become facilitators of latrine adoption by making it possible or attractive. For example, cost of latrines is a factor that constrains

adoption when high and facilitates it when low. Table 3-8 summarizes the main constraints found in the interviews pertaining to awareness about latrines, building the latrine, social disapproval from sources important to the individual, and several psychological factors of the individual or household. In the following presentation, factors in Table 3-8 are discussed as constraints with the understanding that they operate as facilitators when positive for an individual.

TABLE 3-8. Factors Acting as Constraints or Facilitators of Latrine Adoption in Rural Benin

	Implementation-related	Psycho-social
<u>External Factors:</u>		
1. awareness ^a		
2. understanding ^a		
3. soil and water table conditions	√	
4. space	√	
5. technical complexity (skilled labor, expertise, special tools and materials)	√	
6. cost	√	
7. financing (cash or credit availability)	√	
<u>Internal Factors:</u>		
1. identify with, adhere to social norms, fear disrupting social relations		√
2. extended family interaction		√
3. village or family approval of adoption		√
4. decision-making capability	√	
5. psycho-physical aversion to latrines (intolerance of feces smell or sight, fear for safety, conditioned to open defecation)		√
6. perceived benefits of open defecation (fertilize soil, feed pigs/dogs, fresh air, social interaction, privacy)		√

^a Factors that must be present to identify and consider latrines as a choice alternative

5.1 External Constraint Factors

External constraints comprise lack of awareness, misunderstanding, soil unsuitability, lack of space or a suitable site, unavailable or highly complex technical inputs, high cost, and unavailable cash. Whereas these categories are general to latrine

adoption in most developing countries, the aspects of each category presented below are more likely to be specific to a given context.

E1: Lack of awareness

It is not possible to consider installing a household latrine if one does not know what a latrine is or how it is used, or is not aware that latrines can be installed in rural villages. Another awareness issue involves the cultural meaning and social significance a person attaches to latrines. These psychological aspects of a latrine are not stated, but rather must be interpreted in the context of previous latrine exposure, as discussed more fully later in this chapter on latrine experience and exposure. A person who lacks awareness may not perceive latrines as relevant to his life or to even exist as a household option.

E2: Misunderstanding

Misunderstandings or erroneous conceptions may be negative or positive toward latrines, involve mild to severe distortions, and can lead a person to reject latrines in several ways. A person may have little or distorted knowledge about latrines, their operation, how they are built, or their other attributes. For example, when the only “latrines” ever seen are flush toilets, or other inappropriate urban or institutional designs, a person may not consider these applicable to rural housing styles or the village environment. Others believe that latrines are facilities only for the old and sick, and any “healthy” or “strong” person has no need for them. Examples of functional or technical misunderstandings concern the latrine pit (e.g., its depth, whether it can or must be regularly emptied and how this is done, the relationship between depth, number of users and how long it will last, and where the bottom is), falling into the pit, the kinds of

materials required to build it, the cost, and the smell (e.g., its severity, ability to eliminate it, pits less than 40 to 50 meters deep will smell, and latrines with a vent pipe in the roof will not smell).

E3: Soil unsuitability

Sand, solid rock, and high groundwater table are soil conditions that make latrine installation more difficult, and make some designs and construction methods unsuitable. Design and construction techniques to overcome soil problems generally increase construction costs. These options may not be available or known, or their cost may be prohibitive to the individual with a soil problem. On the other hand, clay and other stable soil conditions facilitate simpler pit designs and cheaper construction. Sandy soil conditions presented a common soil constraint in one of the interview villages (Djidja). The others had generally favorable soil for latrine construction. A seasonally high groundwater table was less of a village-wide phenomenon than soil type, and was characterized by much variation within a village. Frequently a ground water table or soil problem was not encountered until after the decision stage, during or even after construction.

E4: Lack of space or a suitable site

Here a household may be short of space deemed appropriate for siting a latrine. While space might presently be free of buildings, a person precludes many of these sites for latrine construction because they have already been designated for future building projects. Increasing space constraints on a family or clan's ancestral lands from subdividing parcels for each succeeding generation can pose concern for latrine siting and durability. Several other factors contributing to space and siting problems include

concern for smell (which can influence the preferred distance and orientation of a latrine from living quarters) and issues of access and use by members of the immediate and extended family, as well as by the general public. These factors can reduce the availability of acceptable sites and increase the desired permanence of the latrine. An environmentally important but thoroughly neglected siting concern is distance from rainwater collection cisterns or drinking water wells. Many installed latrines were within 5 or 10 meters of a cistern or well, and only one informant expressed concern for contaminating cistern or well water supplies in discussing his criteria for siting.

E5: Unavailable or highly complex technical inputs

Technical know-how, skilled labor, and special materials are needed to build a latrine. Lack of information about what these inputs are, where to get them, and their availability may constrain adoption. Several informants indicated that they did not know of any masons or skilled diggers or none were available in their village who knew how to build a pit latrine. Soil problems or design preferences that call for technical expertise may be unavailable. Not knowing how to build a latrine which will last a long time, will not smell too much, can be emptied, or will not have to be rebuilt, created a barrier for some people to choose a latrine. On the other hand, good technical information and other technological inputs that are available will facilitate an individual's decision and subsequent actions to adopt.

E6: High cost

The cost of building a latrine includes direct cash costs of inputs, opportunity cost of one's own and family labor, and any added transaction costs (cash or time) to find and obtain any special materials, technical expertise, or equipment needed. If skilled labor,

technical expertise, or materials and equipment are not available locally and difficult to acquire, cost in terms of time and effort may be perceived as very high.

Relative to a person's resources, the cost of building a latrine may be perceived as anything from a mild or severe hindrance to prohibitively excessive. The following factors can play a role in the presence of this constraint:

- misconceptions about the cost of building a latrine, because of little experience or knowledge of latrine construction, or because the only designs (i.e., institutional, urban, extremely durable, very sophisticated styles) encountered are very costly;
- preference for latrine design features that make the construction more costly (however high cost in this case may not be perceived as excessive, nor inhibit intention); and
- poverty and economic hardship such that household resources must go to serve unmet very basic needs.

E7: Unavailable cash

Independent of whether or not the cost of building a latrine is viewed as a constraint in the context of a person's ability to pay (resources or wealth), serious cash flow and savings problems in rural Benin and lack of credit, produce a finance constraint on latrine adoption. In the current economic and institutional environment, a person must accumulate a relatively large sum of hard cash before building a latrine. Accumulating cash is very haphazard in Benin because most rural households' income is erratic and difficult to predict in time and quantity, formal savings and credit systems are not available to the vast majority of the rural population, and debts from private borrowing to meet short-term medical, ceremonial, and other one-time cash expenses are very

common. Those who succeed in getting the cash to start a latrine often take several years to complete it because they run out and must accumulate more to continue.

5.2 Internal Constraint Factors

Table 3-8 lists six internal constraints that act largely as psycho-social factors to shape the attitudes toward latrines that influence preference. Only one internal constraint, lack of decision-making capability, is thought to act more like an implementation-related factor in influencing intention to adopt without affecting preference.

I1: Identification with and adherence to norms or fear disrupting social relations

This factor is reflected in a person's general disposition to follow social norms established within their reference group, maintain the status quo, accept inherited practices unquestioned and unchallenged, and avoid actions perceived to disrupt interpersonal relations. Although informed about latrines and cognizant of their uses and advantages in other settings (such as visits to the city), a person may view them as outside collective norms of family or village. This sentiment implies that the customs or style of the city and those of the village are different, and each has its proper place and context. Latrines are city ways and open defecation is the village way and such logic and order should neither be challenged nor disturbed.

In rural Benin, installing a household latrine is sometimes perceived to disrupt interpersonal relations and create friction among extended family members living in adjoining households of a common family compound. When one household head installs his latrine, he must address the subsequent and delicate problem of access and use by all these relations. Whether he denies access to siblings, their families, and other kin ("private" use), or allows access to all extended family relations ("public" use), problems

are perceived to arise for the adopter. Private use can engender envy, jealousy, and resentment with potentially dangerous consequences in Fon culture and Voodoo practice. Public use poses problems concerning shared cost and responsibility for the latrine, misuse, cleaning and maintenance, congestion, overuse, rapid filling of the pit, and eventual replacement.

I2: Extended family interaction problems

In addition to creating conflicts with extended family members as mentioned above, latrine installation can exacerbate already existing ones or these existing problems can block an individual's ability to implement practical decisions to get a latrine built. For example, unresolved extended family conflicts over shared resources, collective land rights, existing debts, and so on, may create an environment in which decisions about if or how to share the cost of building a latrine and choosing or liberating land for a site cannot be made in the short- or long-term. Such pre-existing problems among kin may convince a person that the issue of access to the latrine will increase conflict and negative consequences for resolving these other problems.

I3: Village or family disapproval

A more explicit and severe manifestation of social norms against using or having latrines is when specific individuals important to a person actually forbid or disapprove of latrines. Whether the individual is capable or not of making his own decisions, he may feel this approval is important and needed to choose latrines. For example, a wife may have her own financial resources to decide to install a latrine but feels constrained because her husband disapproves of or forbids it.

I4: Lack of decision-making capability

A head of household may lack the ability to decide independently to install a latrine in the following situations:

- a widow or divorced woman who is under the protection or authority of a male relative;
- a younger man living under a strong kinship or clan structure where the senior patriarch oversees all major housing and compound decisions;
- other hierarchical relationships and forms of collective decision-making dynamics; and
- a young person who has not yet been allocated his parcel of land or has not yet achieved the economic and other conditions for independent decision-making.

I5: Psycho-physical aversion to latrines

This factor manifests itself in an inability to relax physically in a latrine to defecate and/or the perception of danger in using a latrine. Three conditions were mentioned as contributing to the presence of this factor for a small but not insignificant number of adults: fear engendered by the sound and depth of the pit or the floor collapsing; psycho-physical revulsion to the smell or sight of feces in a latrine; and a conditioned physical reflex for defecating in the open. This is analogous to a conditioning reflex that prevents some habitual latrine or toilet users from using the bush.

Several informants indicated they had a relative or knew someone who refused categorically to use a latrine for one of these reasons. In some cases, refusal resulted from a first and only very negative experience attempting to use a latrine. One female adopter who installed her latrine for rental income chooses not to use it because she feels more “comfortable” defecating in the bush. In another case, an adopter’s two male

relatives explained how they had never been able or wanted to defecate in his or any other latrine, because they could not relax enough. They explained elaborate measures they take to avoid using latrines during visits to Cotonou, the economic capital, and other urban centers in Benin. It is possible to uncover this factor by asking a person if they have ever preferred not to use a latrine or refused one that was made available to them.

I6: Perceived benefits of open defecation

For some people, several aspects and potential consequences of defecating in the bush may be perceived as beneficial. These include:

- fertilization of the soil in agricultural fields;
- social interaction with a companion or people encountered on the way to and from a defecation site;
- provision of a source of food for pigs and dogs, either privately or as part of village-wide animal raising practices; and
- privacy because a person can avoid being observed on the way to defecate in the bush.

5.3 Frequency of Constraints

Table 3-9 shows the frequency of constraints on latrine adoption identified in the interviews among adopter and non-adopter informants. Most frequently mentioned by both informant categories was lack of cash. Misunderstanding, cost, and adhering to social norms were the next most frequent constraints of non-adopters. Internal psychosocial constraints also are a significant group of barriers to adoption.

Constraints shown in Table 3-9 for adopter informants were present at the time they were considering their decision to install a latrine or during implementation but were overcome or accommodated in various ways. Only soil problems in one case had stalled

TABLE 3-9. Frequency of Constraints on Latrine Adoption Expressed by 40 Informants

	Constraint	Non- adopters (N=15)	Adopters (N=25)
E1	lack of awareness	0	0
E2	misunderstanding	5	0
E3	soil unsuitability	1	6 ^{a c}
E4	space limitation	2	2 ^a
E5	technical complexity	1	1 ^{a c}
E6	high cost	5	3 ^b
E7	lack of cash or credit	8	10 ^c
I1	identify with, adhere to social norms	5	0
I2	extended family interaction problems	2	1 ^c
I3	village/family disapproval	0	1 ^c
I4	lack of decision-making capability	3	1 ^c
I5	psycho-physical aversion to latrines	1	1 ^d
I6	perceived benefits of open defecation	3	1 ^e
	no constraints expressed	1	10

^a These constraints caused the design to be modified and/or increased the cost of building the latrine
^b This caused the adopter to build a simpler latrine design, less durable or structurally sound than preferred
^c These unanticipated or temporary constraints delayed adoption and/or installation for these adopters until the constraint was removed. In one case of a soil problem, implementation had been stalled for over 2 years
^d This case is an adopter motivated by rental income who does not use her latrine
^e This case is an adopter motivated by affiliation prestige, who raises pigs in an enclosure at home where sometimes he and family members defecate

implementation indefinitely. As described by adopters, ways that constraints were overcome include:

- building simpler, less durable or less desired latrine styles (high cost and lack of cash or credit);
- delaying adoption or installation until the constraint was overcome (soil problems, technical complexity, lack of cash or credit, extended family interaction problems, lack of decision-making capability);
- increasing the cost of building the latrine (space limitations, soil problems, technical complexity); and

- not using the latrine themselves (psycho-physical aversion to latrines, perceived benefits of open defecation).

6. PAST LATRINE EXPOSURE AND EXPERIENCE

Interpersonal face-to-face contact is the predominant and sometimes only vehicle for information communication in the rural sector in Benin. The interviews explored informants' direct experience with latrines and exposure through personal and other communication to understand how knowledge and attitudes toward latrines are gained in rural Benin. The amount and quality of past experiences and exposure to latrines were prominent factors in forming an individual's beliefs and attitudes about latrines, explaining the presence of some constraints (awareness, misunderstanding, excessive cost, lack of technical inputs) and constructing the cultural meaning a person attaches to latrines. Lifestyle factors appear to influence both quality and amount of exposure and to shape its effects (positive or negative) on attitude. Early age at first exposure may be important to positive latrine attitudes, especially for those personalities and lifestyles less likely to be inclined to consider latrines in adulthood. Table 3-10 lists aspects of latrine experience and exposure found in the interviews to influence adoption behavior.

TABLE 3-10. Past Latrine Experience and Exposure

Quantity Aspects:

1. no experience or exposure
2. heard of a latrine or seen one only
3. used a latrine only once or twice
4. short periods of daily latrine use
5. extended periods of continual latrine use
6. age at first use

Quality Aspects:

1. private setting (family, social, or occupational)
 2. public or institutional setting
 3. attractiveness (smell and sight of feces, construction quality or condition, novelty features, etc.)
 4. in the village
 5. outside the village
 6. lifestyle similarity and prestige value of setting
 7. age at first use
-

6.1 Amount of Exposure

Degrees of exposure to latrines can be gauged with a scale from none to full exposure where habitual daily use has occurred for years. Awareness from only hearing about latrines, some visual exposure, and at least one use occasion mark the lowest points of such a scale. Higher levels have increasing visual exposures, information contacts, and usage, followed by continuous periods of daily use. The interviews confirm that it is rare in rural Benin to encounter an adult (apparently less rare of women than men) who has not heard something about latrines to have a notion of what they are used for. However, a small number of rural inhabitants may never have seen a latrine and more have never used one.

6.2 Exposure Quality

Several quality aspects of latrine experience and exposure emerged in the interviews as important for shaping positive attitudes, good awareness, and better understanding of latrines, especially at the lower levels of exposure. These are consistent with notions of effectiveness of communication between social peers (*homophilous* exchange in which individuals are similar in such attributes as beliefs, education, social status, and so on) in the diffusion of innovations (Rogers 1983). The following qualities of the exposure source or setting, relative to the exposee, comprise one set of aspects:

- private (personalized) versus institutional or public (impersonal);
- family versus social or occupational ;
- inside versus outside the village;
- degree of socio-economic or lifestyle similarity or dissimilarity; and
- status or prestige value.

The other set consists of qualities and attributes of the latrine which account for its overall attractiveness to the exposee and influence his feelings about it. These are cleanliness, smell, and visibility of feces, quality of construction, novelty features, state of operation, and structural integrity.

In general, exposure to latrines in a private setting (family, neighbor, friend, or colleague) produced greater awareness, more positive attitudes, and better understanding of latrines than exposure in an institutional or public setting (school, clinic, army, market, station, etc.). Informants rarely mentioned public latrines when asked about any latrines they were aware of, although some of these existed in or very near their village. They frequently had difficulty finding personal relevance in a public or institutional latrine because: the design style (construction, technology, or material) was perceived as incompatible with local housing conditions and personal and household lifestyles; the setting was too different from the context of home or village to stimulate analogy to one's own daily defecation habits; and the latrine was viewed as government or development project infrastructure having very little personal meaning or private significance. On the other hand, when a latrine is installed by a personal acquaintance or family relation, with whom one can discuss and observe its use and meanings, it becomes personally relevant and takes on practical, social, and cultural significance for daily life. Institutional or public latrines produced technical misunderstandings when this was the only exposure. However, such negative effects seemed to diminish when institutional exposure was complemented by increasing amounts of private exposure.

6.3 Differences in Exposure and its Effects

Factors influencing differences in an informant's past experiences and exposure to latrines, and the effects these differences have on attitudes were revealed in the interviews. These factors related to individual lifestyle, particularly to gender and age. Furthermore, evidence that patterns of communication and interpersonal contacts are structured by physical geography asserts the importance of village location and the level of adoption within a village as additional factors of latrine exposure.

Gender and age

Past exposure to latrines for men and women was clearly different in the interviews. Men's exposure came much more frequently through status contacts, occupational mobility, and non-family situations. Women's was almost completely limited to domestic family situations while living with or visiting relatives (adult children, in-laws, husband, and a parent or grandparent).

Latrine use at an early age seemed to correlate with more awareness, a positive attitude, greater total exposure, and even adoption. Table 3-3 shows that on average, adopters' age at first exposure was 10 years younger than non-adopters'. Men or women who grew up as children using a latrine at home were typically very well informed and appreciative of the advantages of latrines over open defecation. However, several informants who grew up with a latrine, but were not made or allowed to use it, did not seem to have a strong attachment or appreciation.

Other lifestyle factors

Occupation, social linkages, mobility, and travel patterns are likely to influence exposure to latrines and its effects on perceptions. For instance, individuals with high mobility and travel outside the village and external social or economic linkages were

exposed to and more receptive of non-family heterophilous latrine contacts, modern construction, and novelty design features. Those remaining in the village and linked to traditional rural structures seemed to be more receptive to homophilous and familial exposure and affordable construction designs, but more sensitive to odors or sight of feces in a latrine. Among informants, exposure to a private latrine in the village was observed to stimulate much interest for those whose occupational lifestyle and social reference group was internal to the village. On the other hand, exposure to private latrines outside the village was more important to individuals whose lifestyle orientation and reference groups were outside the village (i.e., more “cosmopolitan” individuals according to Rogers(1983)). The most common places that were mentioned by informants for latrine exposure outside the village were Bohicon/Abomey (the regional capital, nearest urban center, and main location for secondary schools for the sample villages), Cotonou (the urban capital of the country), and urban centers in Ivory Coast, Nigeria, Ghana, and Togo.

For those who attended a school with a latrine, especially in an urban setting, exposure at school was rarely mentioned as a significant experience. More common was reference to health lessons at school as the source of information about infectious diseases spread by feces and flies, and the importance of using a latrine for good health. Those with western scientific notions of health and disease who had never attended school reported that observation and empirical evidence from their personal experiences were the primary sources of these ideas. However, when probed further, many referred to interpersonal exchanges (with their parents, social or occupational acquaintances, neighbors, extension agents, and public health workers) and the radio, as other sources of

this information. Typically, these interpersonal exchanges occurred outside the village or abroad.

Opportunities for exposure

The greater the number of household latrines installed in a village the more informed and aware residents are likely to become, and the more accessible the technology is likely to be. This is likely to be especially true for those who are neither mobile nor travel, nor have occupational or social linkages outside the village. Although this was not explicitly determined from the interviews, non-adopters interviewed in villages with more adoption had generally better information about latrines than their counterparts in villages with low or no adoption. The proximity of population settlements with high levels of private latrine adoption also is likely to increase the opportunities for exposure and experience, independent of such lifestyle factors as occupation, mobility and travel, education, and social linkages. However, these lifestyle factors may be important in shaping how different kinds of exposure are perceived.

7. A CONCEPTUAL MODEL OF LATRINE ADOPTION CHOICE

This section proposes a conceptual model of an individual's choice to install a latrine in rural Benin. The model depicted in Figure 3-1 adapts Mokhtarian and Salomon's (1994) decision structure to include key hypothesized relationships among drives, constraints, lifestyle, village environment, latrine exposure, and choice developed in this chapter. Such a causal framework defines the conditions and cognitive interactions required for an individual to choose latrines and shows some influences on these conditions. By so doing, the diagram greatly facilitates the identification of ways to

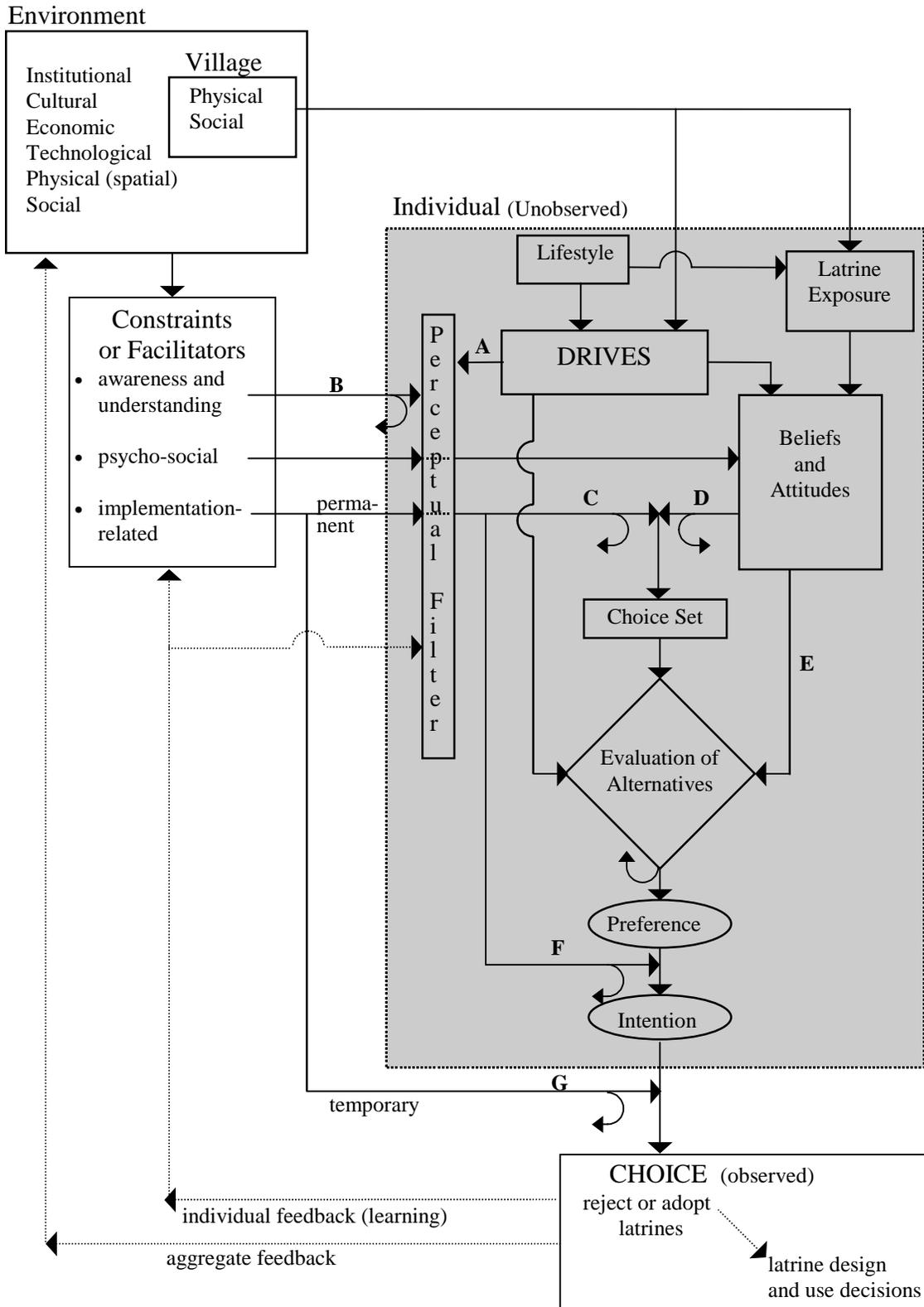


FIGURE 3-1. A Conceptual Model of Latrine Adoption Choice Adapted from Mokhtarian and Salomon (1994)

increase adoption. Quantitative research presented in subsequent chapters will test key relationships of this model for explanatory power and predictive value.

The essence of the model is the individual decision process mapped inside the shaded box labeled *individual*. The context for individual behavior is the environment in which that individual acts. In particular, the environment establishes the objective conditions for the factors constraining or facilitating a decision to adopt, and provides the information and experiences that can arouse motivating drives. For consumer households in rural Benin, their most immediate environment is the village. Characteristics of the village's social and physical environment are hypothesized to influence an individual's choice behavior through arousal of certain drives and opportunities for latrine exposure. Villages exist within the institutional, socio-cultural, technological, physical, and economic context of the regional or national environment. Constraints or facilitators on latrine adoption generated by this macro-environment are likely to vary for villages as they do for individuals. Individuals and the environment are dynamic as experience and learning from actual choice behavior feeds back on an individual and aggregate scale. For example, an individual's beliefs and attitudes are modified as a consequence of a choice made, while constraints may change as more people adopt. Sanitation policies and programs to promote adoption can be directed at the individual (or household), village, and/or larger environment.

The remainder of this section describes the decision process depicted in the shaped box of Figure 3-1 and presents some implications of this model for demand-driven programs and marketing strategies. The boxes labeled *perceptual filter*, *beliefs and attitudes*, *choice set*, *evaluation of alternatives*, *preference*, and *intention* represent

hypothetical components and functions involved in making consumer and other individual choices among discrete alternatives as reviewed in section 2 of this chapter. Arrows trace causal relationships among factors and outcomes at key steps in the process. Dashed arrows represent the dynamic interaction of individuals and the environment over successive choice decisions. The symbols  indicate points where latrines are eliminated in the choice process and establish explanations for *rejection* in the model. The sequence from A to G in Figure 3-1 constitutes the essential mechanics of choice as described next.

7.1 Choice Process

Drives are the engine of the choice process; their arousal indicates an individual's dissatisfaction with one or more aspects of lifestyle or environment. As suggested by the interviews, drives for latrines in rural Benin reflect internal motives (basic values) associated with different lifestyles and their arousal can be influenced by the village environment. Drives stimulate a person to consider a change and activate the perceptual filter to receive and interpret information from the environment about possible alternatives (arrow A). Arrow B requires that awareness and sufficient understanding of latrines be present for them to be identified during the search for alternative solutions. Lack of awareness or misunderstanding, particularly about the relevance of latrines to aroused drives, may block their consideration at this point in the choice process. If latrines are recognized, information about the viability and attributes of latrines and other alternatives for drive satisfaction is filtered as described in the EKB model (see Chapter 2). Environmental conditions may be censored or distorted when perceptions of and feelings about facilitators and constraints are formed through filtering. Past latrine

exposure will influence information processing and filtering through the existing beliefs and attitudes it has created.

As part of the filtering process, if any psycho-social or implementation-related factor is perceived to be a binding constraint (permanent and prohibitive), latrines are given no further consideration. Viewed as a non-available option for implementation-related (arrow C) or psycho-social (arrow D) reasons, latrines are rejected from the choice set. Moreover, negative attitudes engendered by psycho-social factors may cause a person to block some external information about latrines or record it in a biased manner, leading to rejection of latrines from the choice set. Other options that are sought to satisfy the active drive(s) will be similarly judged in forming the choice set along arrows C and D. Once formed, the choice set consists of possible though not necessarily desirable alternatives and always includes the option to do nothing. Thus, alternatives in the choice set will depend on the active drive(s) and may or may not include latrines. As revealed in section 2, some alternatives may have nothing to do with defecation and will not necessarily be the same for each individual.

Each choice set alternative is registered with its perceived levels of constraints, facilitators, and attributes for drive satisfaction. Once enough information about alternatives is accumulated, the choice set is evaluated by comparing alternatives across attributes important to the satisfaction of an individual's drive(s). How beliefs and attitudes about these attributes (arrow E) are combined to arrive at an attitude evaluation of each alternative is called a decision rule. The most preferred or liked alternative is the one with the highest attitude evaluation or most satisfaction overall. Any unfavorable attitudes produced by the presence of psycho-social constraints in Table 3-8 are likely to

influence the evaluation of alternatives in forming preference through arrow E. On the other hand, perceptions of non-binding (physical) implementation-related constraints acting in the long-term or permanently, such as soil problems, lack of space, technical complexity, lack of cash, lack of decision-making capability, and high cost, are expected to reduce or block intention (arrow F) without affecting prior preference by shaping a person's view of his/her ability to implement the preferred alternative. Implementation-related constraints perceived to be temporary (short-term) or those which arise after intention is formed (unanticipated ones) cause an individual's observed choice behavior to deviate from his/her intended choice (arrow G). Either the person does nothing until short-term constraints are removed, or chooses another alternative. If the choice is made to install a latrine, a whole set of subsequent decisions for which analogous choice processes can be constructed must be made about the design and use of the latrine.

7.2 Demand-led and Marketing Program Implications

This model of latrine adoption choice behavior explains in a new way some of the failures of sanitation programs to raise latrine coverage levels and suggests clear ways to stimulate demand. In particular, rejection modes in the choice process imply that the joint action of different strategies is needed to promote demand. These strategies have generally been lacking in past sanitation programs because efforts to understand an individual's decision to install a latrine have not been made.

Multiple strategies to increase adoption emerging from this model include:

- Arousing drives for adoption through advertising campaigns that do two things: 1) promote latrine advantages by associating them with positive values likely to appeal to existing internal motives (values) in the population; and 2) focus attention on the

inadequacy of present conditions as they relate to the drives which latrines satisfy. In rural Benin internal motives are reflected in the 11 drives listed in Table 3-4. Care should be taken to develop messages that do not clash with existing beliefs and values by applying the principles by which external information is filtered.

- Raising awareness and understanding of the drive-satisfying aspects of latrines and correcting specific misunderstandings that cause negative attitudes, through informational strategies and campaigns. From findings about latrine experience and exposure in rural Benin, strategies to increase awareness and understanding should focus on interpersonal communication and create more opportunities for exposure to private household latrines over institutional or public ones.
- Identifying which external constraints are the key barriers of adoption and developing policies, programs, or technology to remove them. For rural Benin these policies and programs might consist of providing better information about: factors perceived to be constraints; access to technical support and inputs for design and construction; schemes for financing; and developing and disseminating new household latrine construction methods and designs to overcome real cost, soil, or space problems.
- Enhancing latrine attributes to increase their desirability over competing alternatives for drive satisfaction by improving the design and image of latrines and by reducing external constraints. Given the kinds of competing alternatives for many of the drives motivating adoption of latrines in rural Benin, *bundling* the promotion of latrines and the delivery of support activities for construction to housing improvements, in particular to highly desired items, may be an effective way to improve the image of latrines, and increase access to key information, resources, and other inputs needed to

remove barriers to adoption. For example, bundling could include: offering loans for housing improvements on condition that family latrines are also built; targeting private sector cistern builders for training and information dissemination on latrine design and construction; and linking latrines to highly desired housing improvements in publicity campaigns.

- Recognizing that market segments with different drives for and constraints on adoption are likely to exist, and thus, a single set of strategies to arouse drives and remove constraints is not likely to work effectively for all segments of the population. The findings indicate that motives are linked to different lifestyles and some drives arise from conditions in the village environment (see Table 3-7). Lifestyle and village environment are also likely to affect the presence of some constraints on adoption. Consequently, different sets of the strategies listed above should be adapted and targeted to different lifestyle groups and/or village types (i.e., market segments).

These strategies may not work if some critical element in the latrine adoption decision is overlooked because the complex set of conditions needed for latrines to be possible, preferred, and chosen must occur simultaneously. For example, efforts to remove barriers, such as those related to affordability or acceptability of latrine technology or design will have little effect without also sufficiently arousing drives for adoption. Although little can be done to remove psycho-social constraints that already exist for individuals, it may be important and possible to prevent future formation of some of them among unaware population groups by influencing the conditions under which these potential future adopters acquire latrine information and experience. Regarding norms against using or adopting latrines engendered by the present social

environment, there may be little that can be done, especially in the early phases of latrine adoption.

8. SUMMARY

This chapter has presented findings from a qualitative investigation of an individual's choice to install a latrine in rural Benin. Findings focus on the drives motivating a desire for that choice and the factors constraining or facilitating it. In the investigation, 40 household heads, of which 25 were latrine adopters, were individually interviewed about their preference and choice to adopt using an ethnographic- and biographic-style exploratory approach. The decision history of the latrine and an inventory of its construction were included in interviews with adopters. These research findings were then integrated into a conceptual model of latrine adoption behavior to explain individual choice among household heads, based on theory about discrete choice decision-making.

Eleven different drives for latrine adoption are active among the rural population in Benin and involve prestige, well-being, and situational motives. The most important drives for adoption have nothing to do with prevention of oral-fecal transmission of diseases. Prestige-seeking drives, in particular the desires to affiliate with the urban elite and to express new experiences and lifestyle acquired outside the village, are the most widely expressed drives. Well-being drives for cleanliness, convenience and comfort, health and safety, and privacy, and situational drives to accommodate restricted mobility or increase rental income were important desires for wanting to install a latrine for some individuals and one or more of these often accompanied a prestige drive. A drive for health and safety was found to have two distinct components, only one of which included

a subset of concerns to protect the health of family members from infectious diseases. However, disease transmission was misunderstood. The majority of health and safety concerns consisted of personal protection against misfortune and illness caused by feces, snakes, and going out at night as explained by various widespread supernatural phenomena, or prevention of naturally explained accidents, injuries, conflict, and other physical threats for oneself and dependent family members.

Individual differences in drives are attributed to the combined influences of gender, occupation, lifecycle stage, education, mobility and travel, social linkages, and wealth which collectively constitute indicators of lifestyle. Interviews indicate that men are more frequently motivated by prestige to adopt a latrine while women are more frequently motivated by convenience and comfort or privacy. Occupationally, farmers are the most likely to lack a drive for adoption, while merchants and new skilled tradesmen are most likely to be motivated by prestige (either a desire to affiliate with the urban elite or to express new experiences) and by concerns for family health and safety that include prevention of infectious diseases. Mobility and travel, independent of occupation and education, provoke strong drives for latrines. Exposure to the world outside the village, especially during formative years before marriage and in early adulthood, arouses drives for latrines to express new experiences and lifestyle, to increase convenience and comfort, and to protect family health from diseases. Various social and physical conditions of the village environment are thought to be important factors in the arousal of well-being drives. Most notable are availability of open defecation sites, degree of social differentiation and heterogeneity, road access and proximity to urban centers, level of commercial or administrative activity, and aggregate level of latrine adoption.

Thirteen factors that relate to awareness, physical implementation, and psycho-social issues act as either constraints on or facilitators of latrine adoption in rural Benin. Lack of awareness (especially of the drive-satisfying aspects of latrines), misunderstanding, lack of space, soil problems, technical complexity, high cost, and lack of finance are barriers to adoption which can potentially be reduced by external policy interventions. Conversely, lack of decision-making capability, village or family disapproval, family interaction problems, psycho-physical aversion, perceived benefits of open defecation, and adhering to social norms against latrines or fear of disrupting social relations are psychological and social barriers internal to individuals and their social environment which are more difficult to affect externally. The most widespread barrier to adoption, present even for adopters, appears to be lack of cash or credit to finance the capital cost of building a latrine. Misunderstandings, high cost, and fear of disrupting social relations are other important barriers among non-adopters.

The quality and quantity of past latrine experience and exposure was found to be an important influence on choice through the beliefs and attitudes it created about latrines. Exposure to private household latrines belonging to a person of social, familial, or occupational importance to an individual increases perception of advantages and positive attitudes which in turn stimulate drives for adoption. In contrast, institutional and public latrines do not stimulate interest in a household latrine because they lack social or personal relevance and are considered impossible options for most rural villagers.

In the conceptual model presented in this chapter, a causal structure links drives, constraints, and facilitators of choice into a decision process from which policy interventions can be identified and their choice outcomes anticipated. In summary, the

model asserts that the key conditions for latrines to be chosen in rural Benin are the presence of at least one active drive from among the 11 found to motivate adoption, and the absence of any binding constraint that excludes latrine adoption from the choice set of possible options or subsequently blocks preference, intention, or choice to adopt. In other words, the second condition requires that all awareness, implementation-related, and psycho-social factors found to hinder adoption in rural Benin be non-binding or acting positively as facilitators for latrines to be chosen. As the number or strength of latrine adoption drives increases, an individual's motivation for change is likely to be stronger. To the degree that latrines fulfill these objectives for change they will be preferred (desired) over competing choice alternatives. Interestingly, competing alternatives found in this research for most of the drives motivating latrine adoption have nothing to do with defecation, and often consist of other infrastructure to improve housing or property. If latrines are preferred, the presence and strength of implementation-related facilitators increase the likelihood that adoption will be chosen. When an intention to adopt is made, temporary constraint factors acting in the short-term can delay actual adoption. Lack of cash is one such constraint that can delay latrine installation for years.

Demand-led program implications for sanitation promotion emerging from this behavioral analysis relate to: drive arousal and message development; strategies to increase awareness and correct misunderstandings about latrines; policies, programs, and technology to remove external constraints; bundling latrine promotion and delivery of support activities to highly desired housing-related improvements which constitute many of the competing alternatives to latrine adoption for drive satisfaction; and the use of market segments based on lifestyle and village type. Strategies that effect the greatest

increases in adoption for different market segments can be identified using quantitative choice models to predict changes latrine adoption behavior under different policy scenarios. The next chapters in this dissertation develop quantitative models of latrine adoption behavior at both the village and household level in order to test hypotheses about the influence of lifestyle and village environment on drive arousal (Chapter 4) and identify the drives and constraint factors that constitute the most important determinants of the decision to install a latrine in rural Benin (Chapters 6 and 7).

CHAPTER 4

***VILLAGE MARKET SEGMENTS FOR PROMOTING LATRINE
ADOPTION IN RURAL BENIN***

ABSTRACT

Regression analysis is used in this chapter to identify village-level conditions and characteristics that stimulate drives and promote demand for household latrines in rural Benin, as hypothesized in Chapter 3. Village-level variables are constructed from secondary data to represent the influences of the physical and social environment, individual lifestyle, and latrine exposure on the arousal of drives (dissatisfactions leading to desires for change) motivating latrine adoption in 502 villages of Zou Department. Results indicate that high population density (reduced availability of open defecation sites), larger size and infrastructure (social system heterogeneity), a higher percentage of non-agricultural households (lifestyles that arouse prestige and well-being drives for latrines), proximity to a major road (regional integration and exposure), proximity to the urban center (increased urban linkages and communication with the local epicenter of latrine diffusion), and greater local opportunities for exposure to private latrines, among others, increase demand for latrines. Using cluster analysis, villages are divided into four homogenous groups with respect to conditions that generate demand. Implications of these village market segments for demand-led approaches to promote rural sanitation are discussed.

1. INTRODUCTION

Renewed attention to the enormous sanitation problem in developing countries is leading to new efforts and approaches, and greater priority (Water Supply and Sanitation Collaborative Council 1997; UNICEF 1998). Management of domestic excreta using on-site latrines has long been recognized as one of the most appropriate, adaptable, and affordable technical solutions to the problem. Effectively promoting latrine adoption, given limited resources in developing countries and aid agencies, remains an uncertain endeavor. The promotion problem is equally important for other technologies and hygiene behaviors that can improve sanitation. The approach most often proposed though rarely followed in sanitation programs has been to target the “poorest” or “neediest” segments of the population for latrine construction programs. Sanitation professionals, recognizing the unsustainability of these past interventions, their frequent failures, and the apparent lack of demand among many beneficiaries, are calling for approaches that stimulate and respond to consumer demand (Cairncross 1992; Lafond 1995; UNICEF 1997; Wright 1997). Under such *marketing* approaches, both targeting and interventions would be quite different. Strategies to promote demand for latrines should consider different market segments (i.e., population groups with different latrine adoption behavior) and initial efforts at “marketing” latrines should start where demand and desire are strongest or can be most successfully stimulated. The key to developing market-oriented promotion is knowing the characteristics of and locating different population groups with respect to the factors that stimulate or suppress demand for household latrines.

In most developing countries, rural populations live in dispersed villages. Research reported in Chapter 3 suggests that the village, as an individual's most immediate environment, shapes household latrine adoption behavior in several important ways. Variation in rates of latrine adoption across villages supports the notion of a village effect on adoption. Thus, it makes good geographic, political, logistic, and conceptual sense to use villages, rather than households, as the first organizational and analytical unit for market-based targeting of latrines. However, the most important reason is probably practical: comprehensive data to identify regional market segments may be more attainable and easily collected at the village level (as demonstrated in this chapter) than at the individual household level.

This chapter presents analysis of household pit latrine adoption data for Zou Department in central Benin using villages as the unit of analysis. The purpose of this analysis is threefold: 1) to identify village characteristics and conditions that promote demand for latrines or for which demand can be simulated; 2) to test hypotheses from Chapter 3 about factors that arouse drives or desires for choosing latrines among household heads; and 3) to classify villages, based on these results, into market segments or homogenous groups for a rural latrine marketing strategy. The small amount of latrine adoption in rural Benin (about 5% to 7% of all rural households in Zou Department by 1996) represents spontaneous behavior of private households in a decentralized diffusion process (see Chapters 1 and 2). Household latrines are nearly 100% privately financed and locally built from designs inspired by urban latrines (Alihounou 1995). Thus, the latrine adoption data and relationships with village variables estimated in this analysis should represent the unbiased influence of village conditions and characteristics on

adoption behavior without the confounding effects of external interventions (i.e., subsidies or other artificial incentives, mass marketing, project support for construction, and other such organized promotional efforts).

Data for (administrative) villages in Zou Department were obtained from government and non-government agencies in Benin. Included are a geographic information systems (GIS) database for Benin and village coordinates. Data were cleaned and merged to produce a complete set for 502 Zou villages. Variables were constructed from these data to approximate factors hypothesized in the conceptual work of Chapter 3 to arouse drives (desires for change) and increase awareness of latrines. Several spatial variables were created using GIS software (MapInfo Professional version 4.0).

Regression models of village-level latrine adoption, estimated from the constructed variables, are used to identify village conditions for latrine adoption. The statistical significance and sign of model coefficients are a test of the underlying hypotheses about village factors and provide estimates of the marginal impacts of each variable on latrine adoption behavior. A subset of village conditions that significantly stimulate latrine demand is used with cluster analysis to classify Zou Department villages into homogenous groups or market segments.

The rest of this chapter is organized as follows. Section 2 reviews hypotheses from Chapter 3 about the role of village environment, individual lifestyle, and latrine exposure in arousing drives to install a household latrine. Section 3 describes the databases and preparation of the data. Section 4 presents the independent and dependent variables constructed from the data. Linear and logistic regression models of latrine adoption are developed in section 5. Interpretation of the model coefficients and

implications for demand-led and market-based strategies are discussed in section 6.

Section 7 discusses how village-level market segments derived from cluster analysis can be used for targeting in a regional approach to latrine marketing. Section 8 concludes the chapter.

2. BACKGROUND

Demand for latrines is the aggregate expression of individual choice to install a latrine. As conceptualized in Chapter 3, such a choice occurs when *drives* (desires for change) motivating latrine adoption are sufficiently aroused and no binding *constraints* (permanent and prohibitive factors that prevent choosing latrines) are present for an individual. Figure 4-1 shows a model of how drives for latrines are thought to be aroused. The key explanatory factors are conditions of the village environment, factors of individual lifestyle, and past latrine exposure, as postulated in Chapter 3.

A drive is a desire for change arising from dissatisfaction with some aspect of lifestyle. Dissatisfaction is caused by a perceived difference between the ideal and actual states regarding this aspect of lifestyle (Engel et al. 1978). According to consumer behavior and marketing theory, ideal states derive from a person's *internal motives*. These can be thought of as goals embodying basic values or preferences associated with a person's lifestyle. External conditions or circumstances can influence perceptions of the ideal state by creating awareness of the potential of some new object, activity, purchase, and so on, to satisfy a person's internal motives. For example, consumer purchase decisions that make another purchase necessary, normative expectations of reference groups, and advertising promotion designed to appeal to dominant motives can all change a person's perception of the ideal state (Engel et al. 1978; McCracken 1988a). Actual

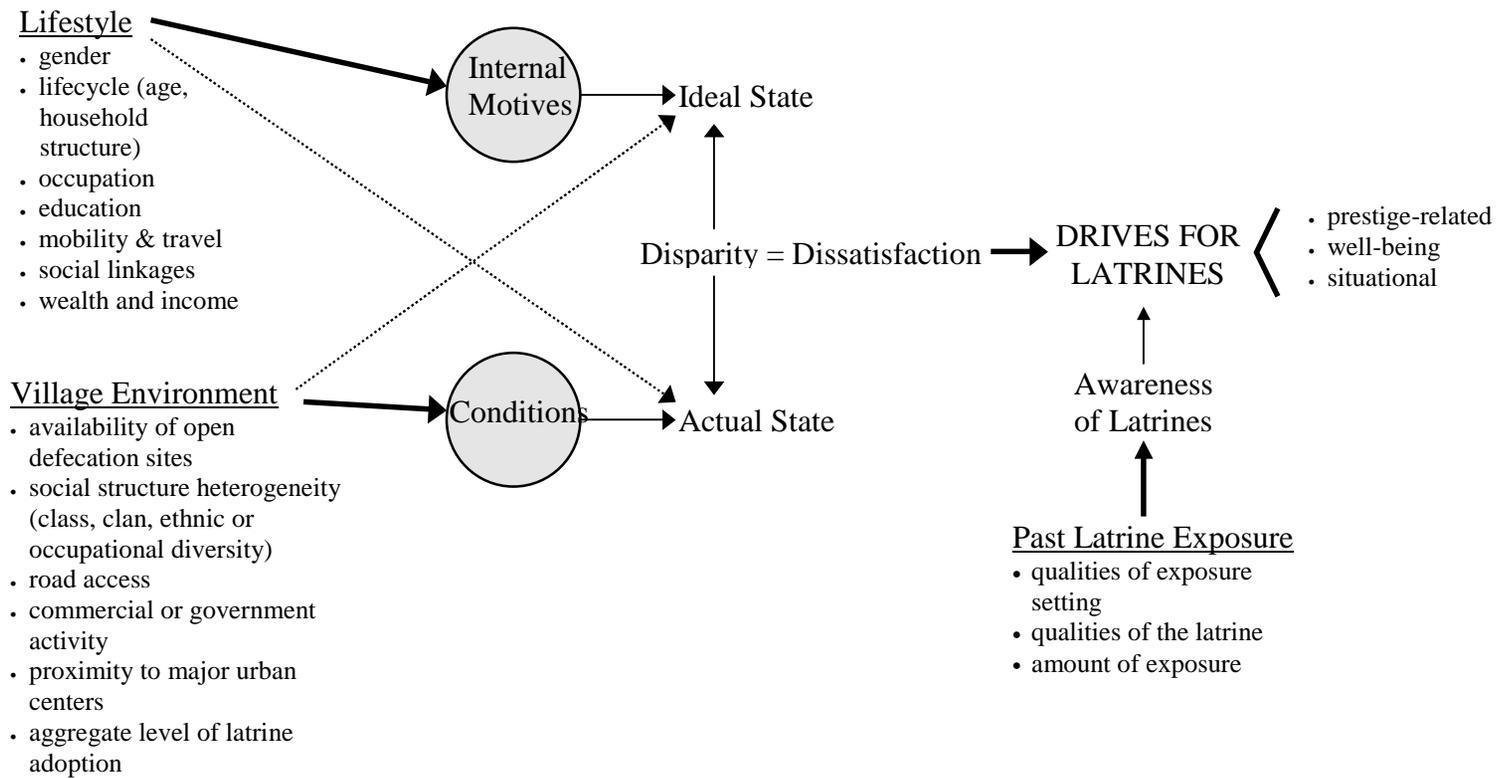


FIGURE 4-1. A Schematic Model of the Arousal of Drives for Latrines

states are determined by perceptions of the environment and individual circumstances. In rural Benin, the village is the most immediate environment for daily life. Changes in individual circumstances such as income, age, household structure (family situation), occupation, and so on, can cause a change in perceptions of the environment and actual state.

Latrine adoption by household heads in rural Benin is motivated by 11 different drives representing prestige-related, well-being, and situational motives (see Chapter 3, Table 3-4). The two most important drives for latrine adoption (the prestige drives to affiliate with the urban elite, and to express new experiences and lifestyles acquired outside the village) are thought to be aroused by the following lifestyle factors: non-agricultural occupations (merchants, new skilled tradesmen, and educated elite), mobility and travel to urban areas in Benin or abroad, male gender, higher levels of formal education, urban social linkages, and young, newly married or middle lifecycle stages. The less common prestige drives to leave a legacy and to feel royal appear to be aroused by lifestyles involving rural social linkages, wealth, farming occupation, and later lifecycle stages.

The well-being drives for cleanliness, health and safety, convenience and comfort, and privacy are thought to arise from perceptions of certain changes in the village's physical and social environment. The decreasing availability of open defecation sites causes problems for cleanliness, personal and family health and safety, convenience and comfort, and visual privacy when defecating in the open. Population pressures on land are the biggest reason for this decreasing availability. Increasing socio-economic differentiation, lack of clan cohesion, increasing numbers of strangers or outsiders,

greater criminal activity, and increasing competition for resources and power in a village create social conditions that engender desires for social or informational privacy, personal or family protection of health and safety, and status symbols of membership in or identity with emerging groups or coalitions. In rural Benin, large size, occupational diversity, commercial or governmental activity, development of infrastructure, regional integration (road access), and urban proximity of a village are thought to engender these kinds of social changes. Perceptions of the village environment leading to arousal of well-being drives may be more frequent for lifestyles involving higher levels of formal education, non-agricultural occupations, and greater mobility and travel to urban centers. Wealth, independent of village environment and other lifestyle factors, may induce a well-being drive for informational privacy and personal protection of health and safety (from enemies stealing your feces for sorcery against you).

The situational drive to ease restricted mobility is aroused by illness associated with old age and several rare situations (ownership of a voodoo convent and physical impairment from a handicap). A drive to increase rental income is also rare but may be responsible for initiating latrine adoption in a village when temporary workers (usually government civil servants) demand rental housing with latrines. Neither situational drive is thought to relate consistently to any lifestyle or village environment factor.

Aroused drives must be coupled with sufficient awareness and understanding of latrines for individuals to actually consider their adoption. For example, a person with lifestyle motives and an aroused drive for convenience and comfort may fail to consider latrines as a solution for change if he/she is unaware of the ways latrines can personally improve the convenience and comfort of his/her lifestyle. In rural Benin, awareness is

thought to develop from exposure to latrines in a private setting (such as at the home of a relative, friend, neighbor, or colleague) and from interpersonal communication with adopters having similar socio-economic and/or lifestyle characteristics. This is because the decision to adopt a latrine requires high cognitive processing where impersonal (or institutional) and mass media sources are not effective. Furthermore, mass media sources are largely non-existent, and a systematic latrine marketing campaign has never occurred in rural Benin. As the amount of direct exposure to private latrines and interpersonal communication with other adopters increases, favorable attitudes, greater appreciation of drive-satisfying attributes, and increased technical and functional understanding of latrines are expected to occur. With more private latrines installed in a village, residents are likely to become more informed and aware, and the technology more accessible, especially for those who are neither mobile nor travel, nor have occupational or social linkages outside the village. The proximity of population settlements with high levels of private latrine adoption is also likely to increase the opportunities for information exposure and direct experience with latrines for all lifestyle groups.

The next two sections describe the village-level data and the variables constructed from these data to represent as many as possible of the lifestyle, village environment, and awareness factors hypothesized to stimulate drives for latrines. This analysis does not focus on constraints and facilitators to explain demand because stimulating latrine demand by removing constraints is ineffective where no drives motivating adoption are aroused. The arousal of drives is the most fundamental and crucial element of a marketing strategy to stimulate demand. Correlation of the constructed village variables with the presence of constraints or facilitators of latrine adoption could influence

regression model results. Such potential correlation will be considered when interpreting variable coefficients in section 6.

3. THE DATA

Village data for Zou Department were obtained in 1994 and 1995 from three different agencies in Benin. The Water Ministry (Ministère de l'Énergie, des Mines et de l'Hydraulique) provided a large database (VILLAGM) of rural water supply monitoring and evaluation information for all Zou villages (720) and a GIS database of administrative boundaries and road networks. VILLAGM includes population data from 1979 to 1992, geographic coordinates, and infrastructure and water supply information. The Cotonou Office of UNICEF provided information from the 1993 National Survey of Guinea Worm Disease. This database (EM93) includes data on households, guinea worm disease, public health activities, and infrastructure covering 536 villages. It contains the number of household latrines installed in each village used to construct the dependent variable in regression analysis. The accuracy of EM93 data, collected by village volunteer health workers, is considered and dealt with later in this chapter. The National Institute of Statistics and Economic Analysis (INSAE) conducted Benin's second National Census in 1992, 13 years after the first one (INSAE 1994b). Unfortunately, the census data, which include more accurate and comprehensive information on household latrine installation, are not publicly available. Only a very limited amount of published information is used here (INSAE 1994c). These data include total and agricultural population, and total and agricultural households in 1992 (the difference being population and households engaged in non-agricultural occupations) for 703 Zou villages.

These various data were collected, coded, and entered into databases by different groups, at different times, with different resources, procedures, methods, and quality control. After the 1992 Census, consensus developed for a national coding system to uniquely and officially identify villages for database work. At this time, village identification codes were manually paired with village names and entered into each database so that records could be matched and data merged across databases. Under these circumstances, inconsistencies, errors, missing data, and other data quality problems found during the cleaning, quality control, and merging procedures to prepare these data for analysis were neither exceptional nor unexpected. The following procedures produced a merged database of 502 villages with data to construct the variables analyzed in this chapter:

- In each database, village identification codes were checked by matching sub-string codes to sub-prefecture, commune, and village name, and errors in codes were corrected (from a master list of village codes).
- In each database, village records with the same identification code were either corrected or removed to eliminate duplicates.
- An automated procedure was used to read geographic coordinates entered in alphanumeric fields in VILLAGM as degrees, minutes, and seconds, and convert them to decimal values for mapping in GIS software.
- Villages with missing coordinates and those located outside their sub-prefecture boundaries or too far from other villages in the same commune (by visual inspection on a map) were removed from VILLAGM.

- VILLAGM, the 1992 census data, and EM93 were successively merged (using the village identification code) and mismatched or unmatched village records at each merge step were corrected or removed. The merged database (ZVLAT4) contained 521 valid village records of which 19 had incomplete data.

3.1 Variability in Village-level Latrine Adoption

The number of installed latrines in 1993 varies from zero to 374 across the 502 villages. The household latrine adoption rate (calculated by dividing installed latrines in 1993 by households in 1992) varies from 0% to 95.8% and averages 4.8%. Although these rates lack accuracy (especially since the numerator and denominator come from different sources), they should indicate order of magnitude differences in adoption reasonably well. The village adoption rate is not normally distributed and appears to follow an exponential or negative binomial distribution (see Figure 4-2). The variability in Table 4-1 suggests two situations for rural demand: one where desire for latrines is non-existent or small and/or major constraints prevent acting on it (villages with no latrines or very low rates of adoption), and the other where desire for latrines clearly exists and a solution is being adopted to satisfy that demand (villages with relatively more latrines and higher rates of adoption).

Spatially, these variations, mapped thematically in Figure 4-3, show a pattern of latrine adoption spreading outwards from urban centers, especially from Abomey, the capitol of Zou Department, and Bohicon, and along road networks. A spatial pattern of latrine adoption diffusing outwards from Abomey-Bohicon is clearly visible in the expanded view in Figure 4-4 and confirmed by the progressive decline in adoption rates with distance from these two cities in Figure 4-5. All together, variations in latrine

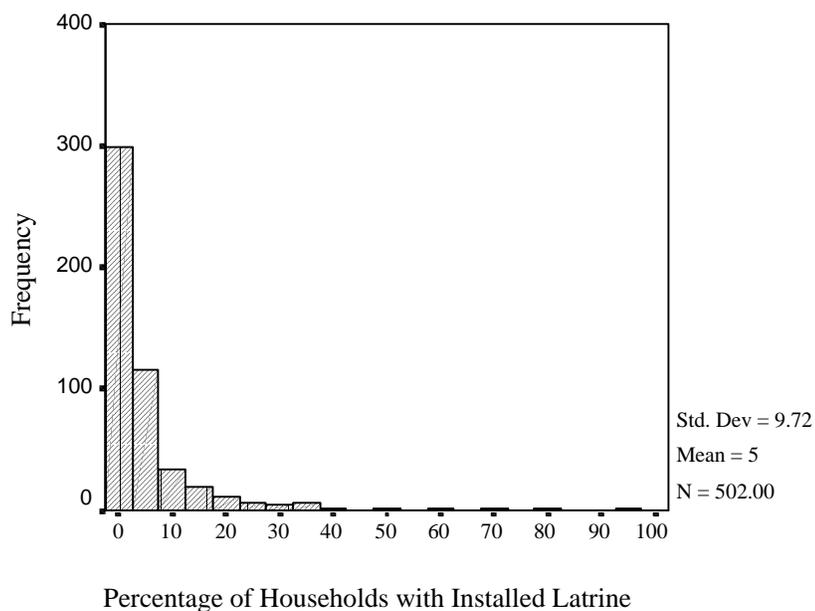
adoption rates provide good evidence to support the ideas that village conditions and characteristics account for differences in adoption behavior and that latrine awareness results largely from communication processes controlled by a village's spatial characteristics.

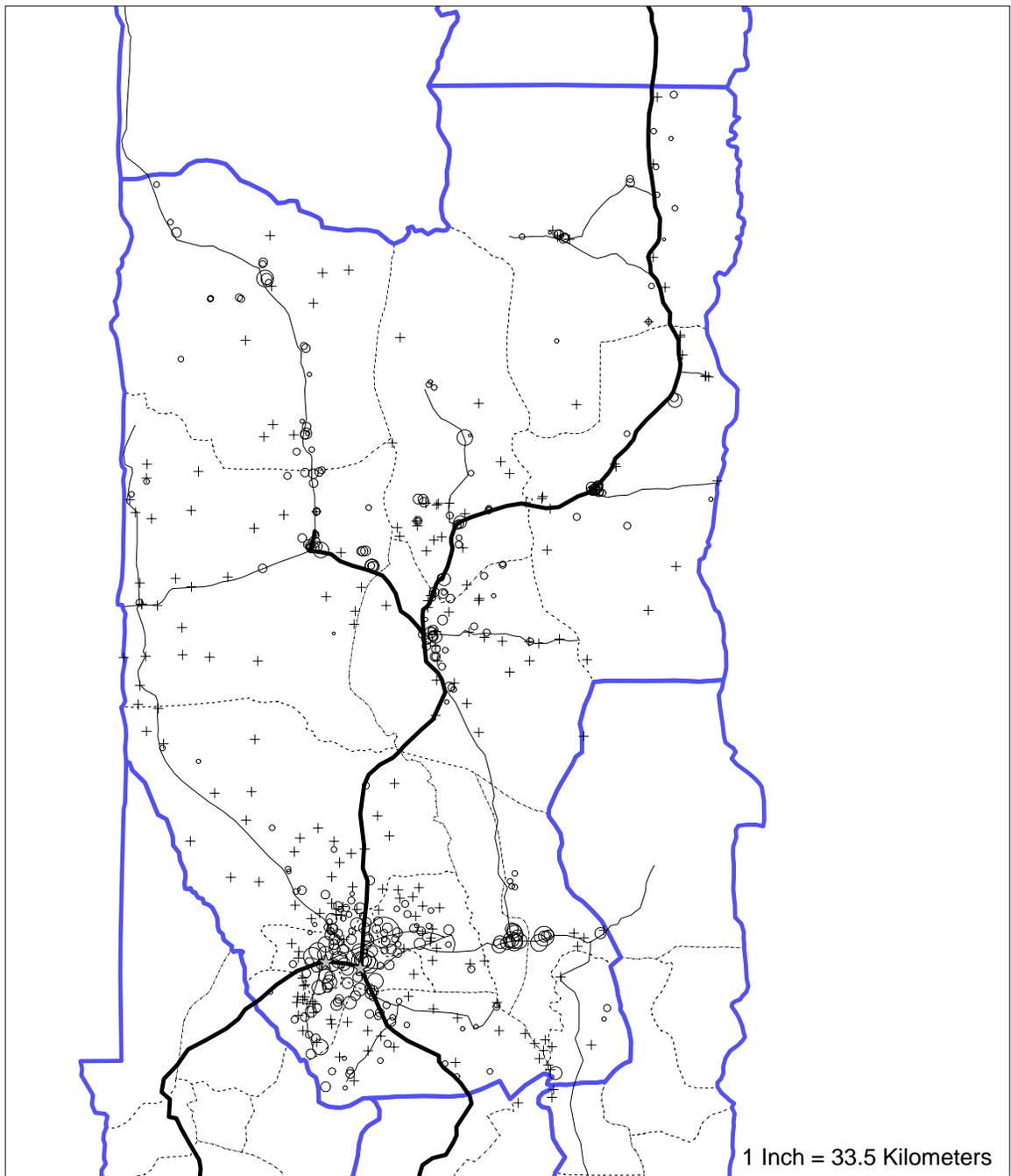
TABLE 4-1. Household Latrine Adoption Rate for Full Set (N=521) and Subset (N=272) of Villages of Zou Department, Republic of Benin, 1993.

Latrine Adoption Rate (% of households)	Number of Villages	Percentage of 521 Villages	Number of Villages	Percentage of 272 Villages
0%	205	39%	106	39%
0 to 2%	87	17%	47	17%
2 to 5%	95	18%	51	19%
5 to 10%	68	13%	34	12.5%
10 to 25%	47	9%	24	9%
25 to 50%	14	3%	9	3%
greater than 50%	4	1%	1	0.5%
All	520 ^a	100%	272	100%

^a One case with missing latrine data.

FIGURE 4-2. Histogram of Village Latrine Adoption Rates in Zou Department, Benin, 1993



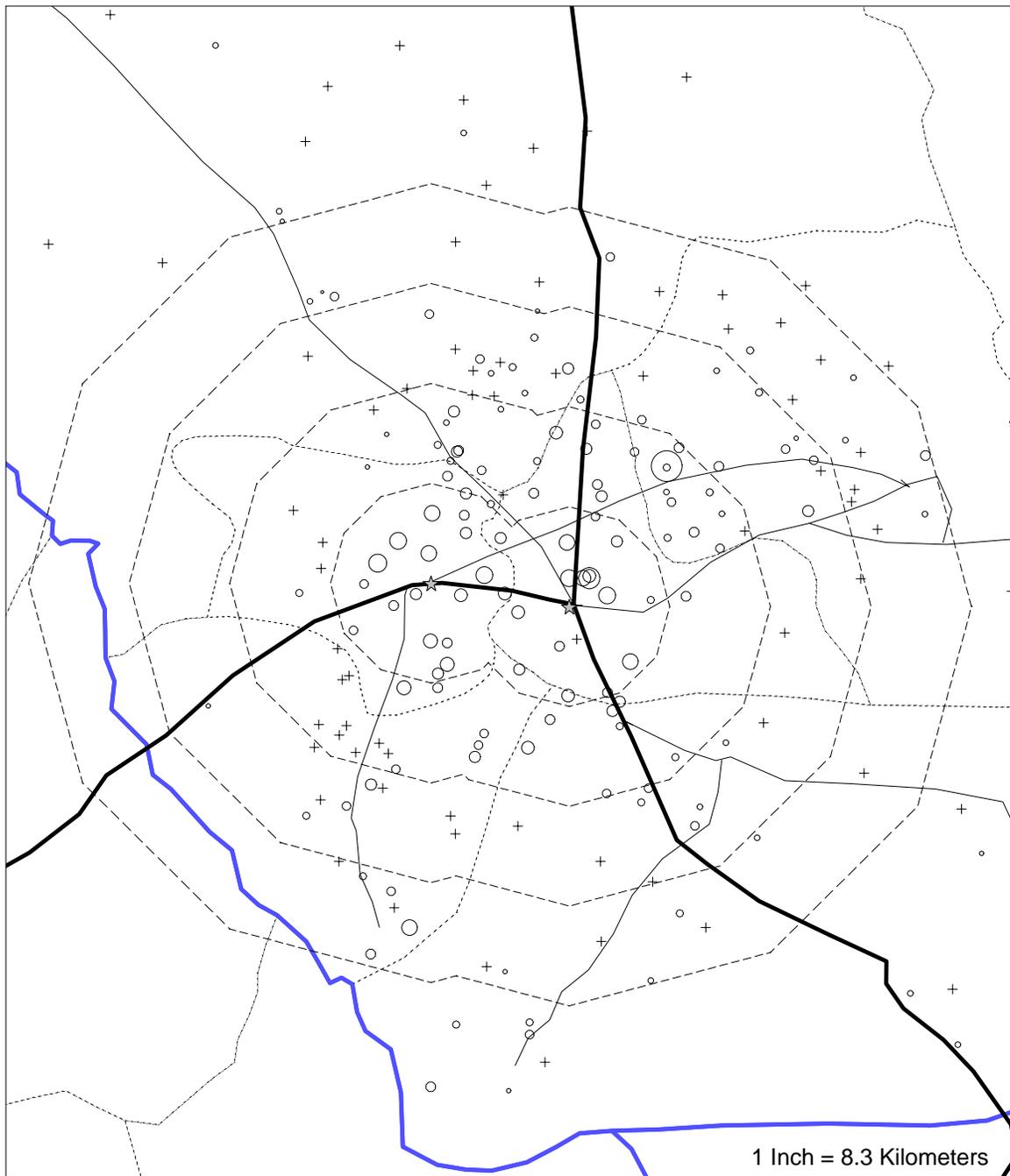


% Households with Latrines
520 Villages

- 50%
- 25%
- 5%
- + no latrines

- - - Department
- - - Sub-prefecture
- Major paved roads
- Secondary roads
- ★ Cities of Abomey, Bohicon

FIGURE 4-3. Map of Latrine Adoption Rates in 520 Villages of Zou Department, Benin, 1993 (one village with missing latrine data)



Households with Latrines in Villages
around Abomey and Bohicon

- 50%
- 25%
- 5%
- + no latrines

- Department
- Sub-prefecture
- Major paved roads
- Secondary roads
- - - - Countours of 5, 10, 15 and 20
kms around★ Abomey/Bohicon

FIGURE 4-4. Map of Latrine Adoption Rates Around Abomey and Bohicon, Benin, 1993

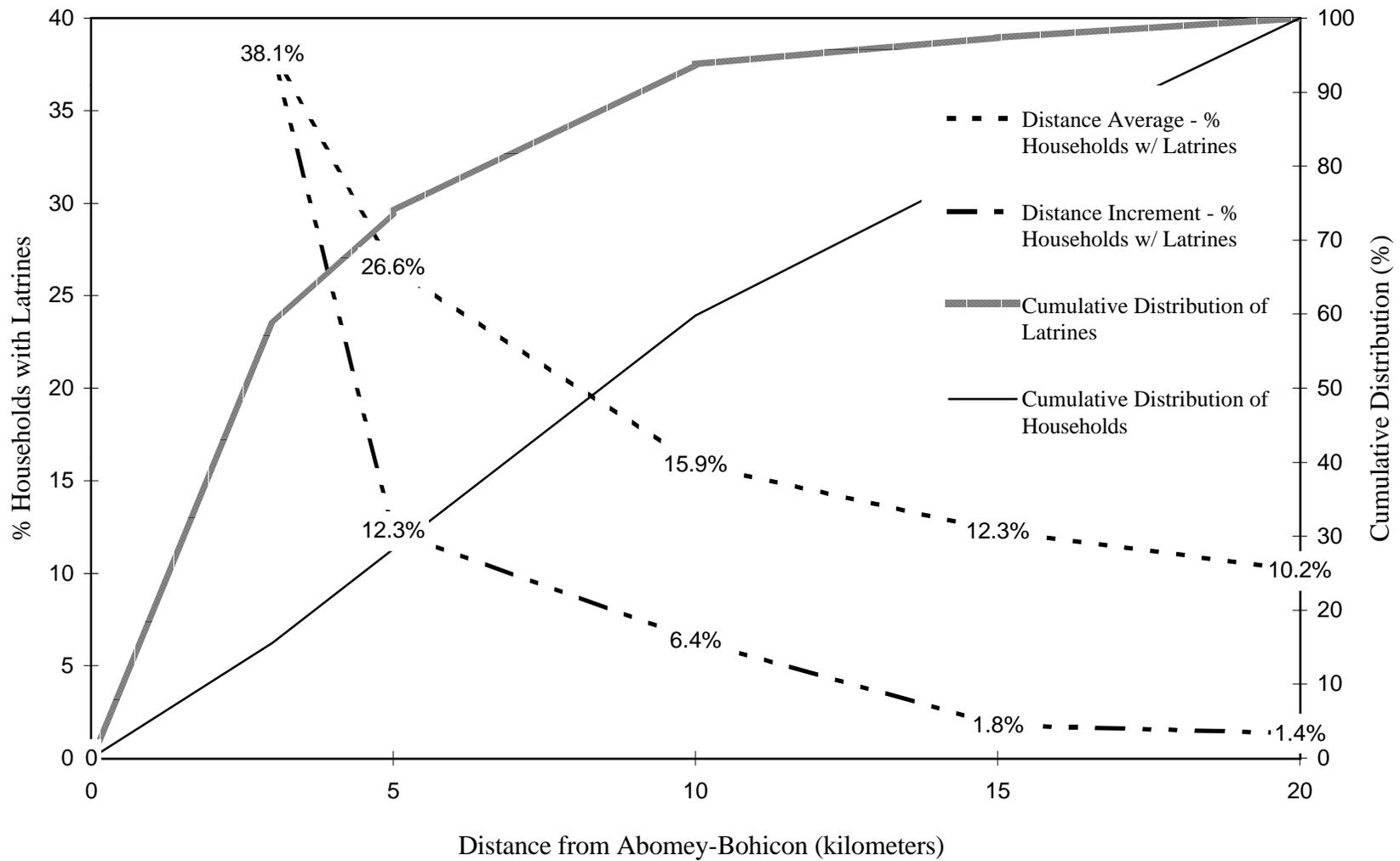


FIGURE 4-5. Latrine Adoption as a Function of Distance from Abomey or Bohicon, Benin, 1993

3.2 Spatially-based Variables

To include spatial characteristics of latrine exposure and the reduced availability of open defecation sites with increased village population density, the following spatial variables were created from the map of Benin and the data for each village using distance, buffer-area aggregation, and buffer-area location functions in GIS software:

- DISTA_B: shortest straight line distance to either Abomey or Bohicon;
- POPDEN2K: population located within a 1 kilometer radius of the village centroid (including the village's own population) divided by a 1 kilometer radius area to produce a proxy for within- village population density;
- POPDEN5K: population located within a 2.5 kilometer radius of the village centroid (including the village's own population) divided by a 2.5 kilometer radius area, to produce a proxy for surrounding-area population density;
- LATADP5K: number of other latrines, apart from those in the village, located within a 2.5 kilometer radius of the village centroid, divided by the number of other households in that same area to compute the surrounding area household latrine adoption rate;
- ONRD_2K: dummy variable for location within 2 kilometers of the nearest road (either paved or maintained dirt road); and
- OFFRD_5K: dummy variable for location beyond 5 kilometers from the nearest road (either paved or maintained dirt road).

For the two density measures (POPDEN2K and POPDEN5K) and for LATADP5K, households in a village are “located” at the village centroid. Thus, these measures are only approximations of the true values that would result from using the exact locations of

all households if these data were available. When no other villages are located within a village buffer, population density is simply a linear factor of size and LATADP5K is zero. This tends to happen more with POPDEN2K than with POPDEN5K.

4. VILLAGE FACTORS AND VARIABLES

From the merged ZVLAT4 database and GIS analysis, 20 village-level variables were constructed to explain arousal of drives and demand for latrines. Several of these are alternative indicators of the same condition or characteristic. Table 4-2 explains each variable, identifies the village condition or characteristic approximated, and indicates its principal type (village environment, lifestyle, or latrine exposure) and direction of hypothesized influence on drives motivating latrine adoption. This simple categorization of variable influence organizes the analysis but ignores the likelihood that some of the variables represent the influences of other types of latrine adoption factors, such as implementation-related and psycho-social constraints or facilitators of choice that operate once drives are aroused. Six variables at the end of Table 4-2, although more difficult to trace directly to particular hypothesized village environment, lifestyle, or latrine exposure factors of Chapter 3, are included for analysis. Table 4-3 lists four alternative definitions of the dependent variable for linear and logistic regression analysis. Explanations of these variables follow.

4.1 Village Environment (VE) Variables

The village environment variables in Table 4-2 indicate size, population density, social system homogeneity, and infrastructure development. Size (TOTPOP92) represents many village environment factors (increased socio-economic differentiation,

TABLE 4-2. Village Variables Hypothesized to Influence Household Latrine Adoption

Variable Name	Explanation	Indicated Characteristic or Condition	Type			Influence
			VE	L	LE	
TOTPOP92 ^a	population	village size	√			+
POPDEN2K ^b	population within 1 km radius of village divided by a 1 km radius area (p/km ²)	within village density (unavailability of defecation sites)	√			+
POPDEN5K ^b	population within 2.5 km radius of village divided by a 2.5 km radius area (p/km ²)	surrounding village density (unavailability of defecation sites)	√			+
NAGDUMMY ^a	population not engaged in agriculture is less than 5%	agriculturally homogenous (more traditional, socio-economically undifferentiated)	√			-
INFRSTM1 ^{c, d}	infrastructure index (0 to 7 points) ^e	level of infrastructure development	√			+
INFRGPS ^{c, d}	0=INFRSTM2 ^f is 0 or 1 1=INFRSTM2 is 2 or 3 2=INFRSTM2 is greater than 3	grouped levels of infrastructure (for logistic regression)	√			+
PRCNAGPOP ^a	fraction of population engaged in non-agricultural occupations	occupation lifestyle factor (favoring drives for latrines)		√		+
AGHHSIZE ^a	average agricultural household size	wealth lifestyle factor of agricultural households		√		+
NAGHHSIZE ^a	average non-agricultural household size	wealth lifestyle factor or less modern marriage/family size orientation		√		?
LATADP5K ^{a, b, c}	latrine adoption rate of households surrounding village within 2.5 km radius	localized opportunities for private latrine exposure			√	+
DISTA_B ^b	the shortest distance to the twin cities of Abomey and Bohicon (kms)	distance from urban center			√	-
TDSTA_B2 ^b	1/sq.rt.(DISTA_B)	proximity to urban center (transformed distance)			√	+
ONRD-2K ^b	within 2 kms of a paved road	road access, exposure			√	+
OFFRD-5K ^b	more than 5 kms from paved and dirt road	isolation			√	-

TABLE 4-2. Continued

Variable Name	Explanation	Indicated Characteristic or Condition	Type			Influence
			VE	L	LE	
URB_COMM ^a	located within an urban-designated commune	urbanization, development (electricity, transportation, markets, economic opportunities)	?	?	?	+
CHGHHIZE ^a	% deviation of non-agricultural households below all households in size	(see text) ?		?		?
SBEE_LOC ^c	number of neighborhoods with piped water	(see text) ?	?			+
SCHOOL93 ^c	primary school in the village	modern/change-oriented village		?	?	+
CLINIC93 ^c	clinic in the village	exposure to health messages about latrines and disease			?	+
POPGRWTH ^d	annual population growth rate from 1979-92, 1984-92 or 1988-92	(see text) ?	?	?		?

? Uncertain what type of factor or influence this variable represents for arousing drives for latrines

^a 1992 Census data or computed from it

^b Spatially computed using GIS (geographic information systems) data and software

^c 1993 National Guinea Worm Epidemiological Survey (EM93) data or computed from it

^d Water Ministry data or computed from it

^e Created by summing one point each for presence of primary school, secondary school, local market, regional market, clinic, handpump, and piped water in the village

^f Modifies INFRSTM1 by using Water Ministry data instead of EM93 data for clinic presence

lack of cohesion, economic development, land pressures, urbanizing social effects, and so on) that stimulate both prestige and well-being drives for latrines. Higher population density both within (POPDEN2K) and around (POPDEN5K) the village is expected to reduce availability of open defecation sites which directly or indirectly stimulates all five well-being drives for latrines. The rural traditional orientation, socio-economic homogeneity, and clan cohesion of agriculturally homogenous villages (NAGDUMMY=1) are thought to inhibit arousal of any drives for latrines. A higher level of village infrastructure (INFRSTM1) indicates more “modern” development and greater commercial and public sector activity. Environment factors (similar to those correlated with size), greater urban social and economic linkages, greater presence of strangers, visitors, and non-native residents, and so on, associated with this infrastructure are expected to stimulate prestige and several well-being drives for latrines. A rental market for housing with latrines created by temporary residents may catalyze early awareness and adoption of latrines in villages with greater infrastructure.

4.2 Lifestyle-related (L) Variables

With the available data, it was only possible to represent the occupation and household size as factors of lifestyle differences. The lifestyles of new skilled tradesmen, merchants, educated elite, and other non-agricultural occupations arouse greater prestige (to affiliate with the urban elite and to express new experiences and lifestyles) and well-being (to protect family health and safety and to increase comfort and convenience) drives for latrines than those of farmers. As the proportion of the population engaged in non-agricultural occupations (PRCNAGPOP) increases, drives and demand for latrines are expected to increase.

In general, household size is an indicator of wealth in rural Benin. This is particularly true for agricultural households where control of labor is key to increased production. Wealth is hypothesized to stimulate prestige and two well-being drives for latrines. Furthermore, individuals with greater wealth are less likely to perceive cost of latrines as a constraint. Thus, villages whose agricultural households are larger on average (AGHHSIZE) are expected to have greater drives and demand for latrines. These larger agricultural households may also have greater demand for latrines from aroused well-being drives, especially for cleanliness and health and safety, caused by more people placing defecation demands on land near the household (see Chapter 3, section 4.2).

Size of non-agricultural households (NAGHHSIZE) is more confusing. On average, they are smaller than agricultural ones (see Table 4-4) because they may have less economic incentive for more members or desire smaller families with fewer children. Larger non-agricultural households may have a greater financial burden to support the domestic and educational costs of extended family members. Very large non-agricultural households may indicate mixed-occupations engaged in some agriculture or the effects of more traditional views about family size and planning. Very small ones may indicate disenfranchisement (non-agricultural activities are pursued because the household lacks land, labor, or good health to do agricultural work) or very “modern” lifestyles (individualistic and financially oriented households) that refuse to take on extended family members and choose to have very small families. These varied explanations leave ambiguous the influence of non-agricultural household size on drives for latrines.

4.3 Latrine Exposure (LE) Variables

These variables indicate three spatial characteristics that influence opportunities for latrine exposure and information contacts with adopters. One is direct distance from (or proximity to) Abomey or Bohicon, the informational epicenter (so-to-speak) of latrine diffusion (DISTA_B or TDSTA_B2). Another is location within two kilometers (or beyond five kilometers) of a major road, representing road accessibility (or isolation) and favoring (or restricting) mobility and travel, information flow, and interpersonal contacts with outsiders (ONRD_2K or OFFRD_5K). The demarcation points of two and five kilometers were selected based on the quality and the structure of the geographic data for villages and roads. In some cases, village coordinates had been measured from maps with much less accuracy than those measured by GPS (geo-positioning satellite). The third variable indicates local opportunities for exposure to private latrines within the nearby surrounding area (LATADP5K). All three conditions are expected to increase awareness and understanding of the drive-satisfying aspects of latrines.

4.4 Other Independent Variables

Six other variables, not directly traceable to factors presented in section 2, have been constructed to explore their relationship to latrine adoption. Urban communes have a local urban center, access to electricity and piped water, and other modern infrastructure and services not available in rural communes. Many environment, lifestyle, and latrine exposure factors that stimulate desires for latrines are probably correlated with village location in a urban-designated commune (URB_COMM).

Household access to piped-water frequently correlates strongly with adoption of better hygiene behaviors and improved sanitation (Cairncross 1990; Curtis et al. 1995).

Explanations for this correlation include the theory that piped-water makes a whole set of hygiene behaviors possible and raises the social standards of cleanliness, and that piped water is actually an indicator of wealth and thus, associated with the same status and lifestyle-related desires for improved sanitation. A decision to install piped water or use it in Benin (piped connections and water are fully user-financed) may be motivated by some of the same prestige and well-being drives as latrine adoption but probably precedes the decision to install a latrine because it satisfies these drives better than a latrine. Each of these explanations would cause more neighborhoods with piped water (SBEE_LOC) to increase drives and demand for latrine adoption in a village.

A greater percentage reduction in average size of non-agricultural households from average household size (CHGHHSIZE) means there are few non-agricultural households in the village whose average size is relatively small. This may indicate a small group of households with either greater poverty (disenfranchisement) or very modern, individualistic lifestyles as discussed above. A negative effect on adoption would occur for the first interpretation and a positive one for the second where these lifestyle characteristics would be associated with a propensity to innovate against traditional social norms.

High annual population growth rates (POPGRWTH) may be a sign of economic vigor and rapid development or the effect of traditional lifestyles where polygamy and having many children are valued. Higher growth rates would tend to be associated with more demand for latrines in the first interpretation and less in the second.

The presence of a school or clinic in the village (SCHOOL93=1 or CLINIC93=1) might increase knowledge about infectious diseases and the health benefits of latrines for

their prevention. These infrastructure elements, especially schools, might also indicate the presence of more dynamic, cosmopolitan, and change-oriented village leaders (who are able to get and maintain these services) that favor innovation in their village. In either case, presence of a school or clinic should be associated with greater latrine adoption.

4.5 Dependent Variables

Different forms of the dependent variable measuring village-level latrine adoption are proposed in Table 4-3. The percentage of households with installed latrines (PRC_LATS), computed from the EM93 latrine data and 1992 census households, provides a straightforward continuous dependent variable for linear regression, but one that is truncated at zero and one. Such truncation causes interpretation difficulties (predicted y-values outside the zero-one range) and violates the normality assumption. However, the Pearson correlation between the number of EM93 households (presumably for which latrines were counted) and the number of 1992 census households is only 0.368. For many villages, these two data diverge greatly, causing uncertainty about the percentage of households with latrines. The natural log of the number of latrines (LNLATRS) avoids having to pick a denominator to compute household adoption rates and transforms the non-zero dependent data into a more normal distribution. As will be seen in the section 5, residuals from LNLATRS regression models are normally distributed in contrast to those from PRC_LATS regression models. The value one is added to the number of latrines before taking the log to handle villages with no latrines.

Two dichotomous dependent variables are proposed in Table 4-3 to examine threshold-related questions about village latrine adoption. For example, what factors distinguish villages without any latrines from those with latrines, or those with many

latrines from those with few or none, and are these sets of factors different. Grouping villages by order-of-magnitude differences in adoption levels may be more appropriate than using continuous data given the suspected weak accuracy of the EM93 latrine adoption data. Grouped outcomes can be modeled with logistic regression to capture threshold effects or non-linear relationships with independent variables (Hosmer and Lemeshow 1989). LAT1 separates villages with no adoption (no latrines) from those with adoption (one or more latrines) to focus on conditions that explain the presence of adoption in a village. LAT3 separates villages with more than ten latrines from those with ten or fewer to focus on conditions that explain the presence of strong demand in a village. In a conceptual sense, logistic regression models of LAT1 and LAT3 should produce snapshots of village conditions at two different stages in the latrine diffusion process as these conditions change over time. The former model (LAT1) would capture the controlling effects of exogenous factors on the initial introduction of latrines into a village. The latter model (LAT3) would capture the acceleration or “take-off” of adoption within a village where endogenous factors might be controlling (Rogers 1983).

TABLE 4-3. Dependent Variables^a Measuring Village Latrine Adoption Rates for Regression Analysis

Variable	Explanation	Computation	Regression Type
PRC_LATS	percentage of households with installed latrines in a village	$100 * (\text{latrines} / \text{households in 1992})$	linear
LNLATRS	natural log of the number of installed latrines plus one in a village	$\text{Ln}(\text{latrines} + 1)$	linear
LAT1	indicates initiation of latrine adoption in a village	LAT1=1 if latrines>0 else LAT1=0	logistic
LAT3	indicates strong demand for latrines in a village	LAT3=1 if latrines>10 else LAT3=0	logistic

^a Computed from EM93 latrine installation data

4.6 Descriptive Statistics

Descriptive statistics for the full set of 502 villages and three other subsets are given in Table 4-4. Data screening of values more than three standard deviations from the mean revealed 63 outliers in the full data set having one or more of the following characteristics:

- $PRC_LATS > 50\%$
- $LATRINES > 125$
- $PRCNAGPOP > 70\%$
- $TOTPOP92 > 4000$
- $POPGRWTH > 0.27$ or < -0.2
- $POPDEN2K > 2865$ per km²
- $PRCNAGPOP > 50\%$ and $PRC_LATS < 2\%$, and
- $LATRINES > 100$ and $PRC_LATS < 1\%$.

Many of these outlier villages are actually urban neighborhoods located on the fringes of Bohicon, Abomey, and Cove (another large urban center to the east of Bohicon). A subset of 439 villages was created by removing the outliers. Two other subsets of 272 and 153 villages were created to improve the accuracy of the dependent variable data by removing villages where the number of households in the EM93 data deviated from the number in the 1992 census data by more than 35% and 20% respectively. These subsets contain 27 and 15, respectively, of the original 63 outliers and have Pearson correlation coefficients for the EM93 and census household data of 0.93 and 0.98 respectively (see the last row of Table 4-4).

TABLE 4-4. Descriptive Statistics of Dependent and Independent Village-level Variables

Data Set N Variable	<u>Full set of Villages</u>				<u>Outliers Removed</u>				<u>Household Data Deviation</u> <u>< 35%</u>				<u>Household Data Deviation</u> <u>< 20%</u>			
	Mean	Min.	Max.	SD	Mean	Min.	Max.	SD	Mean	Min.	Max.	SD	Mean	Min.	Max.	SD
AGHHSIZE	6.05	2.20	11.31	1.28	5.98	2.20	11.31	1.27	5.98	2.93	10.84	1.31	5.98	2.93	10.84	1.33
CHGHHSIZE(%)	29.23	-269.8	98.1	27.60	32.01	-68.6	84.9	22.99	28.86	-269.8	84.9	30.77	28.52	-269.8	84.9	36.61
CLINIC93	0.36	0.	1	0.48	0.36	0.	1	0.48	0.34	0	1	0.48	0.32	0	1	0.47
DISTA_B(km)	56.72	0.47	186.4	47.23	56.48	2.18	184.9	47.11	55.69	1.32	186.4	48.16	54.98	1.70	55.0	46.65
INFRSTM1	1.86	0	7	1.28	1.80	0	6	1.25	1.84	0	6	1.28	1.74	0	6	1.19
INFRGPS	0.75	0	2	0.66	0.73	0	2	0.66	0.76	0	2	0.68	0.71	0	2	0.65
LATADP5K	0.034	0	0.821	0.058	0.031	0	0.821	0.058	0.029	0	0.228	0.040	0.027	0	0.228	0.040
LAT1	0.61	0	1	0.49	0.58	0	1	0.49	0.61	0	1	0.49	0.60	0	1	0.49
LAT3	0.24	0	1	0.43	0.19	0	1	0.39	0.24	0	1	0.42	0.19	0	1	0.39
LATRINES	13.2	0	374	37.1	7.4	0	125	15.1	12.6	0	374	40.3	10.5	0	337	34.0
LNLATRS	1.426	0	5.927	1.431	1.244	0	4.836	1.269	1.380	0	5.927	1.399	1.278	0	5.823	1.336
NAGDUMMY	0.32	0	1	0.47	0.35	0	1	0.48	0.32	0	1	0.47	0.39	0	1	0.49
NAGHHSIZE	3.80	0	23	1.85	3.62	0	9	1.52	3.85	0	23	1.95	3.92	0	23	2.33
URB_COMM	0.21	0	1	0.41	0.15	0	1	0.36	0.18	0	1	0.38	0.20	0	1	0.40
OFFRD-5K	0.16	0	1	0.37	0.18	0	1	0.38	0.16	0	1	0.37	0.17	0	1	0.38
ONRD-2K	0.63	0	1	0.48	0.60	0	1	0.49	0.62	0	1	0.49	0.59	0	1	0.49
POPDEN2K(p/km2)	817.5	26.7	8363	974.1	650.4	26.7	4717	628.3	800.4	41.1	6090	974.0	704.5	41.1	4717	860.1
POPDEN5K	310.0	4.3	2291	357.1	244.6	4.3	1447	246.7	300.6	7.6	2291	361.6	266.6	7.6	2078	308.9
POPGRWTH	.033	-0.313	0.466	0.076	0.028	-0.178	0.381	0.062	0.030	-0.313	0.379	0.073	0.025	-0.313	0.379	0.072
PRCNAGPOP	0.170	0	0.925	0.201	0.130	0	0.668	0.137	0.165	0	0.925	0.186	0.144	0	0.832	0.164
PRC_LATS (%)	4.8	0	95.8	9.72	3.6	0	41.7	6.41	4.5	0	71.4	8.36	3.9	0	49.1	7.67
SBEE_LOC	0.32	0	11	0.92	0.21	0	8	0.69	0.27	0	11	0.92	0.22	0	5	0.68
SCHOOL93	0.66	0	1	0.48	0.65	0	1	0.48	0.64	0	1	0.48	0.63	0	1	0.49
TDSTA_B2	0.212	0.073	1.456	0.156	0.198	0.074	0.677	0.117	0.216	0.073	0.869	0.148	0.210	0.073	0.767	0.136
TOTPOP92	1209	84	9050	933.7	1089	84	3720	647.2	1114	129	4995	698.4	1066	129	3779	678.5
Pearson's Correlation for household data	0.368				0.448				0.929				0.984			

There is a significant amount of collinearity among the twenty independent variables in Table 4-2. Not unexpectedly, Pearson correlation coefficient values over 0.70 occurred positively for POPDEN2K with POPDEN5K, INFRGPS with INFRSTM1, and AGHHSIZE with average household size, and negatively for DISTA_B with TDSTA_B2 and NAGHHSIZE with CHGHHSIZE in all sets of data except the 439 subset. Pearson correlation coefficient values between 0.50 and 0.70 occurred positively for POPDEN5K with PRCNAGPOP, PRCNAGPOP with TDSTA_B2, INFRGPS with SCHOOL93 and CLINIC93, and INFRSTM1 with SCHOOL93, and negatively for PRCNAGPOP with NAGDUMMY for all sets except the 439 subset. Removing all outliers in the 439 subset reduced the overall level of correlation so that only AGHHSIZE with average household size and DISTA_B with TDSTA_B2 had values over 0.70. POPDEN5K, PRCNAGPOP, and TOTPOP92 had correlation coefficient values greater than or equal to 0.30 with seven or more variables in the 502, 272, and 153 data sets. While the 439 data set had the least correlation among variables (33 pairs over +/-0.30), the 153 set had the greatest (44 pairs over +/-0.30), followed by the 272 data set (43 pairs over +/-0.30) and the 502 data set (39 pairs over +/-0.30).

By some standards, the quality and accuracy of these data may not appear particularly good for quantitative modeling and analysis. Nonetheless, given the lack of data in developing countries, particularly in Africa, obtaining secondary data at no cost, even of suspect quality, for analysis such as this is fortunate. The following regression models show that it is still possible to obtain meaningful and important results from such data.

5. REGRESSION RESULTS

Given collinearity among the independent variables, a stepwise forward method was chosen as the most appropriate approach to identify significant variables for developing regression models of the dependent variables. All variables in Table 4-2, excluding DISTA_B and either INFRSTM1 (for logistic) or INFRGPS (for linear), were considered in developing each regression model. In a stepwise forward method of model development, variables are successively entered into or removed from a model starting with the one making the largest contribution towards explaining variation in the dependent variable (largest improvement in R^2 or log likelihood). The process stops when no more variables meet the enter/remove significance limits, set in this case at $p_{in} = 0.15$ and $p_{out} = 0.20$.

Linear regression models of the percentage of households with installed latrines in a village (PRC_LATS) are reported in Table 4-5. Those of the natural log of the number of latrines in a village, increased by one (LNLATRS), are reported in Table 4-6. Models have been estimated and presented for each of the four sets of data. Logistic regression models of villages with adoption initiated (LAT1) and villages with strong demand (LAT3) were estimated for all four data sets but only those for the 502 and 272 data sets are reported in Table 4-7. In these tables, a variable with no reported coefficient means it did not meet the stepwise significance limits for inclusion into the model.

5.1 Models of PRC_LATS

PRC_LATS Model 3 (for the 272 data set) has the best adjusted R^2 at 0.57. Given data quality problems and omission of other factors that might explain adoption behavior, the goodness-of-fit is quite good. Several lifestyle factors of drive arousal and other types

of factors (constraints and facilitators) hypothesized to influence adoption behavior are not represented by the variables tested here. The significant drive-arousing variables in Model 3 include two village environment conditions (surrounding area population density and infrastructure development), two lifestyle factors (non-agricultural occupations and agricultural household wealth), and two latrine awareness factors (local opportunities for exposure to private latrines and proximity to Abomey-Bohicon). All of these variables appear in at least two of the other models while three of them (POPDEN5K, LATADP5K, and TDSTA_B2) are included in all four models. POPDEN5K was entered first in all but Model 2 where PRCNAGPOP was first.

The coefficient signs of significant variables in all PRC_LATS models are consistent with their hypothesized influence on latrine adoption except for TOTPOP92. TOTPOP92 has a negative sign only in PRC_LATS models (compare Tables 4-5, 4-6, and 4-7). TOTPOP92 is the product of average household size and number of households. The latter number is already represented in the dependent variable through its denominator. Thus, a negative sign on TOTPOP92 may actually represent a negative influence of larger average household size. Alternately, it may indicate a negative second order effect (second derivative) of village size on adoption. A concave non-linear relationship between amount of adoption and size is reasonable, especially in the very early stage of latrine diffusion occurring in rural Benin. A negative influence of average household size, given the positive influence of AGHHSIZE in three of the PRC_LATS models, would mean an even more negative influence of non-agricultural household size on adoption. It would follow from this that larger non-agricultural household size indicates less “modern” or more traditionally oriented lifestyles and not wealth.

The negative sign on POPGRWTH in Model 2 of Table 4-5 suggests that high growth rates reflect a combination of greater polygamy and high birth rates associated with traditional rural lifestyles rather than immigration attracted by a village's economic

TABLE 4-5. Linear Regression Models^a of Percentage of Households with Installed Latrine (PRC_LATS) in Villages of Zou Department, Benin, 1993

Model	1		2		3		4	
Data Set	Full set of Villages		Outliers Removed		Household Data Deviation < 35%		Household Data Deviation < 20%	
N	502		439		272 ^b		153 ^c	
Variables	coefficient ^d	t-stat.	Coefficient	t-stat.	coefficient	t-stat.	coefficient	t-stat.
Constant	-8.533	-3.984	-6.205	-3.846	-8.395	-4.231	-2.900	-3.001
TOTPOP92	-0.00280	-5.688	-0.00165	-3.301	-0.00161	-2.696		
POPDEN2K			0.00153	2.230			0.00203	2.018
POPDEN5K	0.00883	6.025	0.00383	2.325	0.00816	5.937	0.00574	1.867
NAGDUMMY								
INFRSTM1	1.581	4.796	0.440	1.879	0.589	1.863		
PRCNAGPOP	6.223	2.255	11.768	5.162	10.081	3.529		
AGHHSIZE	1.134	3.680	.0843	3.946	0.965	3.382		
NAGHHSIZE								
LATADP5K	17.50	2.548	18.64	4.133	35.30	3.289	47.02	3.290
TDSTA_B2	10.833	3.279	8.168	2.880	12.395	3.662	12.046	2.695
ONRD-2K								
OFFRD-5K								
URB_COMM			1.076	1.484				
CHGHHSIZE								
SBEE_LOC	0.768	1.719	0.659	1.718				
SCHOOL93								
CLINIC93								
POPGRWTH			-8.454	-1.969				
Adjusted R ²	0.317		0.387		0.570		0.476	
SE of the Estimate	8.03%		5.02%		5.48%		5.55%	

^a Variables entered using stepwise method with $p_{in}=0.15$ and $p_{out}=0.20$

^b 27 outliers remaining

^c 15 outliers remaining

^d Blank means variable was excluded from the model as insignificant

vitality. POPGRWTH correlates most strongly in all four sets of data with size of agricultural households (Pearson coefficient of 0.19 to 0.25), size of all households (0.20 to 0.28), and TOTPOP92 (0.26 to 0.39).

Figure 4-6 plots the standardized residuals (the difference between the observed and predicted values for each village expressed in standard deviations from the mean value) against the standardized predicted values of PRC_LATS for regression Model 3. Positive residuals are larger and tend to increase for larger predicted values suggesting that latrine adoption may be an increasing non-linear function of some of the independent variables. A negative binomial or exponential function was suggested by the histogram of the latrine adoption data (see Figure 4-2).

5.2 LNLATRS Model Results

Removing the influence of TOTPOP92 from the dependent variable and allowing the independent variables to have an exponential effect on latrine adoption causes several other variables to become significant and improves the goodness-of-fit for all LNLATRS regression models reported in Table 4-6. The coefficient signs of all variables, including TOTPOP92, are consistent with their hypothesized influence on drive arousal and demand for latrines. The negative effect of NAGHHSIZE in Model 1 and the positive effect of CHGHHSIZE in Model 2 agree and support the interpretation that smaller non-agricultural households have a greater desire for latrines because their small size represents modern lifestyle choices more conducive to arousing drives for latrines.

TOTPOP92, POPDEN5K, PRCNAGPOP, and LATADP5K are significant in all four LNLATRS models. INFRSTM1, SBEE_LOC, and distance from the nearest road (represented by either of the strongly correlated variables ONRD_2K or OFFRD_5K) are significant in three of the four models. PRCNAGPOP was entered first in Models 1, 2, and 3. POPDEN5K was entered first in Model 4. Compared to Model 3 of PRC_LATS, LNLATRS Model 3's significant variables represent arousal of drives for latrines by three

FIGURE 4-6. Standardized Residuals from Linear Regression Model 3 of the Village Percentage of Households with Installed Latrines

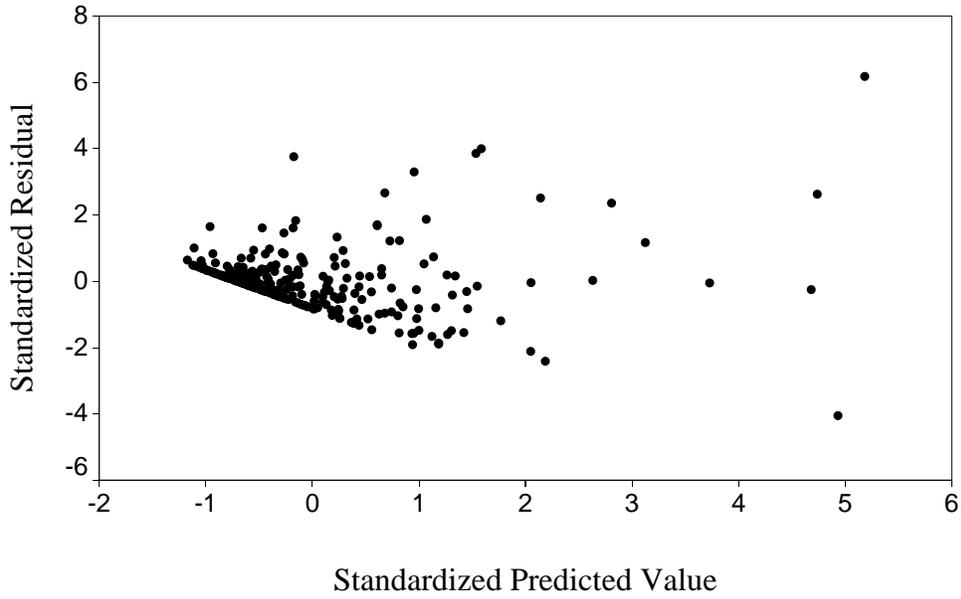


FIGURE 4-7. Standardized Residuals from Linear Regression Model 3 of the Natural Log of the Number of Latrines in a Village

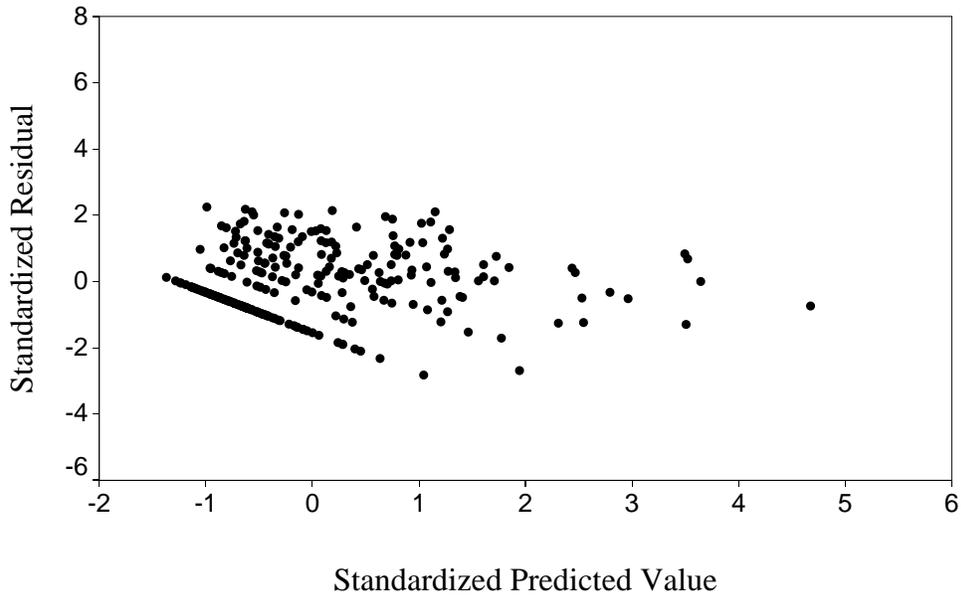


TABLE 4-6. Linear Regression Models^a of the Natural Log of the Number of Installed Latrine (LNLATRS) in Villages of Zou Department, Benin, 1993

Model	1		2		3		4	
Data Set	<u>Full set of Villages</u>		<u>Outliers Removed</u>		<u>Household Data Deviation < 35%</u>		<u>Household Data Deviation < 20%</u>	
N	502		439		272 ^b		153 ^c	
Variables	coefficient ^d	t-stat.	coefficient	t-stat.	coefficient	t-stat.	coefficient	t-stat.
Constant	0.293	1.920	-0.017	-0.119	-0.153	-1.217	-0.018	-0.119
TOTPOP92	0.0000998	1.690	0.000333	3.735	0.000253	2.627	0.000322	2.613
POPDEN2K			0.000168	1.579				
POPDEN5K	0.000997	5.489	0.000803	3.006	0.000564	2.496	0.000917	2.983
NAGDUMMY	-0.359	-3.159	-0.326	-2.881				
INFRSTM1	0.103	2.324			0.140	2.907	0.167	2.625
PRCNAGPOP	1.602	4.783	2.642	5.936	2.079	4.868	1.545	2.698
AGHHSIZE								
NAGHHSIZE	-0.039	-1.544						
LATADP5K	4.535	5.433	4.182	5.155	10.041	5.782	10.682	4.784
TDSTA_B2								
ONRD-2K	0.181	1.822			0.260	2.139		
OFFRD-5K							-0.574	-3.004
URB_COMM								
CHGHHSIZE			0.00312	1.519				
SBEE_LOC	0.153	2.820	0.178	1.519	0.122	1.783		
SCHOOL93	0.276	2.409	0.275	2.726				
CLINIC93								
POPGRWTH			-2.884	-3.802				
Adjusted R ²	0.535		0.495		0.595		0.601	
SE of the Estimate	0.976		0.902		0.891		0.844	

^a Variables entered using stepwise method with $p_{in}=0.15$ and $p_{out}=0.20$
^b 27 outliers remaining
^c 15 outliers remaining
^d Blank means variable was excluded from the model as insignificant

village environment conditions (size, surrounding area population density, and infrastructure development), one lifestyle characteristic (non-agricultural occupations), two latrine awareness factors (local opportunities for private latrine exposure and road proximity), and availability of piped water, a variable of uncertain type. The only variable not significant in any model of either PRC_LATS or LNLATRS was CLINIC93 (presence of a clinic in the village). Standardized residuals from predicted values of LNLATRS in Model 3 are plotted in Figure 4-7. Normality plots support the choice of an

exponential function for modeling the non-linear relationship between independent variables and latrine adoption.

5.3 Logistic Regression Model Results

The outcome of a logistic regression model is the probability of group membership. A measure of the goodness-of-fit (i.e., the proportion of information in the data explained by the model) is given by:

$$\rho^2 = 1 - (L(\beta)/L(0)) \quad (1)$$

where $L(0)$ and $L(\beta)$ are the value of the log likelihood at zero and at convergence, respectively (Ben-Akiva and Lerman 1985; Hosmer and Lemeshow 1989). The improvement in fit over a model having only a constant term, with an adjustment for the degrees of freedom (df) taken up by the model variables is suggested as follows:

$$\rho^2(\beta/c) = 1 - ((L(\beta) - df)/L(c)) \quad (2)$$

where $L(c)$ is the value of the log likelihood at convergence with only a constant term used to predict the probability of group membership. Another indication of fit is the percent of predicted outcomes that are correct, based on a cutoff value for probability. An arbitrary value of 0.5 is usually used. In situations where one of the observed groups is large, a simple constant-term only model will correctly predict all cases in the large group. Thus, models with a constant term will tend to show a relatively high correct prediction, independent of their actual fit. This is seen in Models 1 and 2 of LAT3 in Table 4-7 where the percent correct for a constant-only model (equivalent to the proportion of LAT3=0 cases) is 76% and 81% respectively. The percent correct and ρ^2 with no constant (based on the log likelihood at convergence of a model with the same

variables re-estimated with no constant term) indicate the real explanatory power of the variables in these models.

TABLE 4-7. Logistic Regression Models^a of Villages with Latrines (LAT1) and Villages with More Than 10 Latrines (LAT3) in Zou Department, Benin, 1993

Model	1 of LAT1		3 of LAT1		1 of LAT3		3 of LAT3	
Data Set	Full set of Villages		Household Data		Full set of Villages		Household Data	
N	502 ^b		272 ^c		502 ^b		272 ^c	
Variables	coefficient ^d	sig. ^e	coefficient	sig.	coefficient	sig.	coefficient	sig.
Constant	-1.345	.0003	-0.812	.0355	-5.116	.0000	-6.5988	.0000
TOTPOP92	0.0005	.0331	0.0005	.1001	0.0006	.0119	0.0006	.0867
POPDEN2K								
POPDEN5K	0.0009	.1977			0.0026	.0000	0.0021	.0074
NAGDUMMY	-0.7764	.0064	-0.8679	.0089	-1.1715	.0525		
INFRGPS (1)					0.9717	.0106	1.5255	.0062
INFRGPS (2)					1.8221	.0003	2.3866	.0010
PRCNAGPOP	2.6567	.0350			2.671	.0064	3.2065	.0331
AGHHSIZE								
NAGHHSIZE								
LATADP5K	20.981	.0000	49.27	.0000	5.9835	.0029	10.1319	.0842
TDSTA_B2					3.2635	.0923	4.9261	.0099
ONRD-2K							1.1271	.0456
OFFRD-5K	-0.6096	.0547	-1.010	.0267				
URB_COMM								
CHGHHSIZE	0.0083	.0872					-0.0086	.1589
SBEE_LOC					0.3441	.0806		
SCHOOL93	0.6883	.0080	0.5858	.1010				
CLINIC93								
POPGRWTH	-3.5487	.0288						
% correct:	61.2%		61.0%		76.1%		75.5%	
constant only								
% correct: β	76.5%		77.6%		87.9%		87.1%	
$L(0)$	-348.0		-188.5		-348.0		-188.5	
$L(c)$	-335.4		-181.9		-276.1		-148.4	
$L(\beta)$	-239.6		-124.2		-151.9		-82.0	
ρ^2	0.311		0.341		0.564		0.565	
adj. ρ^2 (β/c)	0.259		0.290		0.417		0.387	
% correct:	75.5%		75.4%		72.1%		80.9%	
β with no constant								
ρ^2 (no constant)	0.291		0.329		0.274		0.360	

^a Variables entered using the stepwise forward likelihood ratio method in SPSS with $p_{in}=0.15$ and $p_{out}=0.20$

^b 63 outliers included, 307 villages with one or more latrines installed, 120 villages with more than ten latrines

^c 27 outliers remaining, 166 villages with one or more latrines installed, 64 villages with more than ten latrines

^d Blank variables excluded due to insignificant contribution within the limits of in the stepwise method

^e Significance of the Wald statistic

As is commonly the case, the ρ^2 values of the LAT1 and LAT3 logistic regression models in Table 4-7 are lower than the R^2 values of the linear regression models (Tables 4-5 and 4-6) (Ben-Akiva and Lerman 1985). The independent variables appear to do a better job distinguishing villages with strong demand from those with weak demand than they do distinguishing villages with adoption from those with none, even when adjusting for the contribution of the constant term (i.e., comparing adjusted ρ^2 (β/c) values). All significant variables in Table 4-7 influence latrine adoption in the direction consistent with hypotheses about their arousal of drives.

In both LAT1 models predicting the presence of latrines in a village, the significant variables are TOTPOP92, NAGDUMMY, LATADP5K, OFFRD_5K, and SCHOOL93. Of these, only LATADP5K, SCHOOL93, and distance to the nearest road (represented by either ONRD_2K or OFFRD_5K) were significant for all four data sets. The significance of school for predicting the presence of at least one latrine in a village might be an artifact of a latrine at the school director's house (often built by the state). In many small villages, the director's house is the only one with a latrine. Putting the influence of schools aside, LATADP5K and distance to nearest road suggest that latrine awareness is the most important condition explaining the initiation of adoption in a village. LATADP5K was entered first or second in all four data set models of LAT1.

In both LAT3 models, the significant variables that predict strong demand for latrines are TOTPOP92, POPDEN5K, INFRGPS, PRCNAGPOP, LATADP5K, and TDSTA_B2. Of these, only POPDEN5K, INFRGPS, PRCNAGPOP, and LATADP5K were significant for all four data sets. PRCNAGPOP was entered first in three of the four data set models while POPDEN5K was entered second or third in all four. INFRGPS

level 1 and 2 were entered third or fourth and fourth or fifth in all four data sets. These consistently significant variables suggest that strong demand develops when village environment and lifestyle factors that arouse drives for latrines are increasingly present in a village, once sufficient awareness has occurred. LATADP5K in LAT3 models may actually represent the increasing presence of implementation-related facilitators of adoption. Differences between the models of LAT1 and LAT3 make sense in the context of the proposed hypotheses about arousal of drives as a necessary condition for demand to be present and support theory that exogenous factors control the start of adoption in a village while endogenous ones determine its rate and level of penetration.

The reversal in sign of the coefficients of CHGHHSIZE and POPGRWTH from LAT1 to LAT3 models makes interpretation of their meaning for drive arousal and demand rather ambiguous. In LAT1 models, the innovative aspect of much smaller non-agricultural households relative to their agricultural neighbors associated with large CHGHHSIZE may explain the initiation of adoption in small villages with few non-agricultural households. On the other hand, in LAT3 models, the very small percentage of non-agricultural households and small village size correlated with large CHGHHSIZE may explain its negative effect on strong demand. Four variables, CLINIC93, AGHHSIZE, NAGHHSIZE, and URB_COMM, were insignificant in all four data set models of LAT1 and LAT3.

6. DISCUSSION

This section estimates the quantitative effects of village conditions on latrine adoption from the regression models presented in the previous section and discusses their implications for latrine marketing strategies. Table 4-8 reports the marginal effects of

village conditions on latrine adoption estimated from coefficients (b 's) in Model 3 of PRC_LATS and of LNLATRS. The marginal impact on the percentage of households adopting latrines is given by:

$$\Delta y = y_2 - y_1 = b_i \Delta x_i \quad (3)$$

where Δy is the increase in percentage points caused by an increase in village condition x_i of amount Δx_i . The marginal impact on the number of installed latrines (plus one) is given by the multiplier ratio:

$$y_2/y_1 = \exp(b_i \Delta x_i) \quad (4)$$

which is derived from the following linear regression equation of LNLATRS:

$$\ln(y_1) = b_0 + b_1 x_1 + b_2 x_2 + \dots + b_i x_i + \dots + b_k x_k \quad (5)$$

where y is the number of latrines plus one.

Table 4-9 reports the marginal effects of village conditions on the likelihood or probability of adoption occurring in a village and of a village having strong demand based on the marginal or adjusted odds ratio calculated from the estimated coefficients (β 's) in Model 3 of LAT1 and of LAT3. The marginal odds ratio expresses how much more likely or more frequently the outcome occurs among villages when the condition increases by the specified amount than among villages without the increase. It is a measure of increased or decreased relative risk of the outcome for the change in condition. The marginal odds ratio Ψ , for an increase in village condition x_i of amount Δx_i , is given by:

$$\Psi(\Delta x_i) = \exp(\Delta x_i \beta_i) \quad (6)$$

with the endpoints of the $100(1-\alpha)\%$ confidence interval given by:

$$\exp[\Delta x_i \beta_i \pm z_{1-\alpha/2} \Delta x_i SE(\beta_i)] \quad (7)$$

where SE is the standard error and $z_{1-\alpha/2}$ is the z-score (Hosmer and Lemeshow 1989).

When independent continuous or interval variables are modeled linearly, as they have been for all variables except TDSTA_B2 and INFRGPS in the logistic regression models, the increased risk or frequency of outcome for a specified change in the condition is independent of the base level of that condition. This may be unrealistic for some village conditions, as already discussed for size.

TABLE 4-8. Impacts of Village Conditions on Village Latrine Adoption Levels

Village Condition	Marginal Increase in Condition	Marginal Impact	95% C.I. for Impact		Equivalent Marginal Impact (average Increase in:)	
			Lower Limit	Upper Limit	adoption rate ^b	number of latrines ^c
<u>PRC_LATS Model 3</u>						
		$\Delta\%$ hholds w/ latrines ^a				
TOTPOP92	500 persons	-0.81	-1.40	-0.22	-18.0%	-1.7
POPDEN5K	100 p/km2	0.82	0.55	1.09	18.2%	1.7
INFRSTM1	2 index points	1.18	-0.07	2.42	26.3%	2.4
PRCNAGPOP	0.05 rate points	0.50	0.22	0.79	11.3%	1.0
LATADP5K	0.01 rate points	0.35	0.14	0.56	7.9%	0.7
AGHHSIZE	1 person	0.96	0.40	1.53	21.6%	2.0
TDSTA_B2	0.1 (sq.rt.(km)) ⁻¹	1.24	0.57	1.91	27.7%	2.6
<u>LNLATRS Model 3</u>						
		multiplier on latrines ^d			adoption rate ^e	number of latrines ^f
TOTPOP92	500 persons	1.135	1.032	1.244	13.5%	1.7
POPDEN5K	100 p/km2	1.058	1.012	1.106	5.8%	0.7
INFRSTM1	2 index points	1.323	1.094	1.600	32.2%	4.1
PRCNAGPOP	0.05 rate points	1.110	1.064	1.157	11.0%	1.4
LATADP5K	0.01 rate points	1.106	1.068	1.144	10.6%	1.3
ONRD-2K	0 to 1	1.297	1.021	1.647	29.7%	3.8
SBEE_LOC	1 neighborhood	1.130	0.987	1.293	13.0%	1.6

^a See equation 3
^b Calculated for the average household latrine adoption rate of 4.47% for this data set (see Table 4-4)
^c Calculated for the average size village of 206 households
^d See equation 4
^e The adoption rate ratio equals the latrine ratio which is nearly equal to the multiplier on latrines (plus one)
^f Calculated for the average village with 12.6 household latrines

6.1 Impacts of Village Conditions on Village Latrine Adoption Levels

The marginal impacts in Table 4-8 have been converted to an equivalent percent increase in the household adoption rate (at the average rate of adoption for Model 3's data

set) and equivalent number of additional households adopting a latrine (for the average village in this data set having 206 households of which 12.6 already have installed a latrine) to compare results from the PRC_LATS and LNLATRS models. The largest increases in adoption, ranging in descending order from a 32.2% to 7.9% increase in adoption rate, occur with:

- an increase in infrastructure development by two points;
 - a decrease in distance from the nearest road from beyond two kilometers to within two kilometers;
 - an increase in proximity to Abomey-Bohicon by $0.1 \text{ (square root (kilometers))}^{-1}$, equivalent to a 4.2 kilometer decrease in distance from 10 kilometers or 33 kilometers from 50 kilometers;
 - an increase in average size of agricultural households by one person;
 - an increase in population density within a 2.5 kilometer radius area of the village by 100 persons/km²;
 - an increase in size of the village by 500 persons;
 - an increase in number of neighborhoods with piped water by one;
 - an increase in households with non-agricultural occupations by five percentage points;
- and
- an increase in the household latrine adoption rate of local surrounding areas by one percentage point.

The magnitude of marginal impacts reported in Table 4-8 and the decreasing order listed above depend directly on the size of the change specified. The magnitude is linear with respect to a change in the PRC_LATS Model and non-linear in the LNLATRS

model. For example, a five percentage point increase in the household latrine adoption rate of the local surrounding area would cause a 68% increase in a village's adoption rate compared to a 10.6% increase for a one percentage point change, according to the LATADP5K coefficient in the LNLATRS Model. For the average village, a 68% increase converts to a three percentage point increase in its adoption rate from 4.5% to 7.5%. This demonstrates a strong contagious aspect to private latrine adoption within a localized area, and is consistent with diffusion theory, the laws of imitation, the symbolic and status carrying value of latrines in rural Beninese society, and the need for substantial amounts of peer evaluation and personal experimentation for adoption to occur (see Chapter 2).

TABLE 4-9. Impacts of Village Conditions on the Odds of Adoption and of Strong Demand for Latrines in a Village

Village Condition	Marginal Increase in Condition	Marginal Odds Ratio ^a	95% C.I. for Odds Ratio ^b	
			Lower Limit	Upper Limit
<u>Adoption Present - LAT1 Model 3</u>				
TOTPOP92	500 persons	1.284	0.957	1.723
NAGDUMMY	0 to 1	0.420	0.219	0.804
OFFRD_5K	0 to 1	1.637	1.359	1.971
LATADP5K	0.01 rate points	0.364	0.149	0.890
SCHOOL93	0 to 1	1.796	0.894	3.611
<u>Strong Demand - LAT3 Model 3</u>				
TOTPOP92	500 persons	1.350	1.006	1.811
POPDEN5K	100 p/km ²	1.234	1.055	1.443
INFRGPS(1)	0 to 1	4.597	1.541	13.715
INFRGPS(2)	0 to 2	10.876	2.634	44.924
PRCNAGPOP	0.05 rate points	1.174	1.013	1.360
LATADP5K	0.01 rate points	1.107	0.986	1.241
TDSTA_B2	0.1 (sq.rt.(km)) ⁻¹	1.637	1.125	2.380
ONRD-2K	0 to 1	3.087	1.022	9.32
CHGHH SIZE	5 percentage points	0.958	0.902	1.017

^a See equation 6
^b See equation 7

6.2 Impacts of Village Conditions for Initiating Adoption

The marginal odds ratio of latrine adoption occurring in a village for changes in village conditions in Table 4-9 are explained as follows. The likelihood of latrine adoption occurring in a village (relative to it not occurring), or the odds, is 1.8 times higher for villages with a school than without one. A one percentage point increase in the household latrine adoption rate of local surrounding areas increases the odds of adoption occurring in a village by 1.7 times (a five percentage point increase in the surrounding adoption rate increases the odds by 11.7 times) over the base condition. A village larger by 500 people increases the odds of having adoption by 1.3 times over the smaller one. The probability of latrine adoption, compared to the probability of none, is 2.4 (1/0.42) times higher among villages with 5% or more non-agricultural households than among those with less than 5% and 2.7 times higher among villages less than 5 kms from the nearest road than those beyond 5 km. For schools and village size, the lower end of the confidence interval on the odds ratio falls below one, reducing certainty in the direction of the odds ratios of these variables for initiating latrine adoption.

6.3 Impacts of Village Conditions on Strong Demand

In contrast with the previous marginal odds ratios, those for a village having strong demand for latrines (LAT3) are very large for changes in several village conditions in Table 4-9. The odds of strong demand are 4.6 times higher in villages with two or three index points of infrastructure than in villages with zero or one index point, while in villages with four or more index points, it is 10.9 times higher. The odds of strong demand is 3.1 times larger among villages less than two kilometers from the nearest road than those beyond two kilometers. Proximity to Abomey-Bohicon, village size,

population density within a 2.5 kilometer radius area of the village, and households with non-agricultural occupations also increase the relative likelihood (odds) of strong demand ranging from 1.6 to 1.2 times for the specified changes in Table 4-9. These effects are less dramatic than the changes in infrastructure development and in proximity to a road. Increased size has a slightly larger effect on strong demand than on initiating adoption while the household latrine adoption rate of local surrounding areas has a considerably smaller effect here than on initiating adoption. A further reduction in size of non-agricultural households relative to the average household size in a village (CHGHHSIZE) has a negligible effect on strong demand with an odds ratio around one.

Consistent with linear regression results, strong demand for latrines in a village seems to be stimulated by factors associated with: infrastructure development, proximity to a major road, proximity to the epicenter of latrine diffusion, larger size (perhaps partially linked to wealth associated with larger agricultural households), higher population densities, and non-agricultural occupations. Unfortunately, the only individual/household lifestyle factors that could be tested in these analyses were occupation and wealth (using a rather poor indicator). Thus, it is not possible to say whether, overall, village environment or individual household lifestyle factors are stronger determinants of drives for latrines. Distinguishing between village environment and individual factors parallels ideas about the public and the domestic domains in disease transmission (Cairncross et al. 1996). For example, the surrounding latrine adoption rate among households was an important influence on demand in every model tested. If latrine ownership is thought of as an infectious disease, its risk definitely increases by having one's neighbors own a latrine.

6.4 Implications for Marketing

Several market-based approaches to stimulate demand for and promote adoption of latrines emerge from these analyses of village-level conditions:

- The first target of marketing and promotional interventions should be villages with high levels of the necessary village environment and/or lifestyle conditions for arousing drives for latrine adoption. These conditions provide the foundation for successfully stimulating high levels of drives and demand for latrines when sufficient awareness is created. Promotion should focus on those strongly and widely felt well-being and prestige drives for latrines aroused by high population density, larger size, non-agricultural occupations, socio-economic diversity, infrastructure development, and so on. Some of these conditions are also likely to be the ones where the health impacts of latrines may be greatest (Esrey 1996; UNICEF 1997).
- Village environment conditions may have a wide impact for stimulating well-being drives for latrines despite individual lifestyle differences. Village environment factors should be the focus of research at the individual household level to see if they can effectively stimulate drives across different lifestyle groups. If true, several common and widely appealing marketing messages about the advantages of having a latrine can be identified and used for marketing latrines in similar classes of village environments.
- The presence of households with non-agricultural occupations is an important lifestyle factor for stimulating demand in a village. This finding supports theory from Chapter 3 and is consistent with results from the household survey (Chapter 5) that non-agricultural households are more likely to adopt latrines. In the average

village, a ten percentage point increase in non-agricultural households represents an increase of 21 non-agricultural households of which 2 to 3 will be latrine adopters, according to marginal impacts in Table 4-8. Initially focusing on non-agricultural households as innovators and early adopters in a village may be an effective way to get demand up and adoption going.

- Other lifestyle factors, such as increased mobility and travel to urban centers, or more urban social linkages, which can be expected to increase with proximity to a major road, may account for the strong effect of ONRD_2K on demand. Marketing latrines by focusing on drives aroused mobility and travel (i.e., expression of new experiences and lifestyles, convenience and comfort, and protection of family health and safety) and urban social linkages (affiliation with the urban elite) may be effective in villages close to major roads.
- The analysis of village conditions reveals how important local opportunities for private latrine exposure are for stimulating latrine adoption in a village. This may be because the contextual aspects of visual exposure to private latrines are critical for conveying the cultural meaning and symbolic value of latrines for arousing prestige drives (Gatignon and Robertson 1985). These local opportunities for exposure also improve the “trialability” of latrines by providing occasions for experimentation and personal evaluation of an innovation (Rogers 1983). Because trialability is intrinsically very poor for such a capital-intensive investment as a latrine, creating and enhancing more local opportunities for private latrine exposure should be an important cornerstone of marketing strategies.

7. VILLAGE MARKET SEGMENTS FOR LATRINE ADOPTION

This section explains how cluster analysis is used to identify relatively homogenous groups of villages with respect to the conditions that generate demand for latrines. These homogenous village groups represent market segments at the village level for promoting latrine adoption. The characteristics of each type of village or market segment are discussed in the context of a regional approach to latrine marketing and promotion.

7.1 Cluster Analysis Method

Cluster analysis creates groupings of villages that are similar (or close together in multidimensional Euclidean space) with respect to a set of variables (Lorr 1987). Those village environment and lifestyle-related conditions that were consistently significant in the regression models of section 5 were selected as the basis for market segments. Latrine exposure factors have not been considered in the cluster analysis because a marketing approach is expected to compensate for their role in stimulating drives for adoption. Thus, the variables used for clustering were TOTPOP92, POPDEN5K, INFRSTM1, PRCNAGPOP, and ONRD_2K. Although it was classified in Table 4-2 as a latrine exposure factor, ONRD_2K is included because distance to the nearest road is also thought to indicate unique village conditions that arouse drives, as suggested by its strong role in the models of LAT3 and LNLATRS. A total of 439 villages (the data set with outliers removed) were classified into clusters. The cluster method chosen was K-means cluster analysis where the number of groups is specified a priori (Norusis 1994).

Three or four market segments of villages was thought to be a reasonable number of groups to interpret. When comparing the three and four cluster solution, village groups

in the four cluster solution had more statistically different characteristics and more distinct levels of demand for latrines. Furthermore, one group of the three cluster solution contained a mixture of two administratively and functionally different kinds of villages, making interpretation of the clusters with respect to knowledge about actual village types, rather difficult. Thus, the four cluster solution was chosen to define village market segments for latrine adoption.

7.2 Market Segment Characteristics and Latrine Demand Levels

Average characteristics of each village market segment are listed in Table 4-10. The values of the first set of five variables define the four cluster centers. The values for the next set of variables provide further information about the characteristics of each segment. One-way ANOVA comparing mean values across segments is significant (at the 0.05 level) for all variables except TDSTA_B2 and CHGHHSIZE. Obviously, the ANOVA statistics are only meaningful for the exogenous variables (those not used in the cluster analysis). A cubic polynomial function explains a significant amount of the between segment differences for POPDEN5K, PRCNAGPOP, and SBEE_LOC, a quadratic function explains a significant amount of the POPDEN2K, ONRD_2K, and URB_COMM differences between segments, and a linear function explains a significant amount of the LATADP5K, NAGDUMMY, and OFFRD_5K differences. Differences in size and population density across the four segments are plotted in Figure 4-8. In Figure 4-9, a map shows the market segment of each village in Zou Department and provides additional insight into the spatial hierarchy of village-level demand for latrines.

TABLE 4-10. Average Characteristics of Village Market Segments^a for Latrine Adoption in Zou Department, Benin

Market Segment	1	2	3	4	One-way ANOVA ^b	
Label	Urban Fringe Villages	Non-urban Sub-prefecture Capitals	Commune Seat Villages	Small Remote Villages	F value ^c	Sig. ^d
Number of Villages	26	37	122	254		
<u>Cluster Variables</u>						
TOTPOP92	1025	2642	1479	682	652.2	.000
POPDEN5K p/km2	929	386	220	166	175.1	.000
INFRSTM1	1.58	2.73	2.37	1.42	27.3	.000
PRCAGPOP	29.9%	13.9%	13.3%	10.8%	16.9	.000
ONRD-2K=1	100%	78%	59%	54%	9.32	.000
<u>Other Variables</u>						
INFRGPS	0.46	1.16	1.06	0.53	29.4	.000
POPDEN2K	1959	1299	730	384	121.7	.000
NAGDUMMY=1	0%	27%	28%	43%	8.92	.000
AGHHSIZE	6.12	6.42	6.22	5.78	5.31	.001
NAGHHSIZE	3.90	3.81	3.95	3.40	4.26	.006
avg. household size	5.29	5.94	5.83	5.47	3.92	.009
LATADP5K	5.7%	4.6%	2.7%	2.8%	2.98	.031
TDSTA_B2	0.21	0.19	0.17	0.21	1.95	.121
DISTA_B km	56	76	64	50	4.87	.002
OFFRD-5K=1	0%	11%	19%	20%	2.65	.049
URB_COMM=1	62%	24%	9%	13%	18.6	.000
CHGHHSIZE	26.1%	34.7%	31.5%	32.5%	0.77	.501
SBEE_LOC	0.69	0.65	0.13	0.13	11.4	.000
SCHOOL93=1	50%	92%	91%	51%	29.1	.000
POPGRWTH	0.015	0.080	0.040	0.016	15.3	.000
<u>Latrine Adoption Variables</u>						
LATRINES	22.0	18.6	9.1	3.5	24.4 ^e	.000
PRC_LATS	11.9%	3.9%	3.2%	3.0%	17.2 ^f	.000
LNLATRS	2.71	2.09	1.46	0.86	31.3 ^g	.000
LAT1=1 (adoption started)	96%	76%	67%	48%	12.9 ^h	.000
LAT3=1 (strong demand)	62%	46%	20%	9.8%	24.0 ⁱ	.000

^a From cluster analysis of the set of 439 villages with outliers removed

^c The noncentral F distribution is the ratio of the treatment mean sum of squares to the error mean sum of squares

^d Upper-tailed significance of the specified F value test of differences between groups

^e 97.9% of the between groups sum of squares is explained by a linear relationship with market segment when the linear term is weighted by the size of each segment

^f 58.7% , 34.3%, and 7.0% of the between groups sum of squares are explained by the size-weighted linear, quadratic, and cubic terms, respectively, of a polynomial relationship with market segment

^g 99.98% of the between groups sum of squares is explained by a linear relationship with market segment when the linear term is weighted by the size of each segment

^h 97.7% of the between groups sum of squares is explained by a linear relationship with market segment when the linear term is weighted by the size of each segment

ⁱ 95.8% and 2.4% of the between groups sum of squares is explained by the size-weighted linear and quadratic terms, respectively, of a polynomial relationship with market segment

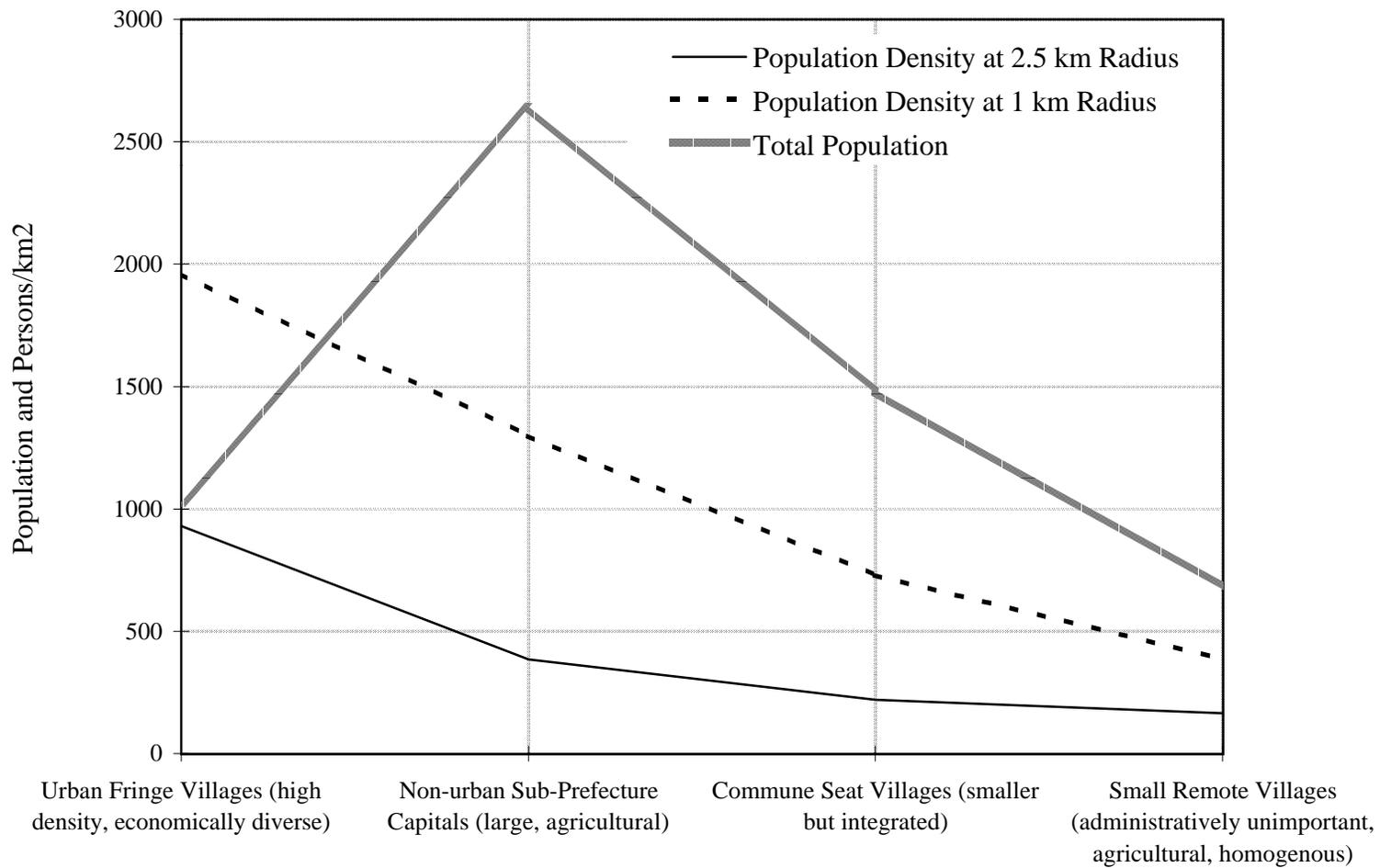
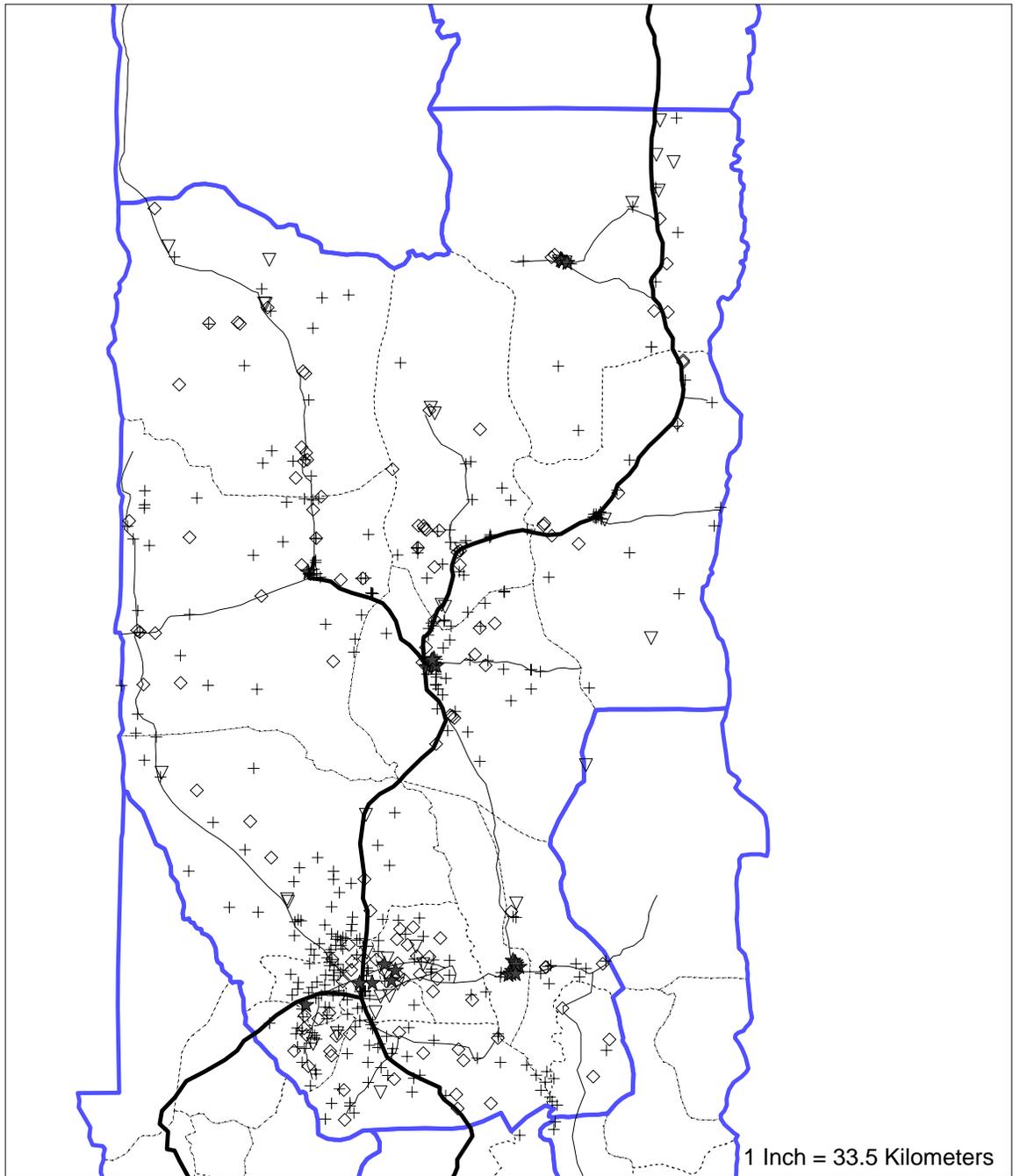


FIGURE 4-8. Population Characteristics of Village-based Market Segments for Sanitation Promotion in Zou Department, Benin



Village Market Segments
439 Villages Classified

- ★Urban Fringe Villages (26)
- ▽Non-urban Sub-prefecture Capitals (37)
- ◇Commune Seat Villages (122)
- +Small Remote Villages (254)

- Department
- - - Sub-prefecture
- Major paved roads
- Secondary roads

FIGURE 4-9. Map of Village-based Market Segments for Sanitation Promotion in Zou Department, Benin

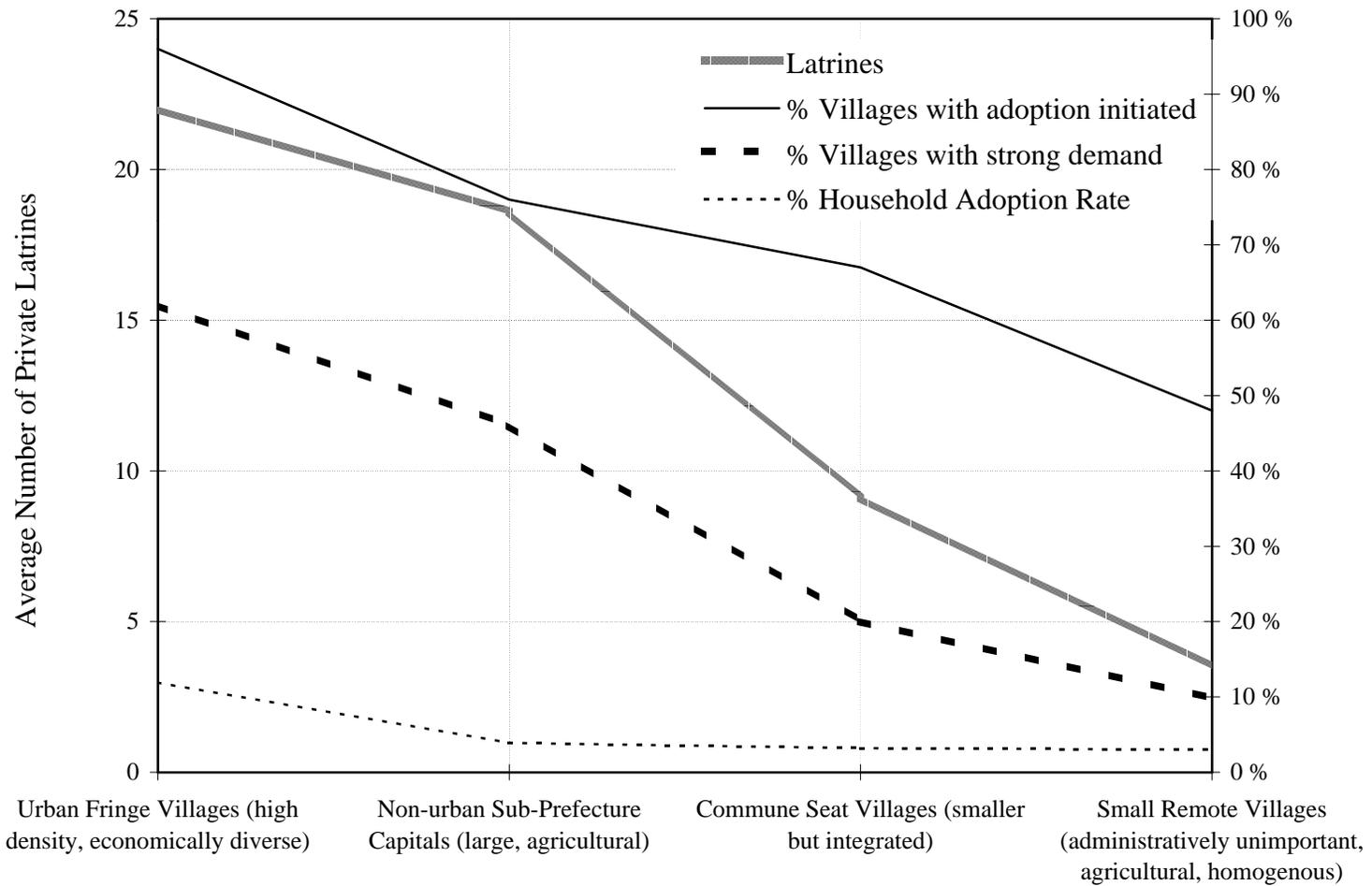


FIGURE 4-10. Demand Characteristics of Village-based Market Segments for Sanitation Promotion in Zou Department, Benin

The last set of five variables in Table 4-10 on latrine adoption behavior characterizes the level of demand for latrines in each segment. Figure 4-10 is a plot of these values by segment with percentages on the right and number of latrines on the left.

Urban Fringe Villages

Market segment 1, called “Urban Fringe Villages”, is a small group of villages with no administrative function that are mostly in urban communes and located very close to large urbanized sub-prefecture capitals (i.e., Bohicon, Abomey, Cote, Dassa, Savalou, Glazoué, and Save) which comprise the first level in a geographic hierarchy of Zou Department population settlements (see Abler et al. (1971), Morrill (1974), and Morrill and Dormitzer (1979) for spatial hierarchies in geography). Segment 1 villages are bedroom communities for the adjacent urban centers. They are more likely to have piped water but not much other infrastructure. Average household size is smaller due to the greater number of smaller non-agricultural households. Surrounding latrine adoption rates are the highest, and population growth rates the lowest for this segment compared to the other three. Although segment 1 villages are smaller, they are economically diverse with none having less than 5% non-agricultural households. In contrast, nearly half of segment 4 villages, which are also small, have less than 5% non-agricultural households.

The highest levels of latrine demand, according to all measures of latrine adoption in Table 4-10, occur in these urban fringe villages. This is due to the higher percentage of non-agricultural households, and the greatest population densities, economic diversity, and latrine exposure opportunities. These village conditions contribute to a much greater arousal of both prestige and well-being drives for latrines. Latrine adoption is underway in nearly all villages in this group while over 60% have strong demand compared to

segment 4 villages of which less than half have any latrines and less than 10% have strong demand. An estimated 6% of the rural population lives in this segment of villages.

Non-urban Sub-Prefecture Capitals

Market segment 2, labeled “Non-urban Sub-Prefecture Capitals”, also includes the principal village of more important, economically developed communes. These villages comprise the second level, below the main urban centers, in the geographic hierarchy of Zou population centers. They tend to be spread out, located on unpaved main roads, and farther from urban centers. Population densities can be high right in the center of town, but drop off quickly in the surrounding areas (see Figures 8 and 9). They are in the process of or may be targeted for getting piped water supplies, but are unlikely to have electricity. They have higher levels of infrastructure development associated with their large size, and more important administrative and commercial roles within their spheres of influence. However, occupations, commerce, and development are oriented toward agricultural production. The percentage of non-agricultural households is below average, annual population growth rates are highest, and household size, both overall and agricultural, are the largest, suggesting that these are substantially wealthier agricultural villages than those of segment 4.

Between segment 1 and 2 there is a sharp drop-off in adoption rates and in the proportion of villages with adoption initiated. Fewer than half of segment 2 villages have strong demand and one out of four have no adoption. In segment 2, it should be possible to stimulate higher levels of demand by increasing latrine awareness since these villages have the conditions (infrastructure development, road access, wealth, size, diversity, and so on) necessary to stimulate prestige and well-being drives even though the presence of

favorable individual lifestyle factors among the population may be lower than in segment 1 villages. This segment represents about 20% of the rural Zou Department population.

Commune Seat Villages

Market segment 3, “Commune Seat Villages”, consists of smaller and less dense villages than segment 2 but these villages possess many similar development-related characteristics. However, with respect to population density, isolation, and local opportunities for latrine exposure, they are more similar to the small remote villages of segment 4. Segment 3 villages comprise the third level down in the geographic hierarchy and typically fill the spaces in a lattice created by the first (urban) and second (non-urban sub-prefecture capital) level population settlements (see map of Figure 4-9). This segment of villages also possesses the largest portion of the rural Zou population at about 38%. They are somewhat regionally integrated with administrative, commercial, or economic linkages to the nearest higher level population center. Because of their administrative function and sphere of influence, these villages have higher levels of infrastructure than either segment 1 or 4 but are not in urban-designated communes, nor do they have the size and importance to be targeted for piped water. They tend mostly to be agriculturally oriented, but their integration assures some economic diversity especially for those villages closer to urban centers.

The proportion of villages with strong demand drops off sharply between segment 2 and 3, although the rate of adoption, around 3% to 4%, is similar. In general, segment 3 villages have less of the village environment factors to arouse well-being drives for latrines. Demand in these and segment 4 villages is thought to be generated mostly by individual lifestyle factors whose presence tends to be quite limited in the most

agricultural and remote of these segments' villages. The "maximum level of penetration" of latrine adoption in market segments 3 and 4 may be low overall until the presence of village environment and lifestyle factors that stimulate drives for latrines increases (Gatignon and Robertson 1985).

Small Remote Villages

Market segment 4 comprises the group of isolated, unintegrated, small, homogenous, agricultural villages with the lowest population densities, lowest proportion of non-agricultural households, little infrastructure, greatest poverty (as suggested by the smallest average agricultural household size), and least likelihood of having a school. The small number of non-agricultural households in these villages tend to have households that are smaller in size than average, which, according to the regression evidence, indicates households with very divergent modern lifestyles from those of their agricultural neighbors. This market segment constitutes the largest group of villages and about 36% of the rural population but has the least potential for successfully stimulating demand for latrines. These villages lack most of the environment conditions and have few households with the lifestyle factors to arouse drives for latrines. Latrine exposure and awareness are also much lower in this market segment as demonstrated by the low percentage of villages with adoption initiated. However, increasing awareness is not likely to create strong demand in segment 4 villages.

7.3 Regional Strategies for Marketing

Recommendations for regional marketing strategies based on the existence of these four village market segments in Zou Department are described next.

Create strategically located diffusion centers:

This recommendation involves selecting an initial set of villages with the conditions for strong demand from market segment 2 and 3. These villages are then turned into regional diffusion centers to take advantage of their apparent hierarchical market position and spatial location relative to surrounding areas regarding adoption potential (presence of village environment and/or lifestyle conditions conducive to drive arousal), communication processes, and latrine exposure involved in creating latrine awareness. The focus of activities should be aimed at raising adoption levels within these villages and creating structures to support eventual promotional activities for out-lying villages in their spheres of influence. The increased opportunities for local exposure to private latrines created by raising adoption levels in these diffusion center villages should increase awareness and get adoption started in surrounding lower potential villages. Once adoption has accelerated in a center village, efforts can be expanded to surrounding segment 3 or 4 villages that have the greatest presence of drive-stimulating village conditions. A sequenced package of appropriately targeted publicity, information campaigns, latrine designs, and technical/construction support activities based on the dominant types of arousable drives in these surrounding villages can be developed and delivered.

Remove implementation-related constraints in urban fringe villages:

Segment 1 villages already have high levels of demand created by favorable village conditions that stimulate strong well-being and prestige drives for latrines. These villages should be the focus of delivery and support activities to reduce or remove implementation-related constraints that block adoption (see chapter 3). Adoption should

accelerate easily and reach high coverage levels in segment 1 villages once constraints on adoption are reduced or removed. These villages offer the fastest and greatest potential for rapidly increasing latrine adoption and improving domestic sanitation.

Use urban-rural linkages to provide access to support services:

Existing urban-rural linkages, specifically private (social and family) and professional (occupational and educational) linkages, provide a potentially effective channel for publicity and dissemination of information and for delivery and access to some support activities. Use of urban-rural linkages could be particularly effective for stimulating adoption among segment 1 urban fringe villages that already have high awareness and potential drives for latrines, but need access to services and support for design and construction. It may also be effective for segment 2 and 3 villages that are well integrated regionally.

8. SUMMARY

This chapter has presented regression analysis to determine village conditions and characteristics that promote demand for household latrines and stimulate adoption in rural Benin. Hypotheses about the arousal of drives motivating latrine adoption from the conceptual model of individual choice presented in Chapter 3 were tested. Model results support the hypotheses about the role of village environment, individual lifestyle, and latrine exposure factors in arousing drives and stimulating demand for latrines.

The analysis shows that the strongest village conditions for latrine adoption are:

- high population density (indicating reduced availability of open defecation sites);
- greater infrastructure development (indicating social system heterogeneity and other socio-economic changes);

- larger size (also indicating both social and physical changes to the village landscape and possibly the presence of wealthier agricultural households);
- proximity to a major road (indicating greater exposure to information, increased urban linkages, and mobility and travel);
- proximity to Abomey-Bohicon (indicating greater communication with the epicenter of latrine diffusion and increased urban linkages);
- higher percentage of non-agricultural households (indicating greater presence of the individual lifestyle factor for occupation); and
- greater local opportunities for private latrine exposure in nearby surrounding areas of the village.

Four village market segments, or groups of villages with different village conditions and characteristics for promoting demand for latrines, were identified. A regional marketing approach should target urban fringe villages for services and support to reduce implementation-related constraints on adoption since these villages already have strong levels of demand for latrines from the presence of very favorable village conditions for drive arousal. Non-urban sub-prefecture capitals and commune seat villages with the conditions for arousing strong demand should be the primary target of marketing efforts to stimulate demand so that these villages can act as strategic diffusion centers for surrounding villages with lower potential demand. Small remote villages, the fourth and largest segment of villages, have the least favorable village conditions for stimulating demand for latrines. Even with intensive marketing efforts, adoption rates are likely to remain very low until their conditions become more favorable for drive arousal. In the third and final phase of this research project, sample villages for household survey

of latrine adoption choice behavior have been selected to represent each of the four village market segments. A fruitful avenue for future analysis would be to examine the influence of village type (or market segment) on the presence of drives for and constraints on latrine adoption at the individual household level.

The research presented in this chapter has demonstrated how village-level secondary data necessary for market analysis of latrine demand can be obtained from existing regional and national databases even in very poor developing countries in Africa. For future work, the analysis might be improved in several ways. Variables in regression models might be easier to interpret if TOTPOP92 were replaced by two separate variables, number of households and average household size, to separate their influences. Given the large amount of correlation between independent variables, factor analysis might be an effective way to represent the underlying dimensions in the set of independent variables, reduce collinearity among factors, and improve stability and interpretation of regression model coefficients. Tobit analysis is a form of regression that can estimate the initiation and amount of village latrine adoption in a single model and would be an appropriate technique for the latrine adoption data, where the distribution is zero-truncated on the lower side (Ameniya 1985).

CHAPTER 5

RESULTS FROM A HOUSEHOLD SURVEY OF LATRINE ADOPTION CHOICE BEHAVIOR

EXECUTIVE SUMMARY

A survey to collect quantitative data on the decision of households in rural Benin to adopt latrines is described and preliminary results, prior to developing mathematical models of preference, intention, and choice, are presented. A questionnaire was individually administered to 320 household heads in six Fon-speaking villages of Zou Department to measure the presence of 11 drives motivating adoption and 13 constraint factors acting as barriers to choice that were identified during the qualitative phase of this research (see Chapter 3).

Contrary to the main objective of sanitation programs to improve health, results clearly show that heads in the sample villages are motivated by other advantages for installing a latrine: prestige and comfort were the first (28%) and second (22%) most frequent primary motives for adoption. Prestige associated with latrines in the study area has several different facets, the most common of which is social status from affiliation with urban elite. Other primary motives in order of frequency were: physical safety (10%), personal protection from threats believed in Fon culture to result from feces left in the open (10%), privacy (6%), restricted mobility (6%), health benefits (4% for “reduce flies in my compound” and 2% for “reduce my household’s health care expenses”), cleanliness (2%), and convenience (1%).

Attitudes toward latrines on nine qualities were all substantially more favorable than those toward open defecation. Latrines scored most favorably on suitability,

followed by cleanliness and comfort, and least favorably on smell, followed by privacy and safety. The fourth, fifth, and sixth most favorable qualities of latrines were usefulness, health, and convenience. These attitudes and other statements measured in the survey indicate that nearly everyone in the study area appears to perceive latrines to be relevant and worthwhile to some degree.

The large gaps between those who stated they prefer latrines to open defecation (97%), those who intend to adopt (24.6%), and those that have actually adopted (4.9%) are attributed largely to the presence of constraints comprising: implementation-related factors (expressed by as much as 82%), misunderstanding about how latrines function and their safety (18%), lack of awareness about the advantages and benefits of installing a latrine (17%), and three psycho-social factors (extended-family interaction problems, psycho-physical aversion to latrines related to fear of dangers and smell, and disrupting social relations and norms). Finance appears to be the critical resource constraint blocking adoption. While 82% of all heads said they would have difficulty saving enough money to build a latrine, only 11% said that high cost was a disadvantage. Lack of a drive (no felt need for a latrine) was a barrier to adoption for 13% of non-adopters mainly because they already used a latrine (belonging mostly to a relative). Preference for an alternative with greater utility than latrines, not for defecation, but for satisfying personal drives poses a significant barrier to adoption in the study area and was present for 46% of non-adopters.

A 2 by 3 sampling design of adoption choice by group (female, male farmer, and male non-farmer heads) allowed comparisons by gender, by male occupation, and by adoption. Major and significant differences in attitudes, drives, and constraints were

found between these groups in the sample villages, indicating the existence of market segments for latrine adoption.

Women rated the convenience, usefulness, suitability, cleanliness, and smell of latrines higher than men. They were more likely to be motivated by drives for comfort, personal protection, and restricted mobility, and less likely by prestige (except for “to leave a legacy for my children”), physical safety, and health benefits. Privacy was not a more frequent motive of women. These differences may also be influenced by age since a much larger proportion of female heads were over 60 years old. Women’s lower rates of intention and choice to adopt, despite their more favorable attitudes toward latrines, can be explained by the greater presence of implementation-related, misunderstanding, and psycho-social constraint factors, and by a larger proportion lacking a drive (mostly because more women already used latrines), compared to men.

Male farmers had attitudes toward latrines and open defecation that were generally similar to non-farmers except for latrine safety and health, which they rated lower, and latrine smell and privacy, which they rated higher. Farmers were more likely to be motivated by drives for physical safety, personal protection, restricted mobility, and privacy than non-farmers, and less likely by prestige and health benefits although these group differences were less pronounced than the gender one. More male farmers expressed implementation-related, awareness, and psycho-social constraint factors than non-farmers, although rate of intention to adopt was similar for both groups.

Differences between adopters and non-adopters confirm hypotheses that adopters feel more favorably toward latrines, face fewer constraints, and have different drives for adoption than non-adopters. In particular, adopters were more likely than non-adopters to

be motivated by two kinds of prestige (40% combined for affiliation with urban elite and expression of new experiences/lifestyle compared to 20% for non-adopters), reduced family health care expenses (12% compared to 1% for non-adopters), and physical safety (17% to 10%), and less likely by comfort, personal protection, restricted mobility, and privacy. The rate of difficulty saving enough money, the most important constraint among adopters, was 47%, about half that of non-adopters. Adopters were predominantly male, earned higher incomes because of higher earning non-farming occupations, were more educated, more involved in their communities, more mobile and traveled, more Catholic or Protestant (rather than Voodoo), and had larger households than non-adopters.

Implications of these results for promoting sanitation more effectively are discussed in the conclusion and address messages to promote adoption, health education issues, adapting and targeting messages and policies to market segments, reducing implementation-related constraints, and making latrines more attractive than competing alternatives.

1. INTRODUCTION

Pit latrines are one of the most widely applicable and adapted technologies for excreta disposal in developing countries. Their public health benefits, especially when combined with water supply and health education, are well recognized (Feachem et al. 1983; Esrey et al. 1985, 1990; Esrey 1996). However, such basic improvements in sanitation in the developing world continue to lag far behind both population growth and provision of water supplies (WHO 1996a; Water Supply and Sanitation Collaborative Council 1997; UNICEF 1998). Lack of understanding of the needs, preferences, and

behavior of intended consumers of new sanitation technologies is frequently why so many programs have failed to achieve improved coverage or sustainability (Cairncross 1992; Water Supply and Sanitation Collaborative Council 1994; Lafond 1995). Other studies have called attention to the importance of socio-economic and cultural aspects for understanding sanitation preferences (Elmendorf and Buckles 1980; Perrett 1983; Cairncross and Kochar 1994; Wikj 1994). In most rural and many peri-urban situations, sanitation consumers are actually choosing between alternatives involving existing and new behaviors. Behavioral methods and models that address the attitudinal determinants of consumers' preferences and choices offer one fruitful approach to analyze and forecast consumer demand for sanitation.

This chapter presents the third phase of research to study, using behavioral methods, the choice of households to install a latrine in rural Benin. The research goal is to provide information to improve the effectiveness of programs to promote sanitation. Chapter 3 developed a conceptual model of the individual decision to install a latrine and described qualitative research on the motives and barriers that constitute the key elements of that decision. In this chapter, preliminary results are presented from a household survey of choice behavior in which quantitative data on the motives, barriers, and attitudes shaping preference, intention, and choice were collected. In Chapter 7 these data are analyzed to develop mathematical models of choice behavior that can be employed, eventually, to forecast changes in latrine adoption for different promotional policies.

In Benin, open defecation is still practiced by the vast majority of the rural population. Health messages encouraging latrine use are disseminated through various governmental and non-governmental agencies but no national program or strategy to

promote adoption of latrines has yet been implemented. It is estimated that latrines are used by about 15% of the rural population and owned by only about 5% of households (see Chapters 1 and 4). Those few latrines have been installed largely through spontaneous adoption by private households of locally adapted designs. Thus, Benin provides a case for the study of latrine adoption behavior early in the diffusion process and under little intervention.

A total of 320 household heads in six villages of Zou Department (see map in Figure 5-1) were individually interviewed to collect data on the choice behavior of different population groups. Gender and occupation (farming versus non-farming) were considered the most basic group factors from previous work as well as the most feasible for stratifying households for sampling. A questionnaire was designed using attitude measurement to quantify the behavioral variables. While attitude measurement is extremely common in developed countries, third world populations with low literacy have little experience quantifying their beliefs and attitudes. This aspect of the survey posed particular challenges that are discussed in the procedural section.

In section 2, the conceptual and qualitative research that led to the design of the survey is reviewed. Section 3 describes the sampling and data collection procedures. Section 4 presents demographic characteristics of the sample population and discusses results from the survey on attitudes toward latrines; on preference, intention, and choice to adopt; on the importance of different motives; and on the presence of barriers to

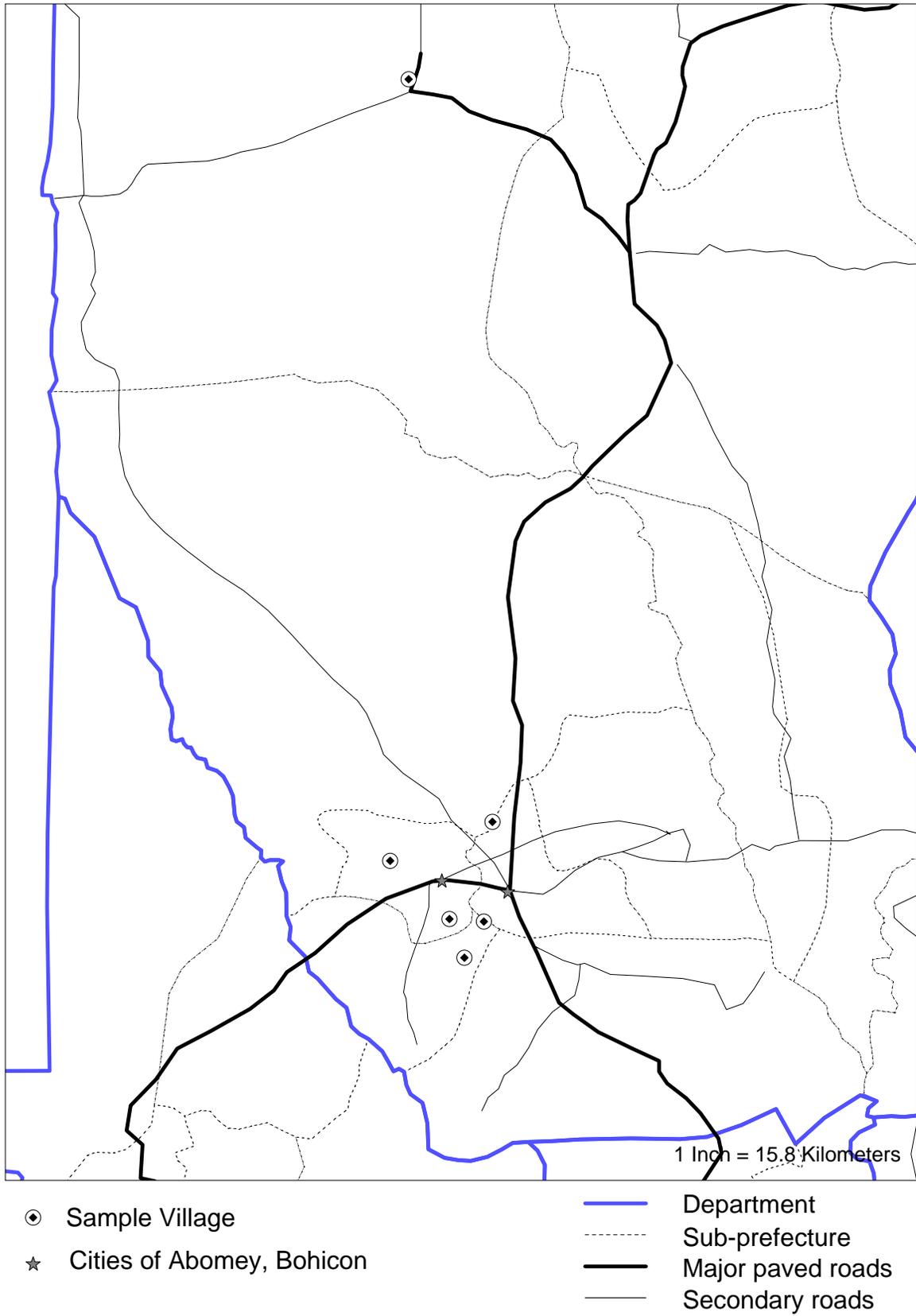


FIGURE 5-1. Location of Sample Villages in the Household Survey

adoption. Gender and occupational differences are examined as well as differences between adopters and non-adopters. A summary concludes the chapter.

2. BACKGROUND AND SURVEY DESIGN

This survey was designed to test hypotheses about the role of motives and barriers in an individual's decision to install a latrine. These hypotheses were developed in the initial qualitative phase of study described in Chapter 3. That phase identified 11 factors or *drives* motivating latrine installation, and 13 factors acting as *constraints* on (or conversely as *facilitators* of) that decision (see Chapter 3, Tables 4 and 8). Drives were grouped as prestige, well-being, or situational motives. Constraint factors were categorized as external or internal and as implementation-related or psycho-social.

The relationships among drives, different types of constraints, attitudes (feelings), preference for latrines, intention to adopt, and actual choice were proposed in a conceptual model of individual choice (see Chapter 3, Figure 3-1). That model was adapted from attitude-behavior relations and several decision process models of individual choice (see Chapter 2). Simplified, the model states that preference is formed from attitudes jointly shaped by drives to choose latrines and perceptions of factors of a psycho-social nature. Once preference exists, implementation factors typically intervene to affect intention through individuals' perceptions of how these factors impede or facilitate their ability to adopt. For example, a person may have a strong desire but little intention to install a latrine because he or she perceives a lack of resources or opportunities needed to act. In some circumstances, when implementation factors are perceived as very negative and very permanent, they can reduce preference as well. Two other factors precede all others: without awareness and some basic understanding, an

individual is unlikely to consider latrines as a choice option. Finally, actual choice will deviate from intention when implementation constraints exist in the short-term. Thus, for latrine adoption to be chosen at least one drive must be present and no constraints can be *binding* (high enough to block preference, intention, or choice to adopt).

The initial qualitative research also hypothesized that an individual's *lifestyle* and the physical and social environment of the village could explain differences in drives. The empirical analyses of village-level latrine adoption in Chapter 4 support this theory and provide strong evidence for the existence of market segments for latrine adoption. Gender, occupation, education, age (or lifecycle), social linkages, mobility and travel, and wealth were identified as lifestyle factors. In Chapter 4 social and physical characteristics of the village environment were represented using census, geographic, and other available data for rural villages in Zou Department. Of the village characteristics found to be significantly associated with latrine adoption in regression models, population size, density, and occupational diversity were selected to classify 443 villages into homogenous market segments in Chapter 4 using cluster analysis. Sample villages for the household survey of this chapter were selected to represent the four types (segments) of villages for which the mean characteristics of latrine adoption are all significantly different (Chapter 4, Table 4-10). In future work the influence of village type on drives for and constraints on adoption will be tested.

The survey questionnaire consisted mainly of closed-ended coded questions measuring, in the following order:

- present defecation practices;

- attitudes toward the present defecation site for non-latrines users, or the most likely alternative to latrines for latrine users;
- past latrine experience, attitudes toward latrines, and adopter status;
- preference for latrines and non-adopters' intention to adopt;
- reasons for non-adoption and presence of various constraint factors;
- importance of advantages (drives) and disadvantages (more constraint factors) of installing a latrine;
- agreement with various beliefs related to drives and constraints; and
- socio-demographic characteristics.

Attitudes about the cleanliness, safety, smell, convenience, usefulness, health, comfort, privacy, and suitability (appropriateness in the sense of *proper*) of latrines were measured using a 7-point bipolar semantic differential scale where, for example, 1=very dirty, 7=very clean and 4=neutral (Osgood et al. 1957). Perception of these nine qualities also was measured for open defecation at a respondent's actual or stated site.

Respondents were asked to rate the nearness of this site on a 7-point scale (1=very near, 7=very far) and then to estimate the distance in paces (a commonly understood term in Fon approximately equal to a meter).

An adopter was defined as a respondent who had installed a latrine at his or her residence in the village. Measurement of preference for and intention to adopt a latrine posed some challenges for this research. It was felt that a question asking about desire to install a latrine would elicit biased responses because respondents would think they were being offered a latrine by the survey sponsors (UNICEF and the Ministry of Health of the Government of Benin). True preference for a latrine should reflect a person's sense of

need for and favorable attitude toward latrines. After much debate, six questions were retained measuring respondents' preference to use latrines and their intentions (plans) to install one. The first preference question stated:

“Imagine that a latrine was available at your house starting from tomorrow. Now you have the possibility to use either this latrine to defecate or the open defecation site you currently use (or would use if you did not have the latrine you now use). During the times you are at home, how frequently would you choose the latrine to defecate?”

Respondents were asked to choose from five levels of frequency: “never or almost never”, “very little”, “sometimes”, “often”, and “always or almost always”. A follow-up question asked how frequently the respondent would choose this latrine for their children to defecate. No particular description of the kind of latrine or its ownership was given. Given the low level of latrine use and adoption in rural Benin, simple preference for defecating in a latrine instead of the open was sought. Furthermore, investigating preference for different styles of latrines or the effect of operation and maintenance would have required a separate survey. Latrines in the study area, as in most of Benin, are privately constructed dry pit types. Small variations in cabin, hole, ventilation, size, and construction style exist, but the basic concept of a dry pit is the same. Some institutional and public latrines are ventilated improved pit (VIP) or composting types. Public flush toilets are extremely rare even in urban centers.

A third question about communal latrines was included to distinguish preference for private and public latrines. The question asked:

“Imagine there is a communal latrine available for the village to use which is located about 300 paces from your house starting from tomorrow. Now you have the possibility to use either this communal latrine to defecate or the open defecation site you currently use (or would use if you did not have the latrine you now use). During the times you are at home, how frequently would you choose the communal latrine to defecate?”

Frequency was measured as usual. For respondents who did not know what a communal latrine was, the question was preceded by this explanation: “a public latrine with separate cabins for each sex and with a village committee responsible for maintenance and cleaning”.

A series of three questions measured non-adopters’ intention to install their own latrine, starting with: “Have you already decided (made a plan) to install a latrine here at your home?” A yes/no response was solicited. If the answer was “yes”, the next two questions asked: “How probable is it that you will implement your decision (achieve your plan) in the next two years?” and then: “Do you already have some money available to build this latrine?” Strength of intention to install a latrine was measured on a 7-point scale with 1=very improbable, 2=improbable, 3=a little improbable, 4=neither improbable nor probable, 5= a little probable, 6=probable and 7=very probable. Availability of money was measured by yes/no.

To measure drives respondents were asked about advantages (positive consequences) for them of installing a latrine at home. Spontaneous advantages were recorded and the personal importance of 19 listed advantages was measured on a 4-point scale consisting of 1=not important, 2=a little important, 3=important and 4=very important. Lastly respondents were asked to pick the first, second, and third most important advantage from all spontaneous and listed ones.

Constraint factors were measured in three different places:

- All respondents were asked if they had (adopters) or anticipated having (non-adopters) difficulty with seven possible latrine construction problems covering external factors 3 through 7 in Table 3-8 of Chapter 3. Responses were yes/no.

- All respondents were asked to estimate how much it would cost them to build a latrine at their home. Responses were measured in Frs. CFA where 500 equaled about U.S.\$1.00 at the time of the survey.
- Non-adopters (and two adopters whose latrines were no longer functional) were asked why they had not installed a (replacement) latrine at their home and then asked to identify from a list of 11 reasons which ones explained their situation. Reasons covered psycho-social and implementation factors, and three other particular cases: no drive, lack of awareness, and preference for a more attractive alternative than latrines. Spontaneous reasons were recorded and listed reasons were measured as yes/no.
- All respondents were asked about any disadvantages (negative consequences) that could discourage or prevent them from deciding to install a latrine at their home and then asked to rate the importance to them personally of 12 listed disadvantages. Spontaneous disadvantages were recorded and importance was measured on the same 4-point scale as advantages. In addition, respondents were asked to select the first, second, and third most important disadvantage of installing a latrine from either spontaneous or listed ones.

A final section measured agreement with nine beliefs, indirectly related to drives or constraints, on a 7-point Likert scale (Likert 1932)

In sum, 79 variables consisting of two ratio (distance to the open defecation site and estimated cost of building a latrine), 59 interval, and 18 dichotomous measurements, were collected in the survey to capture the presence and strength of drives, constraints, and attitudes toward latrines. These variables closely reflect actual statements expressed by informants in unstructured interviews conducted during the first phase of qualitative

fieldwork (see Chapter 3). The questionnaire was written in French and is included in Appendix B. Details of its translation into Fon are described in the proceeding section

The rest of this chapter describes the sampling design and survey procedures and discusses preliminary results from the survey. The next two chapters will present analysis to develop mathematical models of individual preference, intention, and choice to adopt. In that analysis, factor analysis has been used to reduce the large set of 79 variables to a more compact set of quantitative factors representing the key drives and constraints hypothesized to determine adoption behavior.

3. SAMPLING DESIGN AND DATA COLLECTION

The sample consisted of 320 heads of households from six Fon-speaking villages of Zou Department. Sample villages were selected to represent each of four village types hypothesized to influence drives for latrine adoption. As summarized above, village types were identified and villages grouped into clusters in Chapter 4 according to characteristics found to be significantly associated with latrine adoption. The Fon-speaking village closest to the cluster center in terms of multidimensional distance (most statistically similar to one of the four idealized village types of Chapter 4, Table 4-10) was selected to represent that group. Eighty households were sampled from each village group. Two villages were needed to represent two of the groups because of their small average size.

Stratified random sampling of households was combined with choice-based sampling to increase representation of adopters, women, and male non-farmers. A purely random sample would have provided almost no information about adopters and been dominated by male farmers. In each sample village, a census of households was done to

identify the gender, occupation, and adopter status of each head. Household heads were classified as female, male farmer or male non-farmer and assigned a unique number within each class. The sample was drawn in two steps. First, all adopters were selected irrespective of class due to their small number. After accounting for the class of each adopter, a random sample was drawn from within each class from the remaining household heads until the class sample size (including adopters) was reached. Class sizes were designed to produce a sample distribution of 20% female, 30% male farmer, and 50% male non-farmer household heads for each village. This distribution was chosen to obtain sub-samples sizes of approximately 50 to 60 cases for future analysis of lifestyle groups distinguished by gender, occupation, household structure (age), income and/or other key lifestyle factors (see Chapter 3). A reserve list of households was randomly selected for each class in case of absentees at the interview appointment. Table 5-1 compares census characteristics of household heads in the six sample villages to those in the sample. The actual distribution of sample households deviates slightly from the planned distribution because census occupation was not always correct and occasionally absentees were replaced by households from a different class on the reserve list.

In effect, the overall sample proportions are biased by the sampling procedure but within each group (village type by household category) the proportions should be representative of that group. Weighting will be used to make the sample proportions representative of households in the six villages and, ultimately, of households in all rural Zou villages.

One female and three male interviewers conducted individual oral interviews in Fon to administer the questionnaire to household heads. All four were native Fon-

speakers with previous survey experience in the study area. All but one were University-educated. Their training lasted three weeks and included participation in drafting and translating the final versions of the questionnaire into Fon, role playing, pre-testing the questionnaire in focus groups and individual interviews, and organizing the census in each sample village. Fon translation was refined and checked using bi-directional Fon-French translation between pairs of interviewers. In addition, a linguistic expert and a public health researcher assisted in translation, training, and later with supervision of the fieldwork.

TABLE 5-1. Sample and Population Distribution of Household Heads in Six Sample Villages Based on Village Census Information

Village (Type ^a)	Sample N (unadjusted)				Population N and (%)			
	Total	Females	Male farmers	Male non-farmers	Total	Females	Male farmers	Male non-farmers
Makpehogan (4)	40	9	13	18	136	9 (6.6%)	77 (56.6%)	50 (36.8%)
Alomankanme (4)	40	8	12	20	146	51 (34.9%)	38 (26.0%)	57 (39.0%)
Zounzonme (3)	40	10	12	18	298	87 (29.2%)	129 (43.3%)	82 (27.5%)
Goutchon (3)	40	10	15	15	216	53 (24.5%)	134 (62.0%)	29 (13.4%)
Adanhondjigon (2)	80	15	28	37	253	34 (13.4%)	165 (65.2%)	54 (21.3%)
Tchogbodo (1)	80	17	34	29	194	98 (50.5%)	63 (32.5%)	33 (17.0%)
Total	320 ^b	69	114	137	1243 ^c	332	606	305
row %	100%	21.6%	35.6%	42.8%	100%	26.7%	48.8%	24.5%
% from survey ^d	100%	21.7%	35.3%	43.1%	100%	26.7%	41.2%	32.1%

^a Type 1=urban fringe villages, 2=non-urban sub-prefecture capitals, 3=commune seat villages, 4=small remote villages (see Chapter 4, Table 4-10 for details)

^b A total of 3 female, 15 male farmer and 20 male non-farmer adopters included in the sample

^c A projected total of 9 female, 23 male farmer and 29 male non-farmer adopters in all six villages based on actual adoption and occupations from the survey which differ from those recorded in the census. The implication is that 6 female, 8 male farmer and 9 male non-farmer adopters were missed by the survey.

^d These percentages are based on occupations stated by respondents interviewed in the survey rather than occupations recorded by village census takers in the pre-survey census.

Particularly challenging for this survey was getting respondents, who were mostly illiterate, to quantify accurately their attitudes on the scales designed to measure them. After testing several approaches, including a method using greenness of leaves to represent intensity of feeling, a two-step approach was chosen (Hounsa et al. 1994). First, a simpler scale was presented consisting of the two opposing sides and the mid-point (“neither one nor the other”) of a typical 7-point bipolar scale. Then, respondents who chose one of the sides (poles) were asked to indicate the intensity of their attitude by choosing among three levels. For example, in measuring feelings about the cleanliness of latrines, respondents were first asked if they felt a latrine was “dirty, clean, or neither dirty nor clean”. Respondents choosing dirty or clean were then asked whether they felt it was “very dirty (clean)”, “somewhat dirty (clean)”, or “a little dirty (clean)”. While it does not appear that this method biased responses toward neutral (the average proportion of neutral responses for the 29 questions with a 7-point scale was 9.9% with a minimum of 0% and maximum of 30.6% for one of the indirect beliefs), there is a risk that the neutral point is misunderstood to mean “not applicable” rather than “in the middle”. The 4-point scale measuring the importance of advantages and disadvantages was presented slightly differently: the initial step asked to choose between “not important” and “important”, and intensity was measured only if “important” was picked.

Survey administration in each village proceeded in several steps. After the census, a date was picked to return for interviews. The list of sample households drawn from the census was given to the village chief and each household head was informed of the survey, asked to participate, and assigned a day to be interviewed. Each interviewer completed an average of five interviews a day. Interviews lasted an average of 82

minutes. One of the interviewers was responsible for assigning sample households to each interviewer and checking questionnaires for accuracy and completeness. Each day questionnaires were further checked and coded by the author. Problems were discussed at regular meetings with interviewers. When necessary, an interviewer would return to visit an interviewee to correct, complete, or clarify responses. The 320 interviews were completed over four weeks during November and December 1996.

Several difficulties were anticipated and efforts were made to minimize their effects. First was the general unfamiliarity of the population with attitude measurement scales requiring interviewers to use special methods and verbal instructions. Early in the survey, it was discovered that many respondents had trouble rating the relative importance of advantages to them personally without asking them each time to compare their rating of a given statement to the last statement they rated as “very important”. This required vigilance and care in the interviews. While it appears that one or two of the interviewers, prior to the field supervision, were less vigilant about this, interviewer effects in the data are confounded by significant differences in interviewee characteristics for each interviewer (i.e., number of females, adopters, or intenders).

Another set of problems was posed by the context of latrines in Benin as a socioeconomic status symbol and a subject of government and development agency health education campaigns. It was thought that respondents might try to respond to questions to impress or please the sponsors of the survey hoping to receive a free or subsidized latrine in the future. To try to reduce this effect, the purpose and outcome of the survey were carefully explained to the village committee in charge of preparations and again in the introduction to each interview. It was emphasized that the survey was not

part of any project, but was only a study to understand better the defecation practices and village conditions that might explain recent outbreaks of cholera in the region. Cholera is a familiar disease believed by most people to be spread (somehow) by feces so it created a legitimate reason for talking about defecation and feces management. These efforts helped to reduce these biases but probably did not eliminate them.

About half way through the survey, interviewers were observed by the public health researcher who had assisted in training to compare their approaches on critical attitude measurement questions and other aspects of the interview. It was discovered that differences in phrasing some attitude questions was affecting the use of the bipolar attitude measurement scales. The style used by two interviewers appeared to maximize the full use of the scales while that of another interviewer seemed to reduce it to a dichotomous response. The fourth interviewer's approach and results lay between these two situations. At this point phrasing of instructions for all attitude questions was standardized according to the approach found to maximize scale use and used in the last 100 interviews. Unfortunately, it was not possible to schedule this field supervision sooner. Interviewer effects will be investigated in Chapter 7.

4. RESULTS

This section discusses general results from the survey and examines some differences between sub-groups of households. Demographic characteristics, amount of adoption (preference and intention), attitude toward latrines, advantages representing drives for adoption, and constraint factors are presented by class (female, male farmer, male non farmer) and by adopter status. These three classes are potentially informative as a basis for market segments. All results represent the actual population of households in

the six sample villages and were computed by weighting cases to adjust the sample distribution of heads to the population distribution.

4.1 Demographic Characteristics of Household Heads

Household heads had a median age in the category 41-50 years old and were 26.7% female and 73.3% male. Overall the primary occupation was farming (45.0%), followed by self-employed crafts and skilled trades (16.0%), petty trading (14.9%), food and agricultural cottage industries (5.3%), large-scale commerce (3.9%), traditional services (3.1%), manual labor (3.1%), and government employee or retiree (3.0%). The remaining categories had 5.8%. Median income per day fell in the range 250-500 Frs. CFA with 16% earning more than 1000 Frs. CFA and 23% less than 250 Frs. CFA. At the time of the survey 500 Frs. CFA equaled one U.S. dollar. Mean household size, including the head, was 9.00 people of which 2.15 were children 6 years old and under. Voodoo was the religion practiced by 72% of household heads, followed by Catholicism (18%) and Protestantism or Protestant sects (Christianism Celeste and others) (6%). Females were much more likely to be widowed, divorced, or single (62.4%) than males (4.3%). Married heads were more likely to be polygamous (56.3%) than monogamous. Only 26.8% had attended any school and 8.7% had reached secondary levels. The most common group activity was membership in a *tontine* (8.5%), an informal system of savings, loans, and mutual aid. The majority did not participate in any groups (63.5%). At some point in their lives most household heads had lived out of the village (71.0%), while 37.8% had lived in a foreign country. In the last two months 19.6% had traveled, destined mostly for urban centers in Benin. Demographic characteristics are summarized

in Table 5-2. These could be used in future research to identify lifestyle-based market segments (Salomon and Ben-Akiva 1983).

TABLE 5-2. Demographic Characteristics of Household Heads of Six Sample Villages by Group

Characteristic	Overall	Females	Males	Male farmers	Male non-farmers	Adopters	Non-adopters
N (adjusted) ^a	320 ^b	85	235 ^b	132 ^c	103 ^d	16	304 ^e
<u>Age (years)</u>							
• median age category	41-50	51-60	41-50	41-50	41-50	51-60	41-50
• over 60 years old	23.2%	31.7%	20.2%	25.9%	12.9%	34.2%	22.7%
• 30 years old and under	14.7%	7.3%	17.4%	12.3%	24.0%	15.3%	3.0%
<u>Income (Frs. CFA/day)</u>							
• median income category	250-500	< 250	501-1000	501-1000	501-1000	501-1000	250-500
• under 250	23.0%	58.0%	9.9%	14.7%	3.8%	10.4%	23.7%
• over 1000	17.9%	-	24.6%	20.7%	29.6%	49.1%	16.2%
<u>Religion</u>							
• Voodoo	71.5%	81.4%	67.9%	73.3%	60.9%	53.8%	72.4%
• Catholic	18.1%	12.7%	20.0%	17.0%	23.9%	37.4%	17.1%
• Protestant or sects	6.5%	5.8%	6.7%	4.4%	9.7%	8.7%	6.4%
<u>Education</u>							
• Attended school	26.8%	1.9%	35.9%	25.1%	49.8%	39.6%	26.2%
• Reached secondary school	8.7%	-	11.9%	5.1%	20.7%	18.2%	8.2%
<u>Household</u>							
• mean size	9.0	5.8	10.2	10.4	9.8	15.6	8.7
• mean children 6 and under	2.2	1.5	2.4	2.4	2.4	3.7	2.1
<u>Primary occupation</u>							
• farmer	45.0%	14.0%	56.2%	100%	-	35.3%	45.4%
• self-employed crafts or skilled trades	16.0%	4.5%	20.2%	-	46.3% ^f	12.4% ^g	16.3%
• petty trading	14.9%	47.2%	3.1%	-	7.1%	2.5%	15.6%
• cottage industry food or agricultural processing	5.3%	8.5%	4.2%	-	9.5%	2.2%	5.5%
• large-scale commerce	3.9%	9.2%	1.9%	-	4.4%	20.5%	3.0%
• manual labor	3.1%	5.7% ^h	2.1%	-	4.9%	2.5% ⁱ	2.2%
• traditional services (Voodoo priest, healer, herbalist, etc.)	3.1%	-	4.2%	-	9.6%	2.2%	3.1%
• government employee or retiree	3.0%	-	4.1%	-	9.4%	19.4%	2.2%
• housewife	2.4%	8.8%	-	-	-	-	2.5%
• other (nothing, other salaried employment)	3.4%	2.0%	3.9%	-	8.9%	3.0%	3.4%

TABLE 5-2. Continued

Characteristic	Overall	Females	Males	Male farmers	Male non-farmers	Adopters	Non-adopters
<u>Marital status</u>							
• divorced, widowed or single	19.7%	62.4%	4.3%	5.0%	3.5%	14.8% ^j	20.0%
<u>Group involvement</u>							
• active in some group	36.5%	23.0%	41.4%	36.2%	48.0%	50.9%	35.7%
• active in a tontine	8.5%	5.9%	9.5%	8.8%	10.5%	1.6%	8.9%
<u>Mobility and travel</u>							
• migrated in Benin	71.0%	62.7%	74.0%	67.6%	82.3%	84.4%	70.3%
• migrated to foreign country	37.8%	21.6%	43.8%	33.8%	56.3%	58.0%	36.8%
• traveled in last two months	19.6%	12.3%	22.3%	15.7%	30.9%	42.0%	18.4%
^a Numbers rounded to nearest integer							
^b At most 7 cases with missing data							
^c At most 5 cases with missing data							
^d At most 2 cases with missing data							
^e At most 4 cases with missing data for any given value							
^f 21.4% new skilled trades and 24.9% traditional crafts and skilled trades							
^g 8.3% new skilled trades and 4.1% traditional crafts and skilled trades for adopters compared to 6.8% new and 9.5% traditional for non-adopters							
^h All unskilled							
ⁱ All in foreign country							
^j All females							

Female household heads differed from male ones in the following ways: median age was older (51-60 years old compared to 41-50 years old for males), median income was lower (less than 250 Frs. CFA/day compared to 501-1000 Frs. CFA/day for males), more practiced Voodoo (81.4% to 67.9%), almost none had attended school (1.9% to 35.9%), fewer participated in a group activity (23.0% to 41.4%), their households were on average smaller (5.85 people compared to 10.15) with fewer children six years and under (1.53 to 2.38), and fewer had migrated from the village and traveled. The primary occupation of female heads was petty trading (47.2%), followed by farming (14.0%), large-scale commerce (9.2%), housewife (8.8%), food and agricultural cottage industries (8.5%), unskilled manual labor (5.7%), self-employed crafts and skilled trades (4.5%) and nothing (2.0%).

Among male household heads, while median age and income categories were the same and household structure was similar, non-farmers differed from farmers in the following ways: more were 30 years old and under (24.0% to 12.3% for farmers), less were over 60 years old (12.9% to 25.9%), more had incomes above 1000 Frs. CFA/day (29.6% to 20.7%), less had incomes below 250 Frs. CFA/day (3.8% to 14.7%), fewer practiced Voodoo (60.9% to 73.3%), more had attended school (49.8% to 25.1%), more participated in a group activity (48% to 36.2%) and more had traveled and migrated from the village.

4.2 Amount of Adoption

Only 4.9% of household heads in the six sample villages were adopters, however, 17.3% used latrines to defecate. Latrines used by non-adopters belonged to a family relation, and to a neighbor or landlord (68.9% and 4.6% of users respectively). Females were less likely to adopt than males (2.7 % compared to 5.7%) but more likely to use latrines (23.7% to 15.4%). Only two villages, Tchogbodo and Goutchon, had female adopters. Two other villages had no female users (Makpehogon and Adanhondjigon). Survey results indicated that Makpehogon had the highest overall rate of adoption (8.8%) followed by Goutchon (7.9%), Tchogbodo (6.7%), Zounzonme (3.7%), Adanhondjigon (2.8%), and Alomakanme (0.7%). While almost no adopters lived in Alomakanme, 21.3% of heads used a latrine installed by a relative who had moved away from the village. The phenomenon of adoption by former residents of the village was also apparent in Tchogbodo and Goutchon. Among males, non-farmers were more likely than farmers to adopt (7.6% to 4.2%) except in Tchogbodo, and more likely to use latrines (19.2% to 11.6%) except in Goutchon.

Demographic differences between adopters and non-adopters, besides gender and occupation, include: older median age category (51-60 years compared to 41-50 years), higher median income (501-1000 Frs. CFA/day to 250-500 Frs. CFA/day), greater percent with incomes over 1000 Frs. CFA/day (49.1% to 16.2%), larger households (15.6 to 8.7 people) with more children six years and under (3.7 to 2.1), fewer Voodoo followers (52.8% to 72.4%), more Catholics (37.4% to 17.1%), higher rate of school attendance (39.6% to 26.2%) and of reaching secondary levels (18.2% to 8.2%), less involvement in tontines (1.6 % to 8.9%) but more overall group involvement (50.9% to 35.7%), more migration in Benin (84.4% to 70.3%) and to foreign countries (58.0% to 36.8%), and more travel in the last two months (42.0% to 18.4%). Interpretation of adopter characteristics should consider the fact that adopters installed their latrine some time in the past, on average 14.8 years ago. Some characteristics are also likely to be correlated, such as income with age (up to a certain point), education, and household size. Income and education are also correlated with gender and occupation in Benin.

Preference for latrines

The hypothetical frequency of choosing to use a household latrine to defecate failed to adequately capture variability in preference: 96.9% of household heads (adjusted N=310 out of 320) said they would “always or almost always” choose to defecate in a latrine at their house rather than in the open. Among the remaining ten, nine chose “often” and one (a male farmer) chose “very little”. From earlier qualitative work preparing this survey, it was expected that more people would prefer open defecation. In retrospect, this question suffered from several weaknesses: first, using and adopting latrines are distinctly separate choices, making it difficult to infer preference for one from

preference for the other; second, the social and economic status associated with latrines and a desire to please the interviewer (two biasing factors mentioned earlier) may have influenced respondents' answers here; and third, the choice may have been too unqualified and hypothetical to distinguish differences in peoples' desire for and favorableness toward latrines. Only slightly more variability was measured about the hypothetical frequency of choosing a household latrine for children to defecate (90.3% or adjusted N=291 out of 317 indicated a frequency of "always or almost always"). No difference in response by class was apparent.

When specifications were given for a communal (public) latrine located at about 300 paces (meters) away, a very large variation in frequency of choosing was captured. Those stating they would "always or almost always" use this communal latrine to defecate dropped to 29.6%. The median stated frequency was "sometimes" with 18.9% of heads indicating that they would "never or almost never" choose it. Overall, 56.4% of heads knew what a communal latrine was. Females had the highest rate of knowing (63.4%) and male non-farmers the lowest (49.6%). Differences in preference were notable for females and for those with prior knowledge of a communal latrine. Females, irrespective of prior knowledge, showed the least preference for a communal latrine (median frequency of "very little"). Both male farmers and non-farmers with prior knowledge showed an increased preference compared to those without prior knowledge (median frequency of "often" compared to "very little"). Comments made by respondents suggest that distance, smelly and dirty conditions from too many users, and lack of maintenance would cause many to prefer open defecation. Average distance to an open defecation site was 106 paces (meters), considerably less than the hypothetical distance to

a communal latrine. Although average distance was similar for all three groups, females perceived it to be farther than males (“neither near nor far” compared to “a little near”).

Intention to adopt

Questions measuring intention more successfully captured variability than those measuring preference. Figure 5-2 shows intention to adopt a latrine in terms of stated probability of implementing this intention in the next two years among all heads of the six sample villages. Only 24.6% had any intention to adopt a latrine at this time. Rate of intention was similar in all villages except Makpehogon where it was unusually high (51.4%). Females’ rate of intention was much lower than males’ (6.1% to 31.9%) and occurred only in Tchogbodo and Zounzonme. Among males, farmers had a slightly higher rate of intention than non-farmers (33.6% to 29.3%) except in Tchogbodo and Goutchon. Median age of heads with positive intention (5,6, or 7) was similar to the median age of adopters at adoption (41-50 years compared to 36-45 years).

Among those intending to install a latrine (adjusted N=79) three men had put some money aside and three others had actually started building. Such actions signify that adoption has already been chosen. For the rest of this dissertation adopters include these six additional cases for a new adjusted total of 22 out of 320 or 7.0% of household heads. The rate of adoption by females (2.7%) is unchanged by this addition but now increases for males such that adoption among farmers and non-farmers is similar (8.1% to 9.2% respectively).

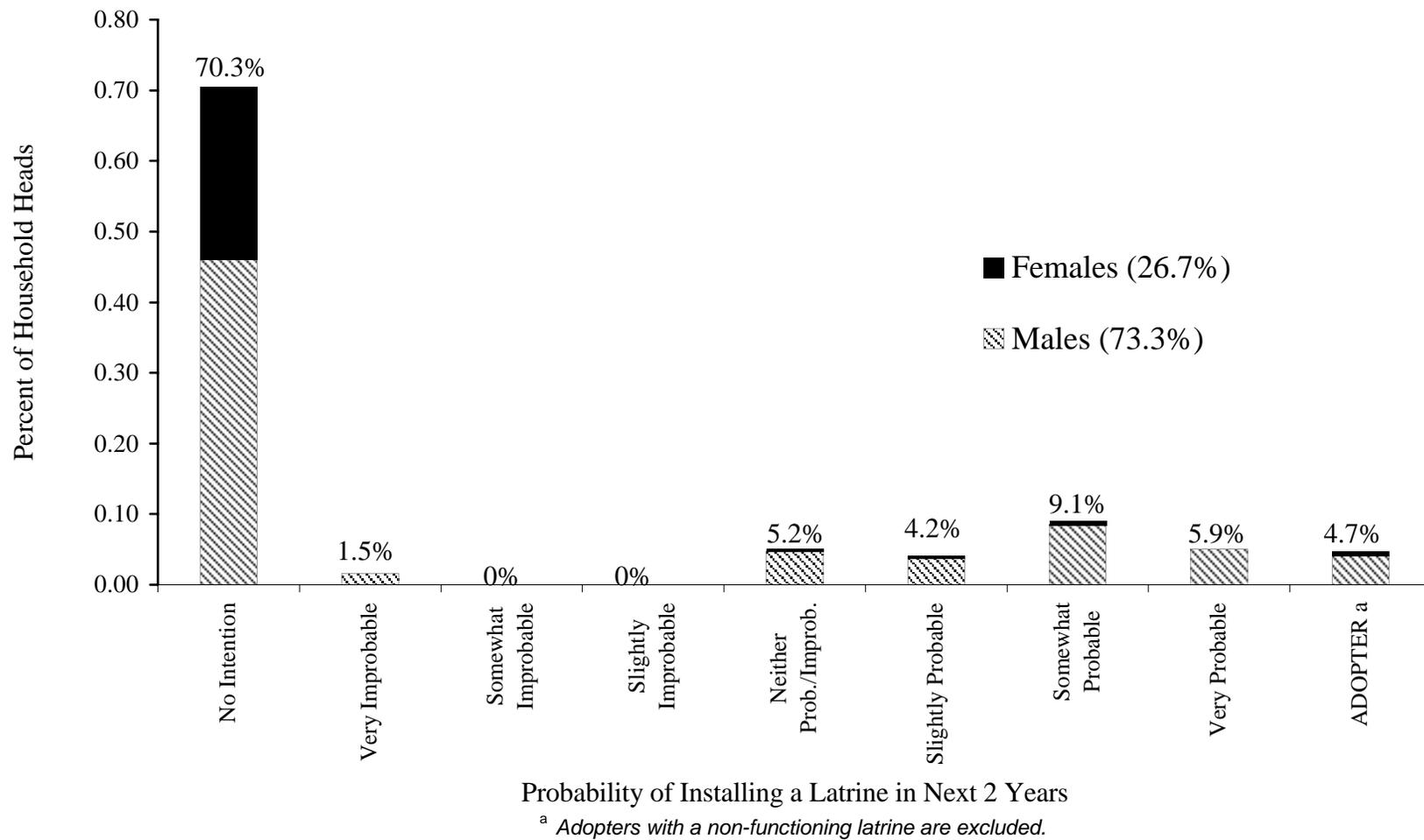


FIGURE 5-2. Intention to Adopt a Latrine Among Household Heads of Six Sample Villages (N=319, data missing for 1 case)

4.3 Attitude Toward Latrines

Attitude toward latrines was ascertained from respondents' ratings on a semantic differential scale of 1 (most negative) to 7 (most positive) of the following nine qualities: cleanliness (dirty/clean), safety (dangerous/safe), convenience (convenient/inconvenient), smell (smelly/not smelly), health (unhealthy/healthy), usefulness (useful/useless), comfort (uncomfortable/comfortable), privacy (indiscreet/private), and suitability (unsuitable/suitable). Respondents also rated these qualities for open defecation at their current (for latrine non-users) or most likely alternative site (for latrine users). Current sites were the bush (81.3% of all heads), the garbage pile at night (1.7%), or other (a hillside, behind the house, etc.) (1.4%). The most likely alternative site for 100% of latrine users was the bush. Average ratings, standard deviations, and the average sum of scores are shown in Table 5-3. The average difference between a respondent's rating of latrines and open defecation is shown in the last column. Table 5-4 and 5-5 compare average attitudes toward latrines and open defecation by class and adopter status. Independent samples t-tests for equality of means were computed for females and males, male farmers and non-farmers, and adopters and non-adopters. Two-tailed significance (p value) of the t test is indicated by stars. In the text, all p values are two-tailed unless specified otherwise.

Overall results

The most highly rated qualities of latrines were privacy, followed by usefulness and suitability. The lowest rated qualities were smell, followed by health and cleanliness. Convenience, comfort, and safety were in the middle. Standard deviations (difference of opinion) were larger for lower rated latrine qualities. Concerning open defecation, household heads rated the cleanliness, followed by smell and comfort of their alternative

site the lowest, and privacy, followed by convenience and usefulness, the highest. Standard deviations were larger for higher rated qualities. In all cases, average scores were more favorable for latrines than for open defecation. The difference between latrines and open defecation was greatest for suitability, followed by cleanliness and comfort, and lowest for smell, followed by privacy and safety. Suitability implies social propriety or the social “properness” of latrines for defecation and its high rating is thought to reflect the social status they carry. Standard deviations of the differences were similar.

TABLE 5-3. Attitudes Toward Latrines and Open Defecation Among Household Heads (N=320^a) of Six Sample Villages

Quality	Latrines ^b		Alternative ^b		Difference ^c	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
clean	6.26	1.31	1.63	1.11	4.63	1.75
safe	6.46	1.02	2.43	1.62	4.03	2.04
convenient	6.70	0.78	2.60	1.85	4.10	2.00
not smelly	4.80	1.69	1.91	1.30	2.89	2.14
useful	6.81	0.60	2.60	1.99	4.20	2.09
healthy	6.16	1.32	2.01	1.51	4.15	2.05
comfortable	6.54	0.97	1.92	1.48	4.62	1.71
private	6.90	0.51	2.94	1.81	3.95	1.89
suitable	6.74	0.67	2.02	1.56	4.73	1.77
sum of 9 qualities	57.40	5.83	20.07	9.97	37.27	11.93

^a At most 1 missing case for any given value
^b Possible scores range from 1 point (most negative rating) to 7 points (most positive rating) for each quality and from a minimum of 9 to a maximum of 63 points for the sum
^c Possible scores range from -6 to +6 points for each difference and from -56 to +56 for the sum of differences

The sum of ratings for latrines is considered a composite measure of favorable feeling or attitude toward latrines and a key determinant of preference. Likewise, the sum of differences is a measure of respondents’ relative favorableness toward latrines over open defecation at their most likely site. Because the data for both these composite attitudes show much better variability than the hypothetical preference question, they may offer better discriminators of preference.

TABLE 5-4. Comparison of Female (N=85^a) and Male (N=235^a), and Male Farmer (N=132^a) and Male Non-farmer (N=102^a) Attitudes Towards Latrines and Open Defecation

Quality	Latrines ^b		Open defecation ^b		Difference in scores ^c		Latrines ^b		Open defecation ^b		Difference in scores ^c	
	Females	Males	Females	Males	Females	Males	Male farmers	Male non-farmers	Male farmers	Male non-farmers	Male farmers	Male non-farmers
clean	6.39	6.21	1.57	1.65	4.82	4.55	6.21	6.20	1.68	1.61	4.53	4.59
safe	6.45	6.46	2.33	2.46	4.12	4.00	6.38	6.57	2.59	2.30	3.78 *	4.27
convenient	6.85 ***	6.65	2.05 ***	2.81	4.81 ****	3.84	6.56 *	6.77	2.80	2.81	3.76	3.95
not smelly	4.40 **	4.95	1.76	1.97	2.63	2.98	5.08	4.78	1.94	2.00	3.14	2.78
useful	6.94 ****	6.76	2.26 *	2.73	4.69 **	4.03	6.69 *	6.85	2.77	2.67	3.91	4.18
healthy	6.16	6.16	1.99	2.01	4.17	4.15	6.10	6.23	2.10	1.89	4.00	4.33
comfortable	6.53	6.55	1.89	1.92	4.62	4.63	6.48	6.64	1.89	1.96	4.58	4.68
private	6.92	6.89	3.12	2.88	3.80	4.01	6.83 *	6.96	2.65 **	3.17	4.18	3.79
suitable	6.94 ****	6.67	1.81	2.09	5.13 **	4.58	6.58 **	6.78	2.10	2.07	4.48	4.71
sum of 9 qualities	57.57	57.34	18.79	20.54	38.66	36.78	56.91	57.90	20.58	20.50	36.34	37.34

Note: Stars indicate 2-tailed significance of independent samples t-test comparing mean scores for females and males, and male farmers and non-farmers: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.005$, and **** $p < 0.0005$

^a At most 1 missing case for any given value

^b Possible scores range from 1 point (most negative rating) to 7 points (most positive rating) for each quality and from a minimum of 9 to a maximum of 63 points for the sum

^c Possible scores range from -6 to +6 points for each difference and from -56 to +56 points for the sum of differences

Differences between females and males

Females rated latrines significantly ($p < 0.05$) higher than males for convenience, usefulness, and suitability, and significantly lower for smell (see Table 5-4). They also rated cleanliness higher but the difference was not significant (one-tailed $p = 0.11$). For all qualities except privacy, females rated open defecation lower than males. However, only their rating for convenience was significantly lower. Differences relative to open defecation confirm that females rate convenience, usefulness, and suitability of latrines significantly higher than males. Females' notably lower overall score for open defecation and higher relative score for latrines were not quite significantly different from males' (one-tailed $p = 0.08$ and 0.11 respectively).

Differences between male farmers and non-farmers

Table 5-4 shows that farmers rated safety, convenience, usefulness, privacy, and suitability of latrines lower than non-farmers. These differences were significant or almost significant ($p < 0.10$). Farmers' overall attitude toward latrines was lower than non-farmers though the difference was not significant (one-tailed $p = 0.11$). Overall attitude toward open defecation was the same for both groups, however, farmers rated its privacy significantly lower and its safety not quite significantly higher (one-tailed $p < 0.10$). Relative scores for latrines confirm that farmers view their safety lower than non-farmers, although again the difference was not quite significant ($p = 0.07$). Concern for safety is thought to reflect misunderstandings and psycho-physical aversion, two factors discussed in the section on constraints later in this chapter. Farmers also viewed the convenience, usefulness, health, and suitability of latrines compared to open

defecation lower than non-farmers, and smell and privacy higher though these differences were not significant.

Differences between adopters and non-adopters

Significant differences in attitudes between adopters and non-adopters in Table 5-5 are consistent with the expectation that favorable attitudes shape a positive preference for latrines needed for adoption to be chosen. Specifically, adopters felt latrines were significantly less smelly, more private, and more suitable than non-adopters. Their overall attitude toward latrines was more favorable than non-adopters' though not quite significantly so (one-tailed $p < 0.10$).

TABLE 5-5. Comparison of Adopter (N=22^a) and Non-Adopter (N=298^a) Attitudes Toward Latrines and Open Defecation in Six Sample Villages

Quality	Latrines ^b		Open defecation ^b		Difference in scores ^c	
	Adopters	Non-adopters	Adopters	Non-adopters	Adopters	Non-adopters
clean	6.33	6.26	1.87	1.61	4.46	4.64
safe	6.37	6.46	2.53	2.42	3.84	4.04
convenient	6.84	6.69	2.07	2.65	4.77	4.05
not smelly	5.75 *** ^d	4.73	1.37 **	1.95	4.38 ****	2.78
useful	6.93	6.80	2.82	2.58	4.11	4.21
healthy	6.37	6.14	1.32 ****	2.06	5.05 **	4.08
comfortable	6.39	6.56	1.30 ****	1.96	5.10 *	4.59
private	7.00 ****	6.89	2.38	2.99	4.62 *	3.90
suitable	6.98 ****	6.72	1.39 ***	2.06	5.60 ****	4.66
sum of 9 qualities	58.96	57.29	17.04 *	20.31	41.92 **	36.92

^a At most 1 missing case for any given value

^b Possible scores range from 1 point (most negative rating) to 7 points (most positive rating) for each quality and from a minimum of 9 to a maximum of 63 points for the sum

^c Possible scores range from -6 to +6 points for each difference and from -56 to +56 for the sum of differences

^d Two-tailed significance of two independent samples t-test of difference in mean scores is indicated by * ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.005$), and **** ($p < 0.0005$)

Adopters viewed open defecation as significantly more smelly, and significantly less healthy, comfortable, and suitable than non-adopters. Lower adopter views of the convenience and privacy of open defecation were not significantly different from non-

adopters', although the one-tailed difference for lower convenience and lower overall attitude toward open defecation was significant (one-tailed $p < 0.05$). Finally, adopters' overall attitude toward latrines relative to open defecation was significantly much more favorable than non-adopters' based on significantly different relative scores for smell, health, and suitability. The one-tailed p-values of differences show that adopters rated latrines relative to open defecation significantly higher (one-tailed $p < 0.05$) than non-adopters for all qualities except usefulness, safety, and cleanliness. These latter qualities were rated slightly lower by adopters, although not significantly different even at the one-tailed level. While perceptions of these three attributes may be less important in shaping latrine preference for current adopters (mostly males), it would be false to assume that this is true for preference in general because these attitudes may have changed as a result of adoption, and implementation constraints may prevent some preferers from becoming adopters.

4.4 Advantages of Installing a Latrine (Drives Motivating Adoption)

Personal importance of 19 advantages of installing a latrine was measured to assess the presence of 11 possible drives motivating adoption (see Chapter 3, Table 3-4). Table 5-6 lists advantages in descending average importance on a 4-point scale. Respondents were also asked to select their first, second and third most important advantage for wanting to install a latrine. Table 5-7 ranks advantages by decreasing frequency of selection as the first most important. In Table 5-8 advantages are ranked by a composite "importance" score calculated by assigning three points whenever the advantage was selected as first most important, two points when it was selected as second most important, and one point when it was selected as third most important. A

spontaneous advantage, “for health”, was frequently mentioned as one of the three most important and is included in all three tables. “For health” has special significance for sanitation programs because it indicates awareness of the official message used to promote latrines in Benin and in most developing countries. Other spontaneous advantages selected as most important were rare and could be more or less matched with one of the 19 listed advantages. Overall results from the three tables are discussed next and then differences between females and males, male farmers and non-farmers, and adopters and non-adopters are examined.

Overall results

The ten most commonly perceived advantages in the six sample villages (i.e., having the highest average importance in Table 5-6), in descending order, were:

1. to avoid discomforts of the bush,
2. to gain prestige from visitors,
3. to avoid dangers at night,
4. to avoid snakes,
5. to reduce flies in my compound,
6. to avoid risk of seeing/smelling feces in the bush,
7. to protect my feces from enemies,
8. to have more privacy to defecate,
9. to keep my house/property clean, and
10. to feel safer.

TABLE 5-6. Average Importance^a of Advantages of Latrine Adoption among Household Heads of Six Sample Villages

Drive ^b	Advantage	Overall N=320 ^c	Females N=85 ^c	Males N=235 ^c	Male farmers N=132	Male non- farmers N=103 ^c	Adopters N=22	Non- adopters N=298 ^c
P2, WB4	avoid discomforts of the bush	3.98	4.00	3.98	3.98	3.97	3.94	3.99
P1	gain prestige from visitors	3.96	3.99	3.96	3.97	3.93	4.00 ** ^d	3.96
WB2, 3	avoid dangers at night	3.86	3.81	3.88	3.85	3.91	3.94	3.85
WB2, 3	avoid snakes	3.85	3.83	3.90	3.84	3.81	3.86	3.85
WB1, 3	reduce flies in my compound	3.81	3.84	3.80	3.78	3.83	3.78	3.81
WB2	avoid risk of smelling/seeing feces in the bush	3.78	3.88 ** ^d	3.74	3.67 **	3.84	3.94 **	3.77
WB2	protect my feces from enemies	3.71	3.86 **	3.65	3.58	3.74	3.78	3.70
WB5	have more privacy to defecate	3.67	3.64	3.68	3.62 *	3.76	3.89 ***	3.65
WB1	keep my house/property clean	3.59	3.65	3.57	3.52	3.62	3.83 **	3.57
WB2, 3	feel safer	3.56	3.53	3.57	3.51 *	3.66	3.67	3.55
WB1, 3, 4	save time	3.53	3.57	3.52	3.47	3.57	3.84 ***	3.51
P2, WB4	make my house more comfortable	3.50	3.51	3.49	3.46	3.53	3.82 ***	3.47
WB3	reduce my household's health care expenses	3.32	3.28	3.34	3.25 *	3.44	3.54	3.30
P3	leave a legacy for my children	3.16	3.42 **	3.07	3.02	3.13	3.35	3.15
WB5	have more privacy for household affairs	3.00	3.14 **	2.95	2.86 *	3.08	3.46 **	2.97
P2	make my life more modern	2.97	2.92	2.99	3.04	2.92	3.48 **	2.93
P4	feel royal	2.75	2.80	2.73	2.75	2.72	2.74	2.75
S1	make it easier to defecate due to age/sickness	2.62	2.70	2.59	2.87 ****	2.23	3.05 *	2.58
S2	be able to increase my tenants' rent	1.17	1.10	1.19	1.21	1.17	1.92 **	1.11
	for health (spontaneous)	1.27 ^e	1.21	1.29	1.29	1.30	1.05 ***	1.29

Note: Stars indicate two-tailed significance of independent samples t-test for equality of means: * ($p < 0.10$), ** ($p < 0.05$), *** ($p < 0.005$), and **** ($p < 0.0005$).

^a On a scale of 1=not important to 4=very important.

^b Drive number from Chapter 3, Table 4

^c At most 5 missing cases overall for any advantage of which all were non-adopters, 4 were female and one was a male non-farmer

^d Unequal variances assumed based on borderline significance of Levene test statistic

^e Respondents spontaneously mentioning this advantage as first, second, or third most important were given a score of 4, 3, and 2 respectively, the rest were given 1

TABLE 5-7. Most Important Advantage of Latrine Adoption Among Household Heads of Six Sample Villages

Advantage	Overall N=320	Females N=85	Males N=235	Male farmers N=132	Male non- farmers N=103	Adopters N=22	Non- adopters N=298
avoid discomforts of the bush	22.5%	31.8% (1) ^a	19.1% (2)	21.6% (1)	15.9% (2)	11.9% (3)	23.2% (1)
gain prestige from visitors	20.7%	9.0% (3)	25.0% (1)	20.0% (2)	31.5% (1)	33.7% (1)	19.7% (2)
for health (spontaneous)	6.8%	7.2% (4)	6.6% (4)	7.7% (5)	5.3% (4)	-	7.3% (3)
have more privacy to defecate	6.4%	6.9% (5)	6.2% (5)	8.3% (4)	3.4%	3.7%	6.6% (4)
make it easier to defecate due to age/sickness	5.9%	12.4% (2)	3.4%	3.4%	3.5%	2.7%	6.1% (5)
protect my feces from enemies	5.2%	5.0%	5.3%	5.9%	4.6%	3.4%	5.4%
avoid snakes	5.2%	0.7%	6.9% (3)	8.6% (3)	4.7%	9.6% (4)	4.9%
avoid risk of smelling/seeing feces in the bush	5.1%	6.8%	4.6%	6.1%	2.5%	2.7%	5.3%
feel royal	4.5%	3.3%	4.9%	1.9%	8.8% (3)	-	4.8%
avoid dangers at night	4.1%	3.1%	4.4%	5.8%	2.7%	4.0%	4.1%
reduce flies in my compound	3.7%	2.0%	4.3%	3.7%	5.0% (5)	3.2%	3.7%
reduce my household's health care expenses	2.2%	0.7%	2.8%	1.8%	4.1%	12.5% (2)	1.3%
keep my house/property clean	2.0%	3.1%	1.6%	1.7%	1.6%	3.3%	1.9%
leave a legacy for my children	1.3%	3.5%	0.5%	0.4%	0.7%	-	1.4%
feel safer	1.2%	-	1.7%	0.7%	2.9%	3.2%	1.1%
make my house more comfortable	1.2%	0.3%	1.5%	2.0%	0.8%	6.1% (5)	0.8%
save time	0.9%	2.6%	0.2%	-	0.5%	-	0.9%
Other ^b	1.2%	1.7%	0.9%	0.6%	0.6%	-	1.3%
Total	100%	100%	100%	100%	100%	100%	100%

^a Rank of the top five of the group in descending frequency as most important

^b Includes in descending order of overall frequency: spontaneous advantage "to make it easier for wife and/or children", none, and "to have more privacy for my household affairs"

TABLE 5-8. Composite Ranking of Advantages of Latrine Adoption Among Household Heads of Six Sample Villages

Advantage	Overall N=320	Females N=85	Males N=235	Male farmers N=132	Male non- farmers N=103	Adopters N=22	Non- adopters N=298
gain prestige from visitors	410 (21.4%) ^a	81 (15.8%)	329 (23.4%)	175 (22.1%)	154 (25.0%)	34.7 (25.8%)	375 (21.0%)
avoid discomforts of the bush	390 (20.3%)	129 (25.1%)	261 (18.5%)	140 (17.7%)	121 (19.7%)	22.1 (16.5%)	368 (20.6%)
avoid risk of smelling/seeing feces in the bush	138 (7.2%)	46 (9.0%)	91 (6.5%)	54 (6.8%)	37 (6.0%)	4.7 (3.5%)	133 (7.4%)
avoid snakes	134 (7.0%)	17 (3.4%)	116 (8.2%)	81 (10.2%)	35 (5.8%)	10.7 (8.0%)	123 (6.9%)
make it easier to defecate due to age/sickness	111 (5.8%)	45 (8.8%)	65 (4.6%)	48 (6.1%)	17 (2.8%)	4.6 (3.5%)	106 (5.9%)
reduce flies in my compound	92 (4.8%)	19 (3.8%)	72 (5.1%)	39 (4.9%)	33 (5.4%)	8.2 (6.1%)	83 (4.7%)
protect my feces from enemies for health (spontaneous)	91 (4.7%)	29 (5.7%)	61 (4.3%)	39 (4.9%)	22 (3.6%)	3.9 (2.9%)	87 (4.8%)
have more privacy to defecate	90 (4.7%)	18 (3.6%)	71 (5.0%)	38 (4.8%)	33 (5.4%)	1.0 (0.8%)	89 (5.0%)
avoid dangers at night	80 (4.2%)	21 (4.1%)	60 (4.3%)	47 (5.9%)	13 (2.1%)	6.5 (4.8%)	74 (4.1%)
leave a legacy for my children	74 (3.8%)	10 (1.9%)	64 (4.5%)	38 (4.8%)	26 (4.2%)	8.6 (6.4%)	65 (3.6%)
keep my house/property clean	58 (3.0%)	37 (7.1%)	22 (1.6%)	3 (0.4%)	19 (3.0%)	2.3 (1.7%)	56 (3.1%)
feel royal	54 (2.8%)	21 (4.1%)	33 (2.3%)	20 (2.5%)	13 (2.2%)	4.3 (3.2%)	50 (2.8%)
reduce my household's health care expenses	45 (2.4%)	8 (1.7%)	36 (2.6%)	7 (0.9%)	29 (4.8%)	-	45 (2.5%)
feel safer	34 (1.8%)	2 (0.3%)	33 (2.3%)	12 (1.5%)	21 (3.4%)	9.6 (7.2%)	24 (1.3%)
make my house more comfortable	34 (1.7%)	-	34 (2.4%)	11 (1.4%)	23 (3.7%)	6.4 (4.7%)	27 (1.5%)
save time	25 (1.3%)	1 (0.3%)	24 (1.7%)	18 (2.2%)	6 (1.1%)	4.5 (3.3%)	21 (1.2%)
other ^b	22 (1.2%)	15 (3.0%)	7 (0.5%)	5 (0.6%)	2 (0.4%)	0.4 (0.3%)	22 (1.2%)
missing	21 (1.0%)	6 (1.2%)	15 (1.1%)	6 (0.7%)	9 (1.4%)	1.6 (1.2%)	17 (0.8%)
Total points ^c	18 (0.9%)	6 (1.2%)	12 (0.9%)	11 (1.4%)	1 (0.2%)	0.5 (0.4%)	23 (1.3%)
	1920 (100.0%)	512 (100.0%)	1408 (100.0%)	792 (100.0%)	616 (100.0%)	134.4 (100.0%)	1788 (100.0%)

^a Percent of total points of the group (column)

^b Includes in descending order of overall composite rank: spontaneous advantage "to make it easier for wife and/or children", none, "to have more privacy for my household affairs", "to make my life more modern", and "to be able to increase my tenants' rent"

^c Total points for each group (column) equals $N \times (3+2+1)$

The two least commonly felt advantages were the two situational drives: “to make it easier to defecate due to age/illness” and “to be able to increase my tenant’s rent”. Very little separated the average importance of “to gain prestige from visitors” (prestige drive 1 (P1) in Chapter 3, Table 3-4) in second place from “to avoid discomforts of the bush” (well-being drive 4 (WB4) and P2 in Chapter 3, Table 3-4) in first place. The third, fourth, and tenth placed advantages mainly involve physical safety (WB2 and 3). The sixth and seventh reflect a drive to protect personal health and well-being (wealth) from various illnesses and threats believed in Fon culture to be transmitted by feces, either in their smell or sight, or by sorcery using feces stolen from the intended victim (WB2). The remaining top ten concern flies, privacy, and cleanliness (WB3, WB5, and WB1 respectively). Reducing flies has several explanations: it demonstrates knowledge about disease transmission by flies, represents food hygiene and health concerns, and expresses Fon beliefs about the polluting nature of flies and their attraction to feces.

In comparing Tables 6 and 7, we see that more commonly perceived advantages were not always selected as most important. While first and second place advantages are identical, three out of the remaining top ten are different. The spontaneous advantage “for health” was the third most-often cited as most important in Table 5-7 by 6.8% of heads. Two advantages with very low average importance in Table 5-6 (“to make it easier to defecate due to age/sickness” and “to feel royal”) were the fifth and ninth most-often cited as most important in Table 5-7. Such differences in ranking between Table 5-6 and 5-7 are evidence that some advantages may be more (less) commonly perceived but less (more) influential as reasons for deciding to adopt.

Table 5-7 shows that physical comfort (“to avoid discomforts of the bush”) was the single most frequent first advantage given for installing a latrine (22.5% of heads). Combined, four prestige-related advantages (“to gain prestige from visitors”, “to feel royal”, “to leave a legacy for my children”, and “to make my house more comfortable”) accounted for the most important reason of 27.7% of heads. Physical safety, taking together the advantages “to avoid snakes”, “to avoid dangers at night”, and “to feel safer”, was the most important reason of 10.5% of heads, while personal protection from threats attributable to feces left in the open was the most important reason for 10.3% of heads. Privacy was the most important reason for 6.4% and restricted mobility (situational drive 1 (S1) in Chapter 3, Table 3-4) for 5.9% of heads. Of the two more meaningful health advantages (aspects of WB3), only 2.2% of heads cited “to reduce my household’s health care expenses” as their most important reason while 3.7% cited “to reduce flies in my compound”. No heads cited “to increase my tenants’ rent” (S2) or “to make my life more modern” (an aspect of P2) as their first reason.

Composite rankings in Table 5-8 vary from those most-often cited as most important in Table 5-7. The two most-often cited advantages in Table 5-7 had the two highest composite scores in Table 5-8 but their positions were reversed. Other differences in the top five positions were: “to avoid risk of seeing/smelling feces in the bush” and “to avoid snakes” moved up in composite rank from their rank as most important; “for health” and “to have more privacy to defecate” moved down. Fifth place (restricted mobility) was the same in both rankings. Interestingly, “to reduce flies in my compound” moved up to sixth place in composite ranking from 11th in Table 5-7, and “to

leave a legacy for my children/descendants” became the second ranked prestige-related advantage in composite rankings (3.0% of points), surpassing “to feel royal” (2.4%).

In short, four prestige-related advantages had 28.1% of the composite importance points, “to avoid discomforts of the bush” 20.3%, physical safety advantages 12.5%, personal protection advantages 11.9%, restricted mobility 5.8%, “to reduce flies in my compound” 4.8%, “for health” 4.7%, and privacy 4.2%. The remaining seven advantages had 6.8% of the points.

Differences between females and males

Statistically significant differences in the average importance of advantages between females and males in Table 5-6 indicate that “to avoid risk of smelling/seeing feces in the bush”, “to protect my feces from enemies”, “to leave a legacy for my children/descendants”, and “to have more privacy for my household affairs” were more commonly perceived as important by females than males. Other notable but not quite significant (one-tailed $p < 0.10$) differences were females’ lower importance for “to increase my tenants’ rent” and higher importance for “to avoid discomforts of the bush” (unanimous rating of “very important”) and “to gain prestige from visitors”.

In Table 5-7 a much smaller proportion of females than males selected “to gain prestige from visitors” as their most important advantage for installing a latrine. In general, females were less likely to have a prestige-related primary motive for adoption (16.1%) than either male group (24.3% of farmers and 41.8% of non-farmers). Only “to leave a legacy for my children/descendants” was selected by more females than either male group. In contrast, females were much more likely than males to select “to avoid discomforts of the bush”. Comparing the other top five most important advantages,

females were noticeably more likely than males to select “to make it easier to defecate due to age/illness” and less likely to select “to avoid snakes” despite their greater superstition about them (see discussion of indirect beliefs later in this section). The large proportion of females over 60 year olds (31.7%) may explain why restricted mobility was the second most-often cited first advantage of females. Although “for health” was selected by a similar proportion of both sexes, females were less likely to choose the more precise health advantages (“to reduce my household’s health care expenses” and “to reduce flies in my compound”) as their first most important reason for adoption.

Female-male differences in Table 5-7 are confirmed by composite points in Table 5-8 with mostly smaller magnitudes, except for “to leave a legacy for my children/descendants” and “to avoid dangers at night” where the differences (positive and negative respectively) increased. On the other hand, composite rankings of the top five advantages were different from those in Table 5-7 for both groups. First place for females remained “to avoid discomforts of the bush”, but “to gain prestige from visitors” moved up to second, “to avoid risk of smelling/seeing feces in the bush” moved up to third, “to make it easier to defecate due to age/illness” moved down to fourth, and “to leave a legacy for my children/descendants” moved up to fifth. For males, the first three advantages in Table 5-7 (prestige, physical comfort, and snakes) held the same positions in composite ranking accounting for 50.1% of the group’s points. In fourth and fifth places were “to avoid risk of smelling/seeing feces in the bush” and “to reduce flies in my compound”.

In general both Table 5-7 and 5-8 show that prestige (except for “to leave a legacy for my children/descendants”) and physical safety were less often the motives of females

(24.9% and 5.3% respectively of composite importance points in Table 5-8) than males (29.3% and 15.3% respectively of points) to adopt latrines, while physical comfort, personal protection, and restricted mobility were more often females' (25.1%, 14.7%, and 8.8% respectively of female points) than males' motives (18.5%, 10.8%, and 4.6% respectively of male points). Males were more likely to state a health motive than females (12.5% and 7.8% of male points respectively for "for health" and the two health-related advantages compared to 7.4% and 4.1% of female points). Privacy was equally likely as a reason of both groups. Cleanliness and convenience ("to save time") were not frequent motives, but females were more likely than males to state them.

Differences between male farmers and non-farmers

In Table 5-6 male non-farmers felt the importance of "to avoid smelling/seeing feces in the bush" significantly more than male farmers but felt the importance of the situational advantage "to make it easier to defecate due to age/illness" significantly less. The latter difference may reflect, as with women, the larger portion of over 60 year olds among male farmers compared to non-farmers (25.9% to 12.9%). On average, "to have more privacy to defecate", "to feel safer", "to reduce my household's health care expenses", and "to have more privacy for my household affairs" were less important for farmers than non-farmers although these differences were not quite significant at the two-tailed level ($0.10 < p < 0.05$).

Farmers' first most important advantage for wanting to install a latrine (Table 5-7) was "to avoid discomforts of the bush" closely followed by "to gain prestige from visitors". The order of these two was reversed and the spread much larger for non-farmers. Farmers' third and fourth most-often cited advantages were "to avoid snakes"

and, unexpectedly, “to have more privacy to defecate”. These were in sixth and tenth place respectively for non-farmers. Farmers were also more likely than either females or male non-farmers to cite both these advantages as their most important. Non-farmers selected “to feel royal” and “for health” in third and fourth place, respectively, as most important. For farmers these were in twelfth and fifth place respectively. Overall, male farmers selected a physical safety or personal protection advantage more frequently (15.1% and 12.0% respectively) than non-farmers (10.3% and 7.1%) but selected a prestige advantage less frequently (24.3% to 41.8% for non-farmers). An unexpected exception was “to make my house more comfortable” (the prestige drive to express new experiences and lifestyle) which was more frequently stated by farmers. Although overall farmers migrate less frequently than non-farmers (see Table 5-2), in some villages there is a tradition of farmers migrating to foreign countries such as Ghana and Ivory Coast (where latrines are much more common) to work for several years as farm or other manual labor before returning to the village. They may regard using latrines as a manifestation of the style of life they experienced abroad. Regarding health-related advantages, although non-farmers were less likely to select “for health”, they were more likely to select “to reduce flies in my compound” and “to reduce my household’s health care expenses”. In fact, reducing flies was non-farmers’ fifth most often selected advantage as the most important.

Generally consistent with Table 5-7, composite scores in Table 5-8 confirm that prestige and health were somewhat more likely to be motives of non-farmers than farmers for wanting to adopt, while physical safety (especially snakes), privacy, and to a smaller extent, personal protection were more likely to be farmers’ motives. Changes from Table

5-7 were: restricted mobility became a more frequent motive of farmers; physical comfort became a more equally likely motive of both groups and “to leave a legacy for my children/descendants” became a noticeably more frequent motive of non-farmers. Cleanliness remained a small, but equally likely reason of both groups.

Differences between adopters and non-adopters

On nine out of 19 listed advantages and on the spontaneous advantage “for health” in Table 5-6, adopters’ perceptions of importance differed significantly from non-adopters’. Adopters’ average importance was higher for all nine of the significantly different listed advantages but lower for “for health”. Notable were the increased perception of importance by adopters of two prestige-related advantages representing the drive to express new experiences and lifestyle (“to make my house more comfortable” and “to make my life more modern”), of both privacy advantages, of the rental income situational advantage, of cleanliness and convenience, and of one personal protection advantage (“to avoid risk of smelling/seeing feces in the bush”). Average importance was not significantly different for any of the three physical safety advantages, nor for “to reduce flies in my compound”.

Adopters’ lower rating than non-adopters for “for health” appears to conflict with their higher rating for “to reduce my household’s health care expenses” (one-tailed $p=0.08$). It is strongly suspected that some respondents who cited “for health” as the main advantage for installing a latrine were repeating the official slogan promoting latrines in Benin because they could think of no strong personal need for a latrine and thought this information was sought by the survey team. The listed advantage “to reduce my household’s health care expenses” expresses a motive uncovered in earlier qualitative

research that reflects a real understanding of the health value of latrines. For these reasons, it was the language chosen to collect more meaningful data on the role of health as a motive for latrine adoption.

The advantage most frequently cited as the most important reason for adopters to install a latrine, selected by one third of them, was “to gain prestige from visitors” (Table 5-7). All together prestige-related advantages were selected by 39.8% of adopters compared to 26.7% of non-adopters. The prestige advantage “to make my house more comfortable” was selected by 6.1% of adopters compared to only 0.8% of non-adopters and was in fifth place as most important for adopters. No adopters selected “to feel royal” or “to leave a legacy for my children/descendants” as their most important reason for adoption. In earlier qualitative research these two advantages were also less commonly cited. In the former case, using latrines imitates a custom of Fon royalty to never defecate in the open. Such appropriation of royal habits by commoners became popular and increasingly common during and after colonialization by the French as a new elite emerged (civil servants, urbanites, merchants, etc.) to take over the power and status once exclusively held by the royal class in traditional Fon society (Degbello 1995; Arnould 1989). The latter case is thought to reflect older people wanting to fulfill obligations and to be memorialized in the context of Voodoo ancestor worship. The survey results show that women rate the importance of “to leave a legacy for my children” significantly more highly than men (see Table 5-6, one-tailed $p < 0.005$), adding a “maternal instinct” interpretation to this advantage for women.

Interestingly, while the second most-often cited advantage as the most important by adopters was “to reduce my household’s health care expenses”, none selected “for

health”. This is consistent with the differences in average importance for these two advantages and suggests that the official health message promoting latrines needs significant modification to have an impact on adoption behavior. “To avoid discomforts of the bush” was in third place and much less frequently selected as the most important by adopters compared to non-adopters. This difference might be an example of perceptions being changed by adoption where the discomforts of the bush have been far removed from the minds of adopters. Physical safety (especially “to avoid snakes” and “to feel safer”) was also more frequently the most important reason of adopters (16.8% compared to 10.1% of non-adopters). Privacy and personal protection were less frequently their most important reason (3.7% and 6.1% of adopters compared to 6.6% and 10.7% of non-adopters).

Differences in composite scores between adopters and non-adopters in Table 5-8 are mostly consistent with differences in Table 5-7, although, as before, the magnitudes are generally smaller. The top five composite rankings in Table 5-8 changed from those in Table 5-7 for both adopters and non-adopters. For adopters “to make my house more comfortable” moved out of the top five in composite rank while “to avoid dangers at night” moved in. For non-adopters, “to avoid risk of smelling/seeing feces in the bush” and “to avoid snakes” moved into the top five while “for health” and “to have more privacy to defecate” moved out.

Composite scores confirm that adopters’ motives for wanting to install a latrine were more likely than non-adopters to involve physical safety (19.1% of adopter points compared to 12.1% of non-adopter points), prestige drives 1 and 2 (29.1% to 22.2%), and “to reduce my household’s health care expenses” (7.8% to 1.5%). Adopters were less

likely than non-adopters to indicate motives involving personal protection (7.0% of adopters' points compared to 13.3% of non-adopters' points), physical comfort, and restricted mobility, and to state "for health". Reducing flies, privacy, and cleanliness were about equally likely motives of both groups.

Some caution is needed in interpreting differences between adopters and non-adopters from these results. Differences can be meaningful in that they show which drives, when present, are more likely to motivate adoption of latrines (i.e., individuals who perceive the importance of certain advantages are more likely to be "driven" to adopt). On the other hand, they can reflect correlation with constraint factors acting as barriers to adoption or changed perceptions arising from the experience of adoption and use of latrines. To clarify which differences are meaningful will require mathematically modeling the role of drives and constraints on preference, intention, and choice in Chapter 7.

Indirect beliefs related to drives

Agreement with six statements designed to enhance interpretation of various drives was measured. Average agreement is shown in Table 5-9. Major and significant differences between female and male opinions indicate that female heads in the sample villages are more superstitious regarding personal protection and more close-minded about personal affairs and community. These female characteristics appear to be consistent with their demographic differences from males (older, less educated, more Voodoo, less mobile and traveled, etc.). Among males, average opinions were not significantly different for farmers and non-farmers. Furthermore, none of the statements shows significant correlation with adoption behavior, although adopters agreed more than

TABLE 5-9. Agreement with Indirect Beliefs Related to Drives Among Household Heads of Six Sample Villages

Drive	Indirect belief	N	Average agreement on a 7-point scale ^a						
			Overall	Females	Males	Male farmers	Male non-farmers	Adopters	Non-adopters
		320 ^b	85 ^c	235 ^c	132 ^c	103	22	298 ^b	
WB5 ^d	There are more and more outsiders living in the village.	5.01	5.58 ***	4.80	4.79	4.82	5.66	4.96	
WB5, WB2	It's better to keep affairs to yourself to avoid problems.	4.12	4.88 ****	3.85	4.01	3.65	4.55	4.09	
WB2	It isn't very important in this village to protect your feces from enemies.	1.70	1.40 **	1.81	1.85	1.74	1.74	1.69	
WB2, WB3	The smell of feces can't make a person sick or weak.	1.33	1.13 ***	1.40	1.49	1.28	1.16	1.34	
WB2	The sight of feces in the morning brings misfortune, bad luck.	5.93	6.11	5.87	5.91	5.81	5.78	5.95	
WB2	Encountering a snake in the bush while defecating is a bad omen.	4.15	5.27 ****	3.74	3.53	4.00	3.44	4.20	

Note: Two-tailed significance of independent samples t-test comparing females/males, male farmers/non-farmers, adopters/non-adopters: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.005$, and **** $p < 0.0005$

^a 1=strongly disagree, 2=disagree, 3=slightly disagree, 4=neither agree nor disagree, 5=slightly agree, 6=agree, 7=strongly agree

^b At most 2 missing cases for any given value

^c At most 1 missing case for any given value

^d Number refers to drives in Chapter 3, Table 3-4

non-adopters with the belief “there are more and more outsiders living in the village” and less than non-adopters with the belief “encountering a snake in the bush while defecating is bad omen” (one-tailed $p < 0.10$ for both differences).

The first two statements in the list were intended to measure aspects related to the drive for social or informational privacy. While opinions about each of these two statements were quite varied, averaging “slightly agree” for the first and “neither disagree nor agree” for the second, the drive for household privacy (“to have more privacy for my household affairs”) was very rarely perceived as a main advantage for adoption (see Table 5-7). As such, it is unclear how these two statements correlate with this advantage.

The remaining four statements concern Voodoo-based beliefs related to personal protection (largely well-being drive 2). On average, all heads “disagreed” with “it isn’t very important in this village to protect your feces from enemies”, “strongly disagreed” with “the smell of feces can’t make a person sick or weak”, and “agreed” with “the sight of feces in the morning brings misfortune, bad luck”. Only females “slightly agreed”, on average, with “encountering a snake while defecating in the bush is a bad sign”. This last belief explores the possibility of a personal protection interpretation for the physical safety advantage “to avoid snakes”. Male farmers and non-farmers tended to believe that encountering a snake was not a bad omen (median response “neither disagree nor agree”). Males who selected “to avoid snakes” as their most important reason for adoption (6.9% in Table 5-7) “disagreed” with this statement (average agreement=2.3 points) and differed significantly ($p < 0.005$) in their opinion from males who did not select “to avoid snakes” (average agreement=4.2 points). On the other hand, females very rarely selected “to avoid snakes” as their most important reason for adopting (0.7% in Table 5-7) while their

majority “strongly agreed” that “encountering a snake while defecating in the bush is a bad sign”. There was some evidence from the qualitative interviews that the omen conveyed by a snake might be a female-specific phenomenon. Perhaps females’ lack of motivation to avoid this omen indicates that it is also perceived to be unavoidable. These relationships in the data suggest that physical safety to avoid snakebites (poisonous in the study area) is the correct interpretation of the advantage “to avoid snakes”.

Almost unanimous strong disagreement with the statement “the smell of feces can’t make a person sick or weak”, even for adopters, indicates that most everyone believes that the smell of feces has the ability to render a person ill or weak. In the qualitative phase of research, it was found that feces odor is believed to be an important mode for the transmission of oral-fecal (i.e., cholera, diarrhea, etc.) and even other germ-related diseases (i.e., tuberculosis), as well as socially-derived illnesses (symptoms explained by sorcery, revenge, envy, etc.).

4.5 Constraints on Adoption

Constraint factors identified in Chapter 3 were measured in different sections of the questionnaire addressing: construction problems, reasons of non-adopters for not installing a latrine, disadvantages of adoption, and agreement with beliefs related to drives and constraints. Results for awareness, understanding, and implementation-related constraint factors are shown in Table 5-10. Results for psycho-social factors and two other barriers to adoption are shown in Table 5-11. The two other barriers are lack of a motivating drive (no felt need for latrines) and preference for a more attractive alternative than latrines for drive satisfaction, discussed in more detail below. Except for decision-making capacity, constraints in Table 5-10 are *external* (in contrast to those in

TABLE 5-10. Presence of External Constraints on Adoption Among Household Heads of Six Sample Villages

Statements Measuring Constraints	Code ^a	Overall	Females	Fraction Expressing Statement ^b			Adopters	Non-adopters	
				Males	Male farmers	Male non-farmers			
N adjusted		320 ^c	85		235 ^c	132 ^d	103 ^d	22	298 ^c
<u>Awareness</u>									
• never thought of it before	R ^e	.171	.164		.173	.201	.136	e	e
<u>Understanding</u>									
• don't know what to do when the pit is full	D	.168	.388	****	.088	.089	.086	.018	**** .180
• can't prevent a latrine from smelling	IB ^b	2.12	2.46	**	1.98	2.06	1.87	1.29	**** 2.18
• afraid of accidents and dangers ^f	D	.072	.088		.065	.091 *	.033	.062	.072
<u>Implementation-related</u>									
• lack money	R(S) ^e	.892	.76	***	.94	.94	.94	e	e
• difficulty saving enough money	CP	.825	.782		.84	.873	.798	.468	**** .852
• cost me too much money	D	.108	.203	**	.074	.092	.051	.086	.110
• don't know cost ^g		.420	.81	****	.29	.37 ***	.18	.19	** .44
• difficulty getting materials/tools	CP	.418	.423		.416	.430	.397	.113	**** .441
• lack technical knowledge	CP	.263	.512	****	.171	.203	.128	.139	* .272
• soil problems	CP	.092	.151	**	.070	.090	.044	.101	.091
• lack space	CP	.071	.126	**	.050	.082 **	.010	.057	.072
• difficulty finding specialists	CP	.066	.100		.054	.068	.036	.055	.067
• shallow water table	CP	.029	.017		.033	.039	.025	.023	.029
• construction difficulties	R	.280	.165	***	.324	.341	.301	e	e
• lack decision-making capacity	R	.054	.110	**	.032	.046	.014	e	e
• bad health, health expenses, handicapped	R(S)	.054	.032		.062	.089 **	.027	e	e
• too old or weak	R(S)	.045	.11	**	.021	.023	.019	e	e
• difficulty meeting basic needs	R(S)	.027	.041		.021	.028	.012	e	e
• too many children/family obligations	R(S)	.026	.050		.017	.010	.027	e	e
<u>Average number of construction problems ("CP") expressed out of 7</u>		1.76	2.11	***	1.63	1.78 **	1.44	0.96	**** 1.82

Note: Stars indicate two-tailed significance of independent samples t-test comparing means for females and males, male farmers and non-farmers, and adopters and non-adopters: * p < 0.10, ** p < 0.05, *** p < 0.005, and **** p < 0.0005

^a Code indicates questionnaire section: R=listed reason for not installing a latrine; R(S)=spontaneous reason for not installing a latrine; CP= construction problem anticipated or experienced (adopters); D=disadvantage of installing a latrine; and IB= agreement with indirect belief

TABLE 5-10. Continued

^b Except for indirect beliefs (IB) where number equals average agreement on a scale of 1=strongly disagree to 7=strongly agree

^c At most 3 missing cases for any given value

^d At most 2 missing cases for any given value

^e Reasons were only asked of non-adopters so that N overall=305, females=83, males=222, male farmers=127 and male non-farmers=95

^f May also represent psycho-physical aversion to latrines and indicate evidence of pit cave-ins and poor quality construction

^g Respondents who had no idea what the estimated cost would be of building a latrine at their home; may also indicate lack of awareness and misunderstanding

TABLE 5-11. Presence of Psycho-social Constraints and Two Other Barriers to Adoption Among Household Heads of Six Sample Villages

Statements Measuring Constraints	Code ^a	Fraction Expressing Statement ^b						
		Overall	Females	Males	Male farmers	Male non-farmers	Adopters	Non-adopters
N adjusted		320 ^c	85	235 ^c	132 ^d	103 ^d	22	298 ^c
<u>Family/village disapproval</u>								
• someone in my family would forbid it	R ^e	-	-	-	-	-	e	e
• important people won't agree/accept latrine	D	.011	.036 *	.001	-	.003	-	** ^f .012
<u>Extended family interaction</u>								
• family refuses to help with construction ^g	R	.055	.078	.046	.072 **	.010	e	e
• difficult to forbid relatives who didn't help with construction	D	.001	-	.001	-	.003	-	.001
<u>Social norms and relations</u>								
• cause me too many problems with family or other people	R	.008	.021	.005	.006	.003	e	e
• fear jealousy or conflict with others	D	.015	.040	.006	.006	.006	-	* ^f .016
<u>Psycho-physical aversion</u>								
• can't tolerate smell or sight of feces in a latrine	R	.008	.018	.004	.006	-	e	e
• obliged to smell bad odors	D	.021	.017	.023	.034	.008	-	** ^f .023
• afraid of accidents and dangers ^h	D	.072	.088	.065	.091 *	.051	.062	.072
<u>Perceived benefits of open defecation</u>								
• it will reduce fertility of my soil	D	.002	-	.004	.006	-	-	.003
• latrine is less private than I wish	D	.002	-	.004	.006	-	-	.003
• miss greeting/visiting friends	D	.002	-	.002	-	.005	-	.002
• pigs or dogs will get lost	D	-	-	-	-	-	-	-
• pigs or dogs won't eat	D	-	-	-	-	-	-	-
• waste of effort/ money to build latrine when bush is free	IB ^b	1.03	1.07	1.02	1.04	1.00	1.00	1.04
<u>No drive</u>								
• already use latrine	R	.112	.216 ***	.072	.065	.082	e	e
• don't need latrines in village	R	.016	.038	.007	.013	-	e	e
• strong and health don't need latrines ⁱ	IB ^b	1.06	1.07	1.06	1.06	1.06	1.00	** ^f 1.07
<u>Alternative more preferred than latrines</u>								
• have other priorities	R	.462	.439	.471	.496	.437	e	e
• disadvantages exceed advantages	R	.003	-	.004	.006	-	e	e

Note: Two-tailed significance of independent samples t-test comparing females/males, male farmers/non-farmers, adopters/non-adopters: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.005$, and **** $p < 0.0005$

^a R=listed reason for not adopting; R(S)=spontaneous reason for not adopting; CP=construction problem anticipated or experienced (adopters); D=disadvantage of installing a latrine; and IB=agreement with indirect belief

^b For indirect beliefs (IB) value equals average agreement on a scale of 1=strongly disagree to 7=strongly agree

TABLE 5-11. Continued

^c At most 3 missing cases for any given value

^d At most 2 missing cases for any given value

^e Reasons were only asked of non-adopters where N overall=305, females=83, males=222, male farmers=127 and male non-farmers=95

^f T-value based on unequal variances although Levene statistic was not significant.

^g May also reflect lack of decision-making capacity

^h Also represents misunderstanding

ⁱ May also indicate lack of awareness

Table 5-11) because external policies largely independent of action by the individual can be implemented to reduce or eliminate them. Of factors in Table 5-11 only preference for another alternative might be influenced by external policies designed to enhance the attributes (overall utility) of latrines relative to competing alternatives. Results for each factor and barrier are discussed next. Differences between females and males, male farmers and non-farmers, and when appropriate, adopters and non-adopters, are examined.

Awareness

Nearly 20% of non-adopters said they had not installed a latrine because they had “never thought of it before”. A strategy to raise awareness about the ways that installing a latrine can satisfy personal drive(s) by promoting the advantages of adoption could stimulate these “unaware” individuals to consider adoption seriously. Lack of awareness was similar for female and male non-adopters, but among male non-adopters it was higher for farmers than non-farmers although this difference was not significant (one-tailed $p < 0.15$).

Understanding

Four statements were designed to measure misunderstandings about latrines. The disadvantage “don’t know what to do when the pit is full”, cited by 16.8% of all heads,

may also indicate concern for the durability of latrines. On average, people disagreed with the belief “can’t prevent a latrine from smelling” but 8.6% agreed (5, 6, or 7 points). Besides misunderstanding and psycho-physical aversion to latrines, “afraid of accidents and dangers” may also signify evidence of poor quality construction since nearly equal proportions of adopters and non-adopters cited this disadvantage. Four pit cave-ins, two after and two prior to completion of latrines, were documented among the 25 adopters interviewed during the qualitative phase of research. Together these statements indicate that the rate of misunderstanding among all heads ranged from 7% to 17%.

Females were more likely than males to express all three misunderstandings. Nearly 40% indicated confusion about what to do when the pit is full while 16% agreed that one “can’t prevent a latrine from smelling”. Female-male differences were statistically significant for both these statements but not for “afraid of accidents and dangers”. Male farmers were almost significantly more likely than non-farmers to express fear of accidents and dangers ($p=0.06$). This difference is consistent with farmers’ more negative attitude about the safety of latrines (see Table 5-4). As expected, adopters were significantly much less likely than non-adopters to express misunderstanding about how latrines function.

Implementation-related factors

Construction problems, lack of decision-making capacity, and spontaneous reasons about lack of resources or poverty represent implementation-related barriers to adoption. Results in Table 5-10 and 5-11 indicate that this set of factors comprises the most extensive constraints for all groups of household heads of the six sample villages,

including adopters. Furthermore, major and significant differences were found between females and males, male farmers and non-farmers, and adopters and non-adopters.

The most frequently cited construction problem by 82.5% of all heads in Table 5-10 was “difficulty saving enough money”. This is consistent with the spontaneous reason “lack money” expressed by the vast majority of non-adopters (89.2%) for not adopting. Furthermore, respondents, when asked to pick their primary reason for not having installed a latrine from spontaneous and listed ones, by far, selected “lack money” (73.4% of 305 non-adopters). Money is not a surprising problem given the cost in the study area of a latrine (estimated by respondents to be U.S \$270 on average) and the median income of household heads (U.S. \$0.50-\$1.00 per day and very irregular). However, it was unclear whether respondents stating “lack money” were referring to cash flow and credit problems, to high cost of latrines, or both (external constraints 6 and 7 in Chapter 3, Table 3-8). Measured separately as a disadvantage, high cost was expressed by only 10.8% of all heads, suggesting that most people who indicate a problem with money are referring to difficulties financing or accumulating the sum needed to build a latrine. However, many (44% of non-adopters) were unable to estimate the amount needed to do so. Inability to estimate cost probably reflects a combination of lack of awareness and misunderstanding with the presence of implementation-related problems.

In second place among construction problems was “difficulty getting materials or tools”, expressed by 41.8%, followed by a lack of technical knowledge (26.3%) and soil problems (9.2%). The remaining construction problems (space, specialists, and water table depth) were each expressed by less than 10% of heads. The study area is notable for generally good soil and water table conditions for digging pits. On average, an individual

faced about two (1.76) out of seven problems while “construction difficulties” was the second most frequently cited reason for not adopting (28% of non-adopters).

About 5% of non-adopters said they lacked decision-making capacity. This is an implementation-related factor *internal* to the individual and his/her extended family which is difficult to change with external policies. It may correlate with extended family interaction problems in Table 5-11 because household heads who lack decision-making capacity in Benin usually depend on their extended family.

Besides money, four other spontaneous reasons for not adopting were often repeated which indicate lack of resources or poverty. These were “bad health, health expenses, or handicapped” (5.4%), “too old or weak” (4.5%), “difficulty meeting basic (food) needs” (2.7%), and “too many children or family obligations” (2.6%). All other spontaneous reasons were rare (one case) or matched to listed reasons.

While still a major problem, “lack money” or “difficulty saving enough money” was less likely to be expressed by females than males, but females were much more likely than males to feel high cost was a disadvantage (20% to 7% for males) even though more of them did not know the cost of building a latrine (81% to 29% for males). Females were also much more likely to express lack of technical knowledge (51% to 17%), soil problems (15% to 7%), lack of space (13% to 5%), and difficulty finding specialists (10% to 5%). Concerning the primary reason for not adopting, females were also less likely to select “lack money” than either male group (56.9% to 83.1% for male non-farmers and 77.8% for male farmers). These differences were all statistically significant or almost so. Widowed and divorced females may control less property and therefore lack space. Why more females expressed soil problems is not clear since soil type and water table depth

should be randomly distributed among the population. Perhaps poor knowledge about soil conditions and pit construction created a heightened perception of soil difficulties among females. These implementation-related constraints perceived by females may also explain their uncertainty about cost. Despite facing significantly more construction problems than males (2.1 to 1.6), females were significantly less likely to state “construction difficulties” as a reason for not adopting.

A larger proportion of females than males lacked decision-making capacity and said “family refuses to help with construction” as reasons for not adopting. The former difference was statistically significant but the latter was not. Females were more likely to be too old or weak (statistically significant), have too many children or family obligations, and have difficulty meeting basic needs. These differences are consistent with female-male demographic differences in age, income, and marital status.

Male farmers were more likely than non-farmers to express high cost, decision-making capacity, and all seven construction problems as constraints in Table 5-10. A larger proportion of male farmers than non-farmers also did not know the cost of building a latrine (37% to 18%). However, only the greater problem with lack of space (8% to 1%) and estimating cost was statistically significant. Space and decision-making problems, along with farmers’ significantly greater likelihood of expressing the reason “family refuses to help with construction” in Table 5-11, suggest that farmers, like widowed and divorced female heads, are more likely to function in and depend economically on extended family groups. Many of the other farmer/non-farmer differences were close to significant (one-tailed $p < 0.15$) and taken together, account for the significantly greater average number of construction difficulties faced by farmers than

non-farmers (1.8 to 1.4). Among spontaneous reasons, farmers were statistically more likely to cite “bad health, health expenses or handicapped” which is consistent with their older age compared to non-farmers.

Construction problems among adopters reflect a different temporal perspective than non-adopters: adopters’ difficulties were actually encountered and overcome, while non-adopters’ were mostly anticipated. Unanticipated problems, for example with soil and water table depth, are often encountered in construction so their frequency among adopters might be expected to be higher than if we had measured adopters’ anticipation of them. Despite this potential for construction difficulties to increase with actual implementation, significantly fewer adopters had difficulty saving enough money (though still a serious problem at 46.8%) and getting materials or tools than non-adopters anticipated having, and a nearly significantly smaller proportion said they lacked technical knowledge (14% to 27%). Adopters had similar or slightly lower rates than non-adopters for other construction problems and for high cost as a disadvantage but differences were not significant. As hypothesized from the conceptual model of choice behavior, adopters faced significantly fewer construction constraints than non-adopters (an average of 0.96 compared to 1.8). Likewise, the proportion of adopters who had no construction problems was significantly higher ($p=0.005$) than the proportion of non-adopter who did not anticipate having any (40.8% compared to 7.4%).

Psycho-social factors

In general, psycho-social factors shown in Table 5-11 were present for a small minority of household heads of the six sample villages, all of whom were non-adopters except in the case of “afraid of accidents and dangers”. The largest percentages among

non-adopters were for extended family interaction (“family refuses to help with construction”) at 6%, and psycho-physical aversion to latrines related to accidents and dangers at 7% and to smell at 2%. There were a few notable and significant differences for gender, occupation, and adoption choice, though less pronounced than differences in Table 5-10.

Females were more likely than males to express family/village approval (4%), extended family interaction (8%), and social norms/relations (4%) as constraints. These differences were not quite significant ($p < 0.15$). For two out of the three statements measuring psycho-physical aversion to latrines, the rate of expression was higher by females but female-male differences were not significant. No females expressed any disadvantage related to perceived benefits of open defecation. Only one “slightly agreed” that “it is a waste of effort/money to build a latrine when the bush is free”.

Male farmers were significantly more likely than non-farmers to perceive extended family interaction (7%) as a constraint. They were also more likely to indicate psycho-physical aversion to latrines (3% for smell to 9% for safety) but this was not significantly different from non-farmers. Perceived benefits of open defecation were each cited or agreed with by one male respondent, either a farmer or non-farmer.

Unexpectedly, nearly equal proportions of adopters and non-adopters expressed fear of accidents and dangers of latrines. This statement, at least for adopters, probably represents real concern for the structural safety of latrines given experience with pit cave-ins in the study area mentioned earlier. The low rates of other psycho-social constraints among non-adopters are significantly different (higher) from adopters for “fear jealousy and conflict with others”, “obliged to smell bad odors”, and “strong and healthy don’t

need latrines” when unequal variances are assumed for the t-test, and almost so for “important people won’t agree/accept latrine”.

Other barriers

Two other barriers to adoption were measured for non-adopters and are shown at the bottom of Table 5-11 (no drive and alternative preferred). An individual who feels no need(s) for a latrine will never be *driven* to consider installing one. As many as 11.2% of non-adopters indicated they had no drive because they “already use latrines” (belonging to an absent relative or neighbor). A much smaller percentage (about 2% in each case) agreed with the two statements that latrines are unnecessary. Such a perception may result in some cases from lack of awareness or misunderstanding about the advantages of latrines. Among non-adopters, females were much more likely than males to lack a drive (25% for both statements combined), due largely to their significantly higher latrine use rate combined with a lower importance of prestige-related drives for which ownership is the critical factor. In fact, 20.3% of female non-adopters said “already use a latrine” was the primary reason they had not installed a latrine compared to 5.2% of farmer and 4.6% of non-farmer male non-adopters. No significant difference in the proportion of male farmers and non-farmers without a drive was apparent. All adopters “strongly disagreed” with the belief “the strong and healthy don’t need latrines”.

The most frequent reason of all groups of non-adopters for not installing a latrine was “have other priorities” (46%). This was also the second most-often cited primary reason for not installing a latrine among male non-adopters (6.2% for farmers and 5.3% for non-farmers) and the fourth most often-cited primary reason among female non-adopters (7.6%). Such individuals are thought to have drive(s), a positive attitude toward

latrines, and no binding constraints but in the evaluation stage of the adoption decision prefer a “better” option, not for defecation, but because it provides greater utility than latrines in satisfying their overall drive(s). In the study area, many competing alternatives to latrines for the set of drives motivating adoption were identified in Chapter 3 that have nothing to do with defecation. For example, individuals who desire greater convenience and comfort in their lives may choose to build a rain water cistern to replace walking long distances to a water source rather than build a latrine. These individuals probably prefer latrines to open defecation, but prefer something else over latrines when it comes to satisfying their drive(s). In the choice of how to spend their limited resources, they reject latrines in favor of a more appealing non-defecation alternative. When latrines become “a priority”, i.e., the most attractive or preferred alternative for satisfying drives aroused in the future, they may decide to adopt. This was certainly true for those respondents who intended eventually to build a latrine but said they needed to get their house or other project completed first. Only one male farmer with very negative feelings toward latrines indicated that “disadvantages exceed advantages”.

Spontaneous disadvantages

Spontaneous disadvantages were rare (one or two cases each) but involved interesting and important concerns: “cleanliness/maintenance problems”, “attracts too many flies and mosquitoes”, “used by women to hide aborted fetus”, “pits cave-in”, “bad vapors from latrines enter the stomach through the anus”, “costs for cleaning and maintenance”, and “bothers me to see feces in the latrine which smell”. Only the first three were also chosen as the most important disadvantages by four respondents.

Maintenance and cleaning of latrines may become potentially significant concerns after adoption.

5. SUMMARY AND CONCLUSIONS

This chapter has described a survey to collect data on the decision of household heads in rural Benin to adopt latrines and presented some preliminary results prior to developing quantitative models of preference, intention, and choice to adopt. As proposed in the two earlier conceptual and qualitative chapters, key decision elements are the drives motivating adoption and the factors constraining or facilitating it. A village's social and physical environment and an individual's lifestyle were hypothesized and shown (see Chapter 4) to influence the presence of drives and constraints.

A questionnaire was individually administered in the Fon language to 320 household heads in six villages to measure the presence of 11 drives and 13 constraint factors as well as attitudes toward latrines, preference, and intention to adopt. Sample villages represent different social and physical characteristics that were found to be related to latrine adoption in Chapter 4. Household heads were sampled on the basis of actual choice and randomly after stratification into three groups (females, male farmers, and male non-farmers) to increase representation of adopters, female heads, and male non-farmer heads. This sampling design will permit future analysis of village type and lifestyle as potential market segments for latrine adoption. Key findings of this chapter are summarized next and implications suggested.

Only 4.9% of household heads in the six sample villages had installed a latrine and another 2.1% were in the process or had money saved. Latrine use was higher at 17.3%. These figures are consistent with regional estimates of rural latrine adoption in

Zou Department from other sources (see Chapters 1 and 4). Female household heads were least likely to have adopted but more likely to use latrines than either male farmer or non-farmer household heads. While few heads had actually adopted, all but ten stated that if they were given the choice between a household latrine and their most likely open defecation site, they would “always or almost always” choose to use the latrine to defecate. More people were expected to prefer open defecation. Socio-economic status of latrines in Benin and a desire to please the survey sponsors may have influenced respondents’ stated preference. It is also possible that private latrine use is preferred but may or may not be a good indicator of preference for installing one.

Attitude toward latrines on nine qualities was measured as an indicator of preference on the theory that a favorable attitude is a necessary condition for preference and choice. While more variability in attitudes was measured compared to preference for use, average scores on all qualities were substantially higher for latrines than for open defecation. Among all heads, privacy, usefulness, and suitability, in that order, were the highest rated qualities of latrines while smell, health, and cleanliness were the lowest. In the middle were convenience, comfort, and safety. Attitude varied the most for the three lowest rated qualities. When compared to open defecation, latrines scored most favorably on suitability, followed by cleanliness and comfort, and least favorably on smell, followed by privacy and safety.

Drives for latrines reflect the motives or reasons that generate preference to install a latrine and must be present for adoption to be chosen. Very little attention in the last 20 to 30 years has been paid to the actual reasons why consumers adopt new sanitation technologies and behaviors. Practitioners and experts alike assumed that improved

health, the objective for implementing programs, would also motivate consumers. Results from this survey clearly show that prestige (several different aspects but especially the status associated with owning a latrine in Beninese society) and increased comfort were the most commonly perceived advantages and the two main drives for latrine adoption among all heads. Physical safety followed by personal protection from threats associated with feces left in the open (reflecting cultural beliefs that are widespread in West Africa and perhaps elsewhere in non-industrial societies according to Douglas (1966)) were the next two most often cited motives for wanting to install a latrine. Privacy, cleanliness, and convenience (to save time) were not remarkable as motives (cited by only 6%, 2%, and 1% respectively). A situational drive to facilitate defecation for individuals with restricted mobility (old age, illness, or handicapped) was the most important motive of about 6% of heads.

Measuring the importance of health as a motive without bias from individuals seeking to please the survey sponsors required some care. An advantage “to reduce my household’s health care expenses” was found to reflect a real perceived benefit of the disease-reducing value of latrines among adopters in the qualitative phase of research and was therefore chosen to measure health as a motive. Only about 2% of heads chose this advantage as their main reason for adoption. Another 7% of heads spontaneously said “for health” was their main motive, choosing it above all other advantages. However, the former group was much more likely to be adopters while none of the latter had adopted. Many of these heads are thought to feel no real drive for installing a latrine and therefore to have responded with the official message about latrines that they thought the survey was seeking.

Only 24.6% of heads in the six sample villages said they intended to adopt with a “slightly probable” average likelihood of implementing this intention in the next two years. The large gaps between those who seem to prefer latrines to open defecation (nearly 97%), those who intend to adopt (24.6%), and those that have actually adopted (4.9%) is hypothesized to be largely the result of implementation-related constraints. Mokhtarian and Salomon (1996a) have demonstrated the importance of such constraints in modeling adoption behavior early in the diffusion process of an innovation. To use their term, for many people in Benin latrines are a “preferred, impossible alternative”.

The most important implementation-related constraints were difficulty saving enough money (82% of all heads), followed by difficulty getting materials and tools (42%), lack of technical knowledge (26%), soil problems (9%), lack of space and difficulty finding specialists (each 7%), and lack of decision-making capacity (5% of non-adopters). Shallow water table was a problem for only 3%. The study area has generally good soils and a deep water table for pit construction. The problem of money to install a latrine has two facets: cost and financing. Because only 11% felt that high cost was a disadvantage of latrines, it appears that cash flow problems and a serious lack of credit for sanitation improvements (and in general) are the key resource constraint.

Other important constraint factors and barriers to adoption among non-adopters were lack of awareness about the advantages and benefits of installing a latrine (17%), misunderstandings about how latrines function and their safety (18%), and preference for an alternative with greater utility than latrines, not for defecation, but for satisfying personal drives (46%). Lack of a drive was present for 13% of non-adopters mainly because they already use a latrine but some felt they were unnecessary. Overall, psycho-

social factors were least important as barriers, however, extended-family interaction, psycho-physical aversion related to fear of dangers and smell of latrines, and social norms and relations were present as constraints at rates ranging from 2% to 7%. Family/village disapproval and perceived benefits of open defecation were extremely rare as constraints and gender-related.

Major differences in attitudes, drives, and constraints were found between female and male heads, and between male farmer and non-farmer heads. Females had a similarly favorable overall attitude toward latrines as males but a generally less favorable attitude toward open defecation. On the particular qualities of convenience, usefulness, and suitability, females rated latrines significantly higher than males. Females were more likely to be motivated by drives for comfort, personal protection, and restricted mobility and less likely by drives for prestige, physical safety, and health. Privacy was not a frequent motive of either females or males. It should be noted that the median age of female heads was higher than male heads and a much larger proportion were over 60 years old. Females had significantly more and higher rates of implementation-related, misunderstanding, and psycho-social constraints than males and a larger proportion lacked a drive for adoption mostly because more females than males already used latrines. These factors explain females' lower rates of adoption (2.7% to 5.7% for males) and intention (6.1% to 31.9% for males) despite more favorable attitudes toward latrines.

A notable difference between male farmers and non-farmers was farmers' significantly more unfavorable view of the safety of latrines relative to open defecation. Farmers' overall attitude toward latrines was slightly lower than non-farmers' based on nearly significantly lower ratings for convenience, usefulness, privacy, and suitability.

Both groups had a similar overall attitude toward open defecation except for privacy which, unexpectedly, farmers rated significantly lower. Farmers were more likely to be motivated by drives for physical safety, personal protection, restricted mobility, and privacy, and less likely by drives for prestige and health, although these group differences were less pronounced than gender ones. Comfort was similar for both groups. Male farmers also expressed more and higher rates of implementation-related, lack of awareness, and psycho-social constraints than non-farmers though the differences again were weaker than gender ones. Intention to adopt was similar between the two groups.

Difference between adopters and non-adopters confirm theory that adopters feel more favorably toward latrines, face fewer constraints, and have different drives for adoption. In particular, adopters were more likely to be motivated by drives for prestige, reduced health care expenses (their second most frequent primary motive for adoption), and physical safety, and less by drives for comfort, personal protection, and restricted mobility. The most often cited implementation-related constraint of adopters was difficulty saving enough money at 47%, about half the rate for non-adopters. About the same proportion of adopters as non-adopters expressed high cost as a disadvantage. Interestingly, adopters were also just as likely as non-adopters to express accidents and dangers of latrines (8%) as a disadvantage, evidence that a real problem with construction quality may exist in the study area. Demographic differences between adopters and non-adopters indicate that adopters were predominantly male, earned higher incomes (because of higher earning non-farming occupations), were more educated, more involved in their communities, more mobile and traveled, more Catholic or Protestant, and had larger households. The main implications of these results are presented next.

Promotional messages

Messages to arouse interest in and promote adoption of latrines should be changed to match the actual advantages perceived by consumers in choosing to adopt latrines, in this case those relating to prestige, comfort, physical safety, personal protection, and others (i.e., privacy, cleanliness, convenience and health-related). Increasing awareness of the most commonly perceived advantages of latrines through mass media campaigns should stimulate interest in and active consideration of adoption by the significant segment of the population who is currently unaware. Messages about health benefits should be re-designed to communicate economic and other benefits of disease reduction based on existing beliefs even if those beliefs about the transmission of disease are not wholly scientific. This data set will be further analyzed in Chapter 7 to develop mathematical models of choice behavior to identify which of the perceived advantages of latrines are the most important for motivating adoption.

Public health education

Public health educational campaigns should not be abandoned but need to be modified to integrate elements and symbols of prestige and other advantages listed above. They are needed to encourage latrine use by all household members, especially when the drives motivating household heads to adopt ignore the needs of other household members. For instance, adopters motivated by restricted mobility, personal protection, and some prestige-related drives tend to restrict latrine use (see Appendix A).

Market segments and targeting

Strong evidence for market segments was found based on the simple comparisons of gender and occupation (farmer/non-farmer), for both motives and barriers to adoption.

Thus, messages promoting adoption, and policies and programs to remove barriers should be tailored and targeted through appropriate channels to such segments. Future analysis to identify market segments for latrine adoption, based on lifestyle and village type (social and physical environment), should be beneficial here.

Supply-side interventions

Removing existing implementation-related constraints should increase the amount of adoption. The key constraint in the study area, far more extensive than any other, appears to be lack of finance related to acquiring the sum of cash needed to install a latrine. Mathematical choice models (developed in Chapter 7) can be used to forecast changes in individual and aggregate adoption behavior when constraints on adoption, such as the lack of finance, are relaxed. Those constraints that yield the greatest increases in adoption when relaxed should be the focus of supply-side interventions.

Latrine design

To significantly increase adoption, latrines need to be made more attractive and appealing than competing alternatives. This can be done by: identifying and improving the attributes of latrines that need design enhancements (i.e., smell and safety), creating incentive programs (subsidies, linkage to more attractive alternatives, co-financing, etc.) that increase the appeal of latrines, and by already mentioned avenues in points 1 and 4. Latrine designs should also be adapted to satisfy the different objectives in adopting of each market segment.

CHAPTER 6

FACTOR ANALYSIS OF DRIVES AND CONSTRAINTS

1. INTRODUCTION

In the first phase of this study, 11 drives motivating latrine adoption and 13 constraints hindering such a choice were proposed in Chapter 3 and hypothesized in a conceptual model to explain the adoption behavior of household heads in rural Benin. As described in Chapter 3, most of these drives and constraints manifest themselves through interrelated attitudes and beliefs. At the same time, a person's position on any one of these attitudes or beliefs, in isolation, makes a rather impure and unsatisfactory measure because it can indicate any of several different drives or constraints. In Chapter 5, statements were formulated expressing specific attitudes and beliefs conceptually associated with the proposed drives and constraints and then data were collected in a survey of 320 heads of household to quantify their presence. In this chapter, factor analysis is applied to reduce this large set of interrelated attitudinal data to a smaller conceptually meaningful set of constructed factors that attempt to capture the underlying latrine adoption drives and constraints. Specifically, the purpose of factor analysis in this application is to:

- examine the interrelationships (correlation) among attitudes and beliefs to improve understanding of the operative drives and constraints in latrine adoption choice behavior; and
- reduce the original set of measured variables to a more parsimonious set of composite explanatory variables with clearer conceptual cogency (representation of the

hypothesized drives and constraints) and improved statistical properties (minimal collinearity) in order to construct mathematical models of choice and test hypotheses about the role of drives and constraints.

Simply stated, the work in this chapter prepares the survey data, described in Chapter 5, for model development in the next and final chapter.

The rest of this chapter is organized into six sections. Section 2 discusses some cautions and complications, both conceptual and methodological, about applying factor analysis to the attitudinal data collected in the survey. Several methodological choices are made including the decision to use the unweighted responses of household heads and to perform separate analyses of drive and constraint factors. Unweighted characteristics of household heads are described next in section 3 and compared with the weighted characteristics described in Chapter 5. In section 4, the variables for the factor analysis of drives are selected and the resultant factors are presented. Likewise, section 5 presents the variables and factor analysis of constraint factors. Section 6 examines the stability of the factor solutions by comparing factor loadings for the weighted and unweighted sample data. Section 7 concludes the chapter with a summary.

2. METHODOLOGICAL CONSIDERATIONS

Factor analysis is a method frequently used in social and behavioral sciences to identify and explore the existence of abstract concepts that can only be indirectly observed through sets of loosely related overlapping measurements. It uses the correlation between a group of variables to detect the intrinsic dimensional structure of their common *space*. For attitudinal research, that space can be thought of as having a distinct perceptual structure or way in which ideas, values, and meanings related to the

topic of research are associated for a group of subjects. The technique involves simplifying a set of variables that have things in common into a smaller set of (usually orthogonal) dimensions or orientations, called factors, according to a mathematical model. In principle, this reduced set of factors explains the common variance of the set of measured variables.

Several statistical and conceptual points about the application of factor analysis to the survey data are of some concern. First, factor analysis assumes several conditions: 1) variables cannot be linear combinations of each other; 2) the sample should not be too heterogeneous; and, if using statistical tests or doing confirmatory factor analysis, 3) the distributions of the variables should be continuous and reasonably normal (Rummel 1970; Bennett and Bowers 1976). The second and third conditions are not always met. Attitudinal data are usually ordinal and sometimes dichotomous (the cases here), and the homogeneity of the perceptual space of a sample of people may not be known in advance, especially in new exploratory research such as this. By increasing the sample size to at least several hundred, these conditions are more likely to be met or less likely to create problems, improving the stability and reliability of the factor solution (Bennett and Bowers 1976).

The set of attitudes and perceptions that characterize latrine adoption drives may not be homogenous among rural household heads in Benin. The likelihood of market segments based on lifestyle differences has already been raised. These population segments may very well have different perceptual structures regarding the set of drive and constraint variables collected in the survey. A significant gender difference was found in the household survey results of Chapter 5.

Recall also that the survey's sampling procedure did not produce a representative random sample of the population. If one's purpose is to identify and measure the levels of drives and constraints prevailing in the study population, then it would seem most appropriate to do factor analysis on the weighted sample data. However, there are several concerns about weighting the data:

- This is extremely exploratory work occurring at the early phases of latrine adoption in rural Benin. Little is known about the real motives and barriers regarding latrine adoption, their perceptual structure, and potential structural differences across subgroups (e.g., lifestyles and village environments).
- Inconsistencies between the census and survey information regarding adopter status and occupations (the two characteristics used to stratify the sample) weaken confidence in the calculated weights. These weights make adjustments to cases on a village by village basis which, given the small size of some village subgroups, leads to rather large weights on some individual cases. At best, weighting the sample produces a representative sample of the six villages that may or may not represent the rural population as a whole.
- The unweighted sample, ignoring village by village differences, compares reasonably in terms of the proportions of stratified groups (females, male farmers, and male non-farmers) to that of the six sample villages (see Chapter 5, Table 5-1) although it does not in terms of adopters.

Modeling work in the next chapter seeks to identify the relationships between explanatory variables and adoption (i.e., to obtain statistically consistent estimators of their effects on behavior) and see whether these relationships differ for population

subgroups rather than to estimate population proportions. For logit models, consistent estimators occur even when the sample is unrepresentative (Ben-Akiva and Lerman 1985). Given that weighting has problems and is not required for the purpose of this research, it is preferred to factor analyze the unweighted data. In section 6 the stability of drive and constraint factors are tested by comparing the factor solution of the unweighted sample data with that of the weighted data.

Methodologically, a factor solution is created by selecting the variables to include in the analysis, choosing a solution method (differentiated by assumptions made about the common and unique portions of each variable's variance), deciding on the number of factors or dimensions to extract, then rotating their reference frame to some new position from the arbitrary position of the initial solution and possibly even distorting its orthogonality (Harmon 1976; Kim 1978). A change in any one of these steps will affect the factor solution, giving rise to a multitude of mathematically correct solutions. Furthermore, guidelines for judging the appropriateness of a solution are somewhat subjective and flexible. The most important criteria are probably stability, in terms of the content of common factors from different solutions, and interpretability. The correlation matrix of candidate variables, and the proportions of total and individual variable variance (communality) extracted by a factor solution are used to help judge which variables to include and the number of factors to extract in an analysis. These proportions of extracted variable variance indicate the amount of shared variance in the variable set and the variables that contribute to it. Ultimately, a theoretical model is required to evaluate and choose a meaningful factor solution.

In identifying drive and constraint factors in this chapter, drive-related variables are factor analyzed separately from constraint-related variables so that the roles of drive and constraint factors can be separately interpreted in the modeling results of the next chapter. The method of principal components is used. Varimax (orthogonal rotation to simple structure) and oblimin (oblique rotation to simple structure) rotated solutions are compared. Factor extraction is varied and the number of factors chosen by a combination of Kaiser's criterion (a cutoff of 1.0 for the latent root or eigenvalue of common factors), the scree test (the factor at which eigenvalues are small and decrease very slowly in a plot of eigenvalues by factor), and interpretability from the point of view of drives and constraints conceptualized in Chapter 3 (Rummel 1970; Harmon 1976).

In recalling the proposed structure of drives and constraints (see Chapter 3, sections 4 and 5), the reader should remember that that work explores new territory not previously examined, either qualitatively or quantitatively. For example, the attitudes and beliefs associated with different drives (Chapter 3, Table 3-5) reflect informants' actual statements about latrines. Their existence is supported by the survey results in Chapter 5. However, the way some have been grouped and others separated into distinct drives is an initial attempt, based on the 40 informant interviews, to structure them coherently. What are thought to be overlapping aspects of a single abstract dimension may turn out to be completely separate drives while those thought to be more separate may in fact be more similar dimensionally. The same is true for constraints, especially internal ones. Thus, the factors emerging from the analysis in this chapter are not expected to match exactly the 11 hypothesized drives and 13 hypothesized constraints of Chapter 3. The factor analysis should provide greater understanding of the underlying dimensions behind

respondents' statements and point out areas for clarification in the meaning and structure of perceptions, an important endeavor for designing good marketing messages and choosing appropriate symbolism.

3. DEMOGRAPHIC CHARACTERISTICS OF THE UNWEIGHTED SAMPLE

Demographic characteristics of the unweighted sample are presented in Table 6-1 and can be compared with characteristics for the weighted sample (Chapter 5, Table 5-2). Groups with higher proportions in the unweighted sample include under 30 year olds, those with incomes over Frs. CFA 1000/day, Catholics, those having some formal education, those reaching secondary school, those engaged in higher wage non-agricultural occupations, and those active in a group. Median income, and mobility and travel are also higher in the unweighted sample. Groups with lower proportions in the unweighted sample include those with incomes under Frs. CFA 250/day, Voodoo practitioners, and farmers. These differences appear to arise from the greater representation of adopters in the unweighted sample (11.9%) compared to the weighted sample (4.9%) which coincides with a smaller number of females (15 less) and a smaller percentage of farmers (41% of males) in the unweighted sample compared to the weighted sample where 59% of males are farmers. The proportion of females in the unweighted sample who are adopters is 4.3%, of male farmers 12.4%, and of male non-farmers 15.3%, compared to the respective weighted sample proportions of 2.7%, 4.2% and 7.6%. A village effect may also account for some differences of the weighted and unweighted sample characteristics because over and under sampling of subgroups occurred differentially in each village (see Chapter 5, Table 5-1).

TABLE 6-1. Unweighted Demographic Characteristics of Household Heads

Characteristic	Overall ^a	Females	Males ^a	Male farmers ^b	Male non-farmers ^c	Adopters	Non-adopters ^a
N (adjusted)	320	69	251	113	138	38	282
<u>Age (years)</u>							
• median age	41-50	51-60	41-50	41-50	31-40	51-60	41-50
• over 60 years old	23.8%	30.4%	21.9%	30.1%	15.2%	36.8%	22.0%
• under 30 years old	17.8%	7.2%	20.7%	13.3%	26.8%	2.6%	19.9%
<u>Income (Frs.CFA/day)^d</u>							
• median income	500-1000	<250	500-1000	500-1000	500-1000	1000-2000	500-1000
• under 250	10.1%	58.0%	8.1%	10.9%	5.9%	10.5%	20.2%
• over 1000	22.2%	-	28.5%	22.7%	33.1%	52.6%	18.1%
<u>Religion</u>							
• voodoo	60.3%	79.7%	55.0%	61.1%	50.0%	50.0%	61.7%
• catholic	26.2%	14.5%	29.5%	25.7%	32.6%	39.5%	24.5%
• protestant or sects	8.1%	5.8%	6.9%	5.4%	11.6%	10.5	7.8%
<u>Education</u>							
• attended school	35.3%	1.4%	44.6%	29.2	57.2%	42.1%	34.4%
• reached secondary school	15.6%	-	19.9%	8.0%	20.3%	18.4%	15.2%
<u>Household</u>							
• mean size	9.8	6.0	10.9	11.0	10.7	16.4	8.9
• mean children 6 and under	2.4	1.6	2.6	2.6	2.6	4.0	2.2
<u>Primary occupation</u>							
• farmer	38.4%	14.5%	45.0%	100%	-	36.8%	38.7%
• self-employed crafts or skilled trades	23.1%	2.9%	28.8%	-	52.3% ^e	13.2% ^f	24.5%
• petit trading/small vender	12.2%	49.3%	2.0%	-	3.6%	2.6%	13.5%
• cottage industry food, agricultural processing	4.1%	7.2%	3.2%	-	5.8%	2.6%	4.3%
• large-scale commerce	4.4%	8.7%	3.2%	-	5.8%	15.8%	2.8%
• manual labor	2.2%	5.8%	1.2%	-	2.1%	2.6% ^g	2.1% ^h
• traditional services (voodoo priest, healer, herbalist, etc.)	3.8%	-	4.8%	-	8.6%	2.6%	3.9%
• government employee or retiree	4.7%	-	6.0%	-	10.9%	21.1%	2.5%
• housewife	1.9%	8.7%	-	-	-	-	2.1%
• other (nothing, other salaried employment)	5.3%	2.9%	6.0%	-	10.8%	2.6%	5.7%
<u>Group involvement</u>							
• active in some group	42.1%	23.1%	47.4%	47.3%	47.4%	55.3%	40.3%
• active in a tontine	7.3%	4.3%	8.1%	5.5%	10.2%	2.6%	7.9%
<u>Marital status</u>							
• divorced, widowed or single	17.8%	65.2%	4.8%	6.2%	3.6%	7.9% ⁱ	19.1%

TABLE 6-1. Continued

Characteristic	Overall ^a	Females	Males ^a	Male farmers ^b	Male non-farmers ^c	Adopters	Non-adopters ^a
<u>Mobility and travel</u>							
▪ migrated in Benin	73.1%	63.7%	75.7%	69.0%	81.2%	84.2%	71.6%
▪ migrated to foreign country	42.0%	20.3%	48.0%	41.1%	53.6%	52.6%	40.6%
▪ traveled in last two months	25.6%	14.5%	28.7%	21.2%	34.8%	36.8%	24.1%
^a At most 5 cases with missing data for any give value							
^b At most 3 cases with missing data for any give value							
^c At most 2 cases with missing data for any give value							
^d Frs. CFA 500 = U.S. \$1.00 at time of the survey in November 1996							
^e % new skilled trades and % traditional crafts and skilled trades							
^f % new skilled trades and % traditional crafts and skilled trades for adopters compared to % new and % traditional for non-adopters							
^g All unskilled							
^h All in foreign country							
ⁱ All females							

The characteristics of male non-farmers and male farmers in the unweighted and weighted sample also differ. The differences arise from a combination of adopter and village effects. The lower age, lower proportion of Voodoo practitioners, larger household size, and higher proportions of Catholics and school attendees in the unweighted sub-sample of male non-farmers are consistent with greater representation of adopters, but the lower proportion of those who migrated to a foreign country and higher proportion of those under 30 years old are not. Among male farmers in the unweighted sample, the lower proportions of Voodoo practitioners and of those with incomes under Frs.CFA 250 /day, and the higher proportions of those over 60 years old, of Catholics, of school attendees, and those active in a group are all consistent with greater adopter representation. The differences for the unweighted and weighted female sub-sample are not pronounced. Adopters in the unweighted sample have a higher median income and larger mean household size than adopters in the weighted sample, in part, due to the greater representation of male non-agricultural adopter households in the unweighted

sample. The proportions of adopters in the unweighted sample who are Catholics, Protestants, or active in a group are higher, but foreign mobility and travel is lower than for adopters in the weighted sample.

The weighted and unweighted sample factor analyses will differ if the perceptual structures of any of these subgroups are substantially different. Statistically significant differences in attitudinal measurements for men and women (see Chapter 5) is suggestive evidence that men and women have different attitudes, beliefs, and values concerning drives for and barriers to latrine adoption. It is not, however, conclusive evidence because having different scores on a particular perception is possible without having different perceptual dimensions (i.e., a different perceptual structure). At this early stage in the diffusion of latrines, it is quite possible that adopters, given their innovative personalities in breaking new social ground, have a distinctly different perceptual structure than that of the general population and of potential mainstream adopters. Furthermore, as diffusion progresses the values, motives, and drives behind adoption often change as an innovation becomes integrated into daily life and less exotic. A systematic approach to examine perceptual differences would have to compare separate factor analyses for each subgroup suspected of having a different structure in the meaning of drives motivating adoption and its barriers. Future work seeking to analyze the existence of lifestyle-based market segments for latrine adoption would need to consider such an approach.

4. DRIVE FACTORS

The following 37 variables collected in the household survey of Chapter 5 comprise the candidate set of data for the analysis of drive factors:

- importance ratings for 19 listed advantages of latrine adoption (Chapter 5, Table 5-6)
- spontaneous expression of the importance of “for health” as a reason for latrine adoption (Chapter 5, Table 5-6)
- agreement with six indirect beliefs related to drives (Chapter 5, Table 5-9)
- attitude toward open defecation for nine qualities (Chapter 5, Table 5-3)
- estimated distance in paces (meters) to the site for open defecation and perception of its far-ness (Chapter 5, section 5.2)

A modification to the importance ratings of advantages by adding three, two, and one point respectively to the first, second, and third most important was considered and rejected because the correlation between modified advantage ratings was generally lower than that between unmodified advantage ratings. These points used to modify the importance of advantages may distort the interrelationships among advantages by setting the three most important too far apart from each other and from the rest of the advantages. In the modeling work of the next chapter, modified advantage ratings will be tested against the composite factor scores derived in this chapter in developing models of choice.

The matrix of Pearson’s moment correlation coefficients of the 37 unmodified variables calculated from the unweighted sample reveals that ten of these variables are each largely uncorrelated with any of the other 36. These variables have either no statistically significant correlations at the 0.01 level (a correlation of magnitude 0.14 or greater for the sample size of 320) or just a few very small ones and were therefore removed. They consist of the two situational advantages (“to increase my tenant's rent” and “to facilitate defecation due to age/illness”), estimated distance and perceived far-

ness to a person's site for open defecation (each correlated only with each other), and all six indirect beliefs. As a group the indirect beliefs neither correlated much with each other nor with any of the other variables and appear to have little directly to do with any of the drive-related advantages.

The resultant group consists of 18 advantages of latrine adoption and nine open defecation qualities. The open defecation qualities are strongly correlated amongst themselves but less so with the advantages. This is not unexpected when recalling from Chapter 3 that for many of the drives motivating latrine adoption, the alternatives competing with latrines have nothing to do with defecation. The highest correlation between an open defecation quality and an advantage is -0.34. The number of significant correlations at the 0.01 level between each open defecation quality and the 18 advantages ranges from one for clean to ten for suitable and private. Given the ambiguous relationship between open defecation qualities and measured advantages, alternative sets of drive factors, with and without including the open defecation qualities in the factor analysis, are generated and presented here for model testing in the next chapter.

4.1 Factor Results for Alternative 1 (Open Defecation Qualities Included)

Table 6-2 shows the varimax rotated loadings for seven common factors extracted from the factor analysis of the 18 advantages and nine open defecation qualities. A loading is equivalent to the correlation coefficient between the variable and the corresponding factor (for orthogonal factors), and the squared loading is the proportion of

TABLE 6-2. Drive Factors and Drive Variable Loadings for Alternative 1

Variable	Label	Loading	
		Unweighted Data	Weighted Data
FACTOR 1: Satisfaction with open defecation			= wt. F1
bush doesn't smell		0.77	0.78
bush is comfortable		0.75	0.76
bush is useful		0.74	0.73
bush is suitable		0.74	0.76
bush is safe		0.72	0.69
bush is healthy		0.70	0.73
bush is convenient		0.69	0.71
bush is clean		0.64	0.61
bush is private		0.44	0.42
leave a legacy for my children	A4	-0.29	-0.34
FACTOR 2: Express new experiences & lifestyle of improved family well-being			= wt. F2
make my house more comfortable	A2	0.76	0.76
save time	A13	0.76	0.75
keep my house/property clean	A6	0.68	0.66
feel safer, avoid accidents, problems	A20	0.65	0.72
have more privacy to defecate	A14	0.63	0.58
have more privacy for my household affairs	A19	0.43	0.39
avoid smelling/seeing feces in the bush	A17	0.40	0.28
make my life more modern	A3	0.38	0.48
reduce my household's health care expenses	A10	0.29	0.26
FACTOR 3: Royal status and intergenerational legacy			= wt. F3
for health		-0.80	-0.83
feel royal	A15	0.70	0.72
make my life more modern	A3	0.60	0.60
avoid smelling/seeing feces in the bush	A17	0.42	0.53
leave a legacy for my children	A4	0.40	0.27
bush is suitable		-0.39	-0.42
have more privacy for my household affairs	A19	0.37	0.38
bush is private		-0.34	-0.38
feel safer, avoid accidents, problems	A20		-0.26
FACTOR 4: Affiliate with urban elite, personal comfort & hospitality			= wt. F4
gain prestige from visitors	A1	0.86	0.82
avoid discomforts of the bush	A21	0.74	0.84
have more privacy to defecate	A14	0.36	0.27
avoid snakes	A18	0.31	0.37
avoid smelling/seeing feces in the bush	A17	0.30	0.34
avoid dangers/difficulties at night	A9		0.25
FACTOR 5: Health benefits			= wt. F5
reduce my household's health care expenses	A10	0.76	0.76
reduce flies in my compound	A11	0.75	0.75
bush is healthy		-0.29	-0.32
have more privacy for my household affairs	A19	0.28	0.30
avoid discomforts of the bush	A21	0.26	
bush is comfortable			-0.25
FACTOR 6: Personal protection and safety			= wt. F6
protect my feces from enemies	A8	0.84	0.80
leave a legacy for my children	A4	0.43	0.25
feel safer	A20	0.40	0.39
avoid snakes	A18	0.40	0.56
feel royal	A15	0.37	
have more privacy for my household affairs	A19	0.32	0.44

TABLE 6-2. Continued

Variable	Type	Loadings	
		Unweighted Data	Weighted Data
FACTOR 7: Night-time defecation (safety, comfort , convenience at night)		= wt. F7	
avoid dangers/difficulties at night	A9	0.76	0.69
avoid snakes	A18	0.45	
bush is private		-0.32	-0.37
avoid discomforts of the bush	A21	0.28	
feel safer	A20	0.27	
reduce flies in my compound	A11	0.25	
leave a legacy for my children	A4		-0.58
reduce my household's health care expenses	A10		-0.26

total variance of the variable that is explained by the factor. Only loadings of magnitude 0.25 or greater are shown as this is considered a conservative cutoff for loading significance, given the sample size and number of extracted factors (Child 1973).

The first common factor expresses a composite attitude toward open defecation while the remaining six are drives. The number of factors extracted is one factor beyond the eigenvalue cutoff of one. Reducing the number of extracted factors caused more variables to have multiple loadings making the factors less interpretable. Oblique rotation also did not yield a noticeable improvement in structure (i.e., less multiple loadings for variables). The set of factors explains 61.9% of the total variance of the 27 variables. Communalities of variables (the percent of variance in the variable that lies in the seven-dimensional factor space) range from a low of 46% for the advantage “to avoid smelling/seeing feces in the bush” to a high of 77% for the advantage “to gain prestige from visitors”. An interpretation of each factor is presented next.

Factor 1: Satisfaction with open defecation site

This factor is not a drive but expresses an individual’s overall positive attitude or evaluation of his or her open defecation site. All nine open defecation qualities load on this factor, with privacy being the least correlated. Only the advantage “to leave a legacy

for my children” loads negatively, suggesting that those who see this as an advantage of latrines tend to be dissatisfied with all aspects of their open defecation site.

Factor 2: Express new experiences and a lifestyle of improved family well-being

This drive factor combines two advantages that are thought to represent a prestige drive to express new experiences and a new lifestyle acquired outside the village (“to make my house more comfortable” and “to make my life more modern”) with a number of well-being advantages. Many of these well-being advantages implicate family members and express values associated with the new experiences and lifestyle. Time and money saved from avoided family accidents, reduced household illness, and keeping house and compound clean and organized, along with desires for informational privacy for one’s nuclear family were noted in Chapter 3 as attitudes expressed by individuals motivated by this prestige drive to install a latrine. Furthermore, the formative urban experiences and new occupational activities of such individuals were hypothesized to have made them less comfortable with defecating in the bush and are consistent with the loadings of the advantages “to have more privacy to defecate” and “to avoid smelling/seeing feces in the bush” on this factor.

Factor 3: Aspire to royal status and leave a legacy (personal prestige)

This drive factor expresses the perceived advantages of a latrine relating mainly to more traditionally oriented personal prestige. The combination of the advantage “to feel royal” with the advantage “to make my life more modern” reflects the need for a relevant symbol of class distinction, status, and power in present-day Fon society. The other loadings on this factor indicate that a desire for personal prestige is associated with one for intergenerational prestige and informational privacy. The strong negative loading on

“for health” reflects lack of interest in health or wellness motives. The loadings of “to avoid smelling/seeing feces in the bush”, “bush is not suitable”, and “bush is not private” on this factor are consistent with traditional beliefs that the bush is a highly improper, indiscreet, and even dangerous place for Fon royalty to defecate, in part because it is the place used by commoners.

Factor 4: Affiliate with the urban elite (personal comfort and hospitality)

This factor combines the prestige drive to affiliate with the urban elite with advantages related to personal comfort, visual privacy, and safety. These well-being advantages are thought to reflect concerns for hospitality toward urban guests discussed in Chapter 3, and a general perspective on the difference between defecating in the city and in the village. Caution is needed in interpreting and using this factor as all but five and eight survey respondents, respectively, rated the advantages “to avoid discomforts of the bush” and “to gain prestige from visitors” as “very important”. These two advantages, sharing very little variation, will tend to load on the same factor independently of any conceptual commonality they may or may not have.

Factor 5: Health benefits

This drive factor expresses two health-related benefits of latrine adoption in the advantages “to reduce my household’s health care expenses” and “to reduce flies in my compound”. Consistent with this interpretation is the negative loading on “bush is healthy”. Desires for informational privacy and physical comfort have small but statistically significant ($p < 0.01$) loadings here. Advantages with borderline significant loadings are “to make my life more modern” and “to keep my house and property clean”.

The non-health advantage loadings may indicate lifestyle values that are associated with these health benefits of latrines.

Factor 6: Personal protection

This drive factor is dominated by a desire for latrines for personal safety from supernatural threats, in particular to protect one's feces from the danger of sorcery instigated by one's enemies. As discussed in Chapter 3, people in positions of power and wealth in Fon society often feel threatened by jealous or vengeful enemies who resort to sorcery to harm them. While such beliefs do not necessarily reflect traditional or rural values and lifestyles, the smaller but important loadings of the two more traditional prestige advantages ("to feel royal" and "to leave a legacy") tend to support the idea that this drive is associated with more rural spheres of life. Fear of snakes associated with this factor might reflect superstitious concerns about snakes as bad omens in contrast to its meaning in the next factor.

Factor 7: Night-time safety, convenience, comfort, and privacy

This drive factor reflects a perception of serious problems defecating in the night, particularly for safety and including snakes. It is suspected that underlying these problems is a decreased availability of appropriate defecation sites close to the house and/or the presence of robbers or other strangers in the area at night. The village environment conditions that tend to generate these situations are increasing population density and regional integration, indicated in Chapter 4 by village location on a major road or within close proximity of an urban center where crime is common. The loading on "bush is not private" and "to reduce flies in my compound" may reflect the fact that dangers and difficulties at night force family members to defecate close to the house

which is highly indiscreet and attracts flies to the compound. Nearly significant negative loadings on bush is not smelly and bush is clean support these interpretations.

4.2 Factor Results for Alternative 2 (Open Defecation Qualities Excluded)

Six drive factors were extracted for this alternative with almost identical varimax rotated loadings to factors 2 through 7 of alternative 1 for the 18 advantages. These loadings are shown in Table 6-3. Only very slight differences are notable for the smallest loadings on some factors. These six common factors capture 65.1% of the total variance of the 18 variables with communalities ranging from 51% for the advantage “to leave a legacy for my children” to 79% for “to gain prestige from visitors”.

4.3 Discussion

The six drive factors emerging in this analysis encompass attitudes and beliefs grouped in Chapter 3 into nine separate drives. However, their structure is different from that proposed in Chapter 3. This smaller number of drives is not surprising given that only 18 variables were retained in the factor analysis. The advantages “to have more privacy for my household affairs”, “to avoid smelling/seeing feces in the bush”, “to leave a legacy for my children”, and “to avoid snakes” are rather evenly split across three or four factors. Other advantages, for example “to make my life more modern”, “to feel royal”, “to feel safer”, and “to reduce my household’s health care expenses”, have one high or primary factor loading and then a moderate loading on one or more other factors. Several interpretations for these patterns are possible:

- an advantage is a contributory aspect of several drives rather than a defining element;
- an advantage has multiple meanings with different value orientations which are revealed by the splits; or

- an advantage is a primary drive element of a population segment whose representation in the sample is too small to allow it to emerge as a distinct drive.

TABLE 6-3. Drive Factors and Drive Variable Loadings for Alternative 2

Variable	Label	Loading	
		Unweighted Data	Weighted Data
FACTOR 1: Express new experiences & lifestyle of improved family well-being		= wt. F1	
Make my house more comfortable	A2	0.76	0.77
save time	A13	0.76	0.76
keep my house/property clean	A6	0.69	0.67
have more privacy to defecate	A14	0.65	0.62
feel safer, avoid accidents, problems	A20	0.64	0.70
have more privacy for my household affairs	A19	0.42	0.37
avoid smelling/seeing feces in the bush	A17	0.39	0.29
make my life more modern	A3	0.35	0.43
reduce my household's health care expenses	A10	0.28	0.23
FACTOR 2: Royal status and intergenerational legacy		= wt. F2	
for health		-0.78	-0.82
feel royal	A15	0.73	0.77
make my life more modern	A3	0.60	0.64
avoid smelling/seeing feces in the bush	A17	0.53	0.52
leave a legacy for my children	A4	0.49	0.26
have more privacy for my household affairs	A19	0.40	0.43
FACTOR 3: Affiliate with urban elite, personal comfort & hospitality		= wt. F3	
gain prestige from visitors	A1	0.88	0.82
avoid discomforts of the bush	A21	0.67	0.83
have more privacy to defecate	A14	0.45	0.28
avoid snakes	A18		0.39
avoid smelling/seeing feces in the bush	A17		0.34
FACTOR 4: Health benefits		= wt. F4	
reduce my household's health care expenses	A10	0.80	0.78
reduce flies in my compound	A11	0.79	0.79
avoid discomforts of the bush	A21	0.25	
have more privacy for my household affairs	A19		0.30
FACTOR 5: Personal protection and safety		= wt. F5	
protect my feces from enemies	A8	0.86	0.79
feel safer	A20	0.42	0.43
avoid snakes	A18	0.32	0.59
leave a legacy for my children	A4	0.40	0.25
have more privacy for my household affairs	A19	0.32	0.44
feel royal	A15	0.33	
FACTOR 6: Night-time defecation (safety, comfort , convenience at night)		= wt. F6	
avoid dangers/difficulties at night	A9	0.69	0.80
avoid snakes	A18	0.70	
avoid discomforts of the bush	A21	0.45	
Feel safer	A20	0.32	
Avoid smelling/seeing feces in the bush	A17	0.25	
Leave a legacy for my children	A4		-0.60

The advantage “to have more privacy for my household affairs” is thought to be associated with economic advantage, indicating a desire to avoid extended family

jealousy, conflict, and dependency created by the difference between rich and poor family members. Thus, it is not surprising that this advantage loads on both prestige drive factors and is associated with the drive for personal protection. The two different meanings of the danger implied by “to avoid snakes” discussed in Chapter 3 may explain its split across several factors. As an example of the third interpretation, “to leave a legacy for my children” is a more prominent primary advantage of females than males. In factor analyzing the full heterogeneous sample of respondents, this drive, as a distinct primary motive of women, may not be detectable due to their small number (69 females out of 320).

One explanation for the emerging structure of drive factors is a pattern of lifestyle differences and village environment conditions. Specifically, factors 2 and 3 of alternative 1 seem to reflect two distinct lifestyles. Because the advantages “to gain prestige from visitors” and “to avoid discomforts of the bush” were almost universally rated as very important, factor 4 may reflect a generic perception of the advantages of latrines by rural villagers of all lifestyles and environments. In contrast, factors 5, 6, and 7 consist of perceptions of problems defecating in the open that are associated with changing village environment conditions.

In addition to the six composite drive factors, the advantages “to facilitate defecation due to age/illness” and “to increase my rental income” removed from the original set of 37 drive-related variables, comprise two additional hypothesized situational drives. Likewise, of the two possible measures of distance to the respondent’s open defecation site that were uncorrelated with other data, estimated distance in paces is positively and significantly related to intention to adopt and offers an alternative indicator

of a drive for convenience, safety, cleanliness, and/or privacy arising from decreasing availability of open defecation sites near home. All together, the original set of drive-related variables has now been reduced to one composite open defecation attitude factor and nine drive factors. The nine drive factors consist of six composite factor scores, two situational advantages, and estimated distance to the open defecation site.

5. CONSTRAINT FACTORS

The set of candidate variables for inclusion in the analysis of constraint factors consists of the following 31 variables:

- difficulty with any of seven construction problems (Chapter 5, Table 10);
- importance rating of ten listed disadvantages of installing a latrine modified to reflect ranking of the three most important by adding three, two, and one points, respectively, to those selected as first, second, and third most important (Chapter 5, Tables 10 and 11);
- importance of a spontaneously cited disadvantage concerning maintenance, operations, and cleaning problems of latrines which was expressed relatively frequently by six respondents;
- agreement with three indirect beliefs related to constraints or showing lack of drive (Chapter 5, Tables 10 and 11)
- attitude toward latrines for nine qualities (Chapter 5, Table 3)
- a dummy variable for respondents who could not estimate the cost of building a latrine (Chapter 5, Table 10).

Modified scores for importance of disadvantages (as described above) are used because they have similar levels of correlation as unmodified scores but are more nearly

normal for factor analysis. Answers to survey questions about the 11 listed reasons and four frequently mentioned spontaneous ones for not installing a latrine are not included here because they were only measured for non-adopters (see Chapter 5, Tables 10 and 11). However, these data could strengthen the factor analysis and understanding of constraints and would be appropriate to include for modeling intention among current non-adopters. Investigating intention has the advantage of examining temporally consistent attitudes relative to the decision to adopt a latrine. It would eliminate the problem of mixing prospective attitudes of non-adopters with retrospective attitudes of adopters, sometimes many years after latrine installation, which arises with the present analysis. Unfortunately, it would not have been possible to measure adopters' attitudes before their decision to adopt without conducting a longitudinal survey over many years.

The matrix of Pearson's moment correlation coefficients between the 31 candidate constraint variables shows that latrine qualities lack correlation with any disadvantages, indirect beliefs, or construction problems, and were therefore removed. The disadvantage "miss greeting friends on the way to the bush" was removed because it was stated by only one respondent. Two disadvantages about perceived benefits of open defecation ("a latrine will reduce the fertility of my soil" and "a latrine is less private than I wish") were perfectly correlated with each other so one was removed. These modifications resulted in a set of 20 constraint variables for factor analysis.

5.1 Factor Results

Table 4-4 shows the oblique (oblimin) rotated factor loadings for ten common factors extracted from the reduced set of 20 constraint variables. Again, only loadings of magnitude 0.25 or greater are shown. The number of factors extracted is two beyond the

eigenvalue cutoff of 1.0 but both additional factors have eigenvalues greater than 0.94. This solution was the most interpretable and consistent with the hypothesized constraints of Chapter 3. It also produced separate factors for lack of finance and high cost so that hypotheses about these two barriers to adoption can be separately tested in the models of the next chapter. Compared to varimax rotated factors, the oblique factors were similar but chosen because they had a simpler structure. The largest correlation between factors is 0.16. Factor 1 is the most correlated, ranging from 0.13 to 0.16 with factors 2, 3, 5, and 6. The set of ten factors explains 73.0% of the total variable variance. Communalities range from a low of 60% for the disadvantage “don’t know what to do when the pit is full” to a high of 91% for the belief “waste of effort/money to build a latrine when the bush is free”. An interpretation of each constraint factor is presented next with an indication of whether external intervention can be used to eliminate or reduce it.

Factor 1: Perceived benefits of open defecation and psycho-physical aversion (internal)

This constraint reflects preference for defecation in the bush rather than in a latrine for reasons representing two proposed internal constraints in Chapter 3 (see Chapter 3, Table 3-8). This factor also shows lack of any felt need or drive for having a latrine. It is most correlated with misunderstanding (factor 2) at 0.16.

TABLE 6-4. Constraint Factors and Constraint Variable Loadings

Variable	Label	Loading	
		Unweighted Data	Weighted Data
Factor 1: Perceived benefits of open defecation & psycho-physical aversion (internal constraint)			= wt. F1
it will reduce fertility of my soil / latrine is less private than I wish	D2	0.91	0.93
waste of effort/ money to build latrine when the bush is free	IB2	0.90	0.77
strong and health don't need latrines	IB3	0.74	0.80
obliged to smell bad odors	D6	0.27	0.25
fear jealousy or conflict with others	D5	0.26	0.40
Factor 2: Misunderstanding (external constraint)			= wt. F8
don't know cost		0.81	-0.30
don't know what to do when the pit is full	D10	0.61	-0.70
can't prevent a latrine from smelling	IB10	0.48	-0.73
lack technical knowledge	CP	0.38	
afraid of accidents and dangers	D8		-0.28
cost me too much money	D11		0.28
Factor 3: Social or extended family interaction problems (internal constraint)			= wt. F9
difficult to forbid relatives who didn't help with construction	D1	0.90	-0.86
fear jealousy or conflict with others	D5	0.69	-0.56
important people won't agree/accept latrine	D9	0.43	
Factor 4: Unsuitable soil (external constraint)			= wt. F6
shallow water table	CP	0.85	0.79
soil problems	CP	0.56	0.42
lack space	CP		0.50
fear jealousy or conflict with others	D5		0.39
Factor 5: Technical complexity (external constraint)			
difficulty finding specialists	CP	0.77	Merged into F10
difficulty getting materials/tools	CP	0.56	
lack technical knowledge	CP	0.48	
Factor 6: O & M problems (external constraint)			= wt. F7
O & M problems, smell, cleanliness	D13	0.86	0.89
obliged to smell bad odors	D6	0.64	0.48
Factor 7: Space problems (external & internal constraint)			= wt. F4
lack space	CP	0.78	0.34
important people won't agree/accept latrine	D9	0.55	0.91
soil problems	CP	0.30	
can't prevent a latrine from smelling	IB10	-0.26	
waste of effort/ money to build latrine when the bush is free	IB2	0.25	0.56
afraid of accidents and dangers	D8		0.29
Factor 8: Poor latrine performance (external constraint)			
afraid of accidents and dangers	D8	0.81	merged into F10
can't prevent a latrine from smelling	IB10	0.45	
soil problems	CP	-0.36	
Factor 9: Finance (external constraint)			= wt. F3
difficulty saving enough money	CP	0.84	0.74
difficulty getting materials/tools	CP	0.55	0.79
important people won't agree/accept latrine	D9	0.27	
can't prevent a latrine from smelling	IB10	0.26	
afraid of accidents and dangers	D8		-0.33

TABLE 6-4. Continued

Variable	Label	Loading	
		Unweighted Data	Weighted Data
Factor 10: Cost (external constraint)			= wt. F2
cost me too much money	D11	0.91	0.74
lack technical knowledge	CP	0.29	0.60
difficulty finding specialists	CP		0.64
obliged to smell bad odors	D6		0.50
afraid of accidents and dangers	D8		0.32
difficulty getting materials/tools	CP		0.28
Weighted Factor 5: Technical complexity 2 (external constraint)			
don't know cost			0.64
soil problems	CP		0.64
lack technical knowledge	CP		0.37
afraid of accidents and dangers	D8		-0.46

Factor 2: Misunderstanding (external)

This constraint reflects misunderstandings about how latrines function, and lack of awareness of the cost of latrines. It is likely to be a strong barrier to adoption but overcome with a mass media informational campaign focusing on these common misunderstandings.

Factor 3: Social/extended family interaction problems (internal)

This constraint reflects social interaction and norms problems caused by a household installing a private latrine in the context of extended family and/or village community relations. When a household head builds a latrine, it can cause friction in a compound of extended family and kin, particularly concerning contributions to the construction, operation and maintenance, and access or use of the latrine. Village, social or family approval and acceptance of latrine construction may be needed for heads of households, in particular females, who lack full decision-making authority or for those who are social conformists. These psycho-social conditions are internal to an individual,

his or her extended family, and/or other social relations and are difficult to change by external policies.

Factor 4: Unsuitable soil (external)

This constraint reflects problems with the soil for digging and stabilizing the latrine pit and can be overcome externally with improved design and construction methods. A negative significant loading of -0.22 for “important people won’t agree/accept the latrine” on this factor reinforces a purely external and physical interpretation for this constraint.

Factor 5: Technical complexity (external)

This external constraint expresses a felt need for expertise and technical help to construct a latrine. The need for experienced masons and pit diggers, manufactured materials that may not be available locally, and good design and construction methods to assure durability and proper performance make latrine installation a technically complex endeavor for which many household heads may need help. This factor is most correlated at 0.16 with misunderstanding (factor 2).

Factor 6: Maintenance and operations problems (external)

This factor indicates a perception of problems with the maintenance and operation of a latrine after it is built, particularly regarding cleanliness. The main loading on this factor comes from a spontaneously cited disadvantage (problems and associated costs of cleaning and maintenance) which unfortunately was not included in the list of disadvantages addressed to all respondents. Consequently, its presence is probably under-reported, stated by six respondents. Bad odors are clearly a perceived negative consequence of poor cleaning and maintenance as seen in the loading for the

disadvantage “obliged to smell bad odors” on this factor. However, it is presumed that bad odor does not operate psycho-physically in this case as it does in factor 1. This constraint may very well be associated with choice to adopt because of the way it was measured. Respondents with little experience using latrines are unlikely to anticipate such difficulties. In fact, the individuals spontaneously mentioning these operation and maintenance problems were significantly much more likely to currently use a latrine (of a relative’s or neighbor’s), have higher levels of latrine experience, and be familiar with communal latrines ($p < 0.01$ for all three).

Factor 7: Lack of space (external & internal)

Interestingly, this constraint regarding lack of space probably has more to do with extended family conflict over land and lack of family collaboration than with an objective lack of space for installing a latrine. The inheritance and division of communal lands is a constant source of disagreement and is thought to be at the root of conflict over compound space in many cases (see Chapter 3, section 5.1). Thus, while a physical lack of space could be overcome by technology or design, the internal aspects of this constraint make it more difficult to eliminate.

Factor 8: Poor latrine design and performance (external)

This constraint, in contrast to factor 2, is thought to indicate good understanding and awareness of latrines but evidence that real problems exist in the study area with their design, construction, and performance regarding structural integrity, safety, and smell. These problems can and need to be corrected through technical interventions. A small negative loading of -0.16 for the disadvantage “obliged to smell bad odors” associated

with psycho-physical aversion to latrines (factor 1) supports the external nature of this constraint.

Factor 9: Lack of finance (external)

This constraint expresses the problems people have in rural Benin with cash flow, saving money, and borrowing. The loading of “difficulty getting materials/tools” reflects the fact that cash is needed to purchase construction materials such as cement and reinforcement. The difficulty of getting contributions or loans from extended family members or other “important” people is reflected in the loading of “important people won’t agree/accept latrine”. This factor is expected to be very widespread and a significant barrier to latrine adoption that could be removed with a carefully designed credit program for housing improvements (see Varley (1995) for details and difficulties designing household credit for sanitation).

Factor 10: High cost (external)

Along with factor 9, this constraint measures the other part of cost as a barrier to adoption. Nearly all discussions of cost in evaluations of weak demand for latrines and other sanitation improvements fail to distinguish the impacts of these separate barriers to adoption. This is an important distinction because lack of finance and high cost require very different interventions to overcome. The relative importance of these two distinct constraints on latrine adoption can be assessed in the next chapter by analyzing the two nearly orthogonal factors 9 and 10 in models of choice behavior.

5.2 Discussion

The set of unweighted sample constraint factors in Table 6-4 reproduces the 13 proposed constraints of Chapter 3 as eight distinct factors. In addition, operation and

maintenance problems, and poor latrine design and performance are two unanticipated dimensions that emerge from the data as potential barriers to adoption. Of the 13 originally proposed constraints:

- perceived benefits of open defecation combines with psycho-physical aversion to latrines in a single factor;
- misunderstanding encompasses lack of awareness in a single factor;
- identify with, adhere to social norms, or fear disrupting social relations combines with extended family/social interaction problems in a single factor;
- family and/or village disapproval aligns with extended family/social interaction problems, lack of space, and lack of cash; and
- lack of decision-making capability could not be assessed for adopters but is expected to coincide with “important people won’t agree/accept the latrine” in the lack of space and lack of cash/credit constraint factors for non-adopters.

6. STABILITY OF FACTOR SOLUTIONS

The stability of the common factors emerging from the preceding analyses of drive and constraint variables is examined in this section. This is done by comparing the drive and constraint factors from the unweighted sample data to factors produced from the weighted sample data. Comparing factor solutions is not so easily done because extraction and rotation offer many possibilities for adjustment. Lack of factor stability between the unweighted and weighted sample can indicate, among other things, the presence of heterogeneous perceptual structures and the need for market segments.

6.1 Weighted Sample Factor Analysis

Using the same solution method, rotation, and variables, six drive factors were extracted from the weighted sample data for the two alternative sets of drive variables. Their loadings are presented along side the unweighted sample data loadings in Tables 2 and 3. For the constraint variables, one less constraint factor was extracted from the weighted data, again using the same solution method and rotation. This was done because the tenth common constraint factor from the weighted data had an eigenvalue less than 0.9 and the nine factor extraction more closely matched the factors extracted from the unweighted data. The weighted data constraint factor loadings are presented along side the loadings for the unweighted data in Table 6-4. Variables with no loading or a loading less than +/- 0.25 on a given factor are left blank in all tables. The stability of the factor solutions for each set of results is discussed next.

6.2 Drive Factor Stability

Loadings for the composite open defecation attitude factor and the six drive factors of the unweighted and weighted data in Table 6-2 appear quite stable overall. The greatest differences occur for the advantages “to avoid snakes” and “to leave a legacy for my children” on factors 6 and 7 (personal protection and safety, and night-time defecation difficulties). In recalling the weighted survey results of Chapter 5, male farmers cited the former advantage most frequently as most important while females cited the latter most frequently. From the unweighted to weighted sample, females increase from 21% to 26% and male farmers from 35% to 41%. Therefore, unstable loadings of these two advantages may indicate different perceptual structures of females and male farmers. In contrast to the unweighted solution, the seventh extracted factor from the weighted data

had an eigenvalue above 1.0. This eigenvalue, the scree plot, and the high negative loading of the advantage “to leave a legacy for my children” on factor 7 for the weighted data support the extraction of an eighth and even ninth common factor from the weighted data. The seven factors of the weighted data, however, capture 63% of the variance of the weighted variables, about 1% more than that captured by the seven factors of the unweighted data. Communalities are similar with the greatest variations occurring for “to avoid smelling/seeing feces in the bush”, “to leave a legacy for my children”, and “bush is clean”.

Weighted and unweighted data loadings for the six drive factors of alternative 2 are also very similar in Table 6-3. Exceptions are for the loadings of “to avoid snakes”, “to leave a legacy for my children”, and, to a lesser degree, “to avoid discomforts of the bush” on factors 3 (affiliate with the urban elite), 5 (personal protection and safety), and 6 (night-time defecation problems). The advantage “to avoid discomforts of the bush” was a more frequent primary motive of females in the weighted data (see Chapter 5, Table 5-7). The sixth and a seventh extracted factor for the weighted data in alternative 2 have eigenvalues above 1.0 and 0.9 respectively while those for the unweighted data are below 1.0 and 0.9 respectively. However, the amount of variance explained by both the weighted and unweighted extractions is 65%. Again, the high negative loading of “to leave a legacy for my children” on factor 6 (night-time defecation) from the weighted data, along with the higher eigenvalues, suggest that a seventh distinct drive factor might emerge from the weighted data. In the factor extraction from the weighted data, consisting of more females, more male farmers, and more non-adopters, communalities are notably lower for “to avoid snakes”, “to have more privacy to defecate”, and “to gain

prestige from visitors”, and notably higher for “to avoid dangers at night” and “to have more privacy for my household affairs”.

In summary, the six drive factors emerging from the unweighted full sample appear to be quite stable. Slight variations, however, suggest that gender and occupation as markers of lifestyle differences may cause heterogeneous perceptual structures that should be investigated if market segments are analyzed later.

6.3 Constraint Factor Stability

Comparing weighted and unweighted data loadings for constraint factors, the majority of extracted factors in Table 6-4 are similar but for several, the weighted and unweighted results are markedly different. Of the ten common factors extracted from the unweighted data, major loadings on seven are quite stable although minor loadings tend to be change. In factor 7 (space problems and disapproval), disapproval emerges as the dominant feature in the weighted data loadings and may result from the increased representation of females who are in general much less independent when it comes to decision-making. At the same time, “lack of space” shifts onto factor 4 (unsuitable soil) where its implications are less psycho-social and more purely physical in nature. The three remaining factors of the unweighted data (technical complexity, poor latrine design and performance, and high cost) combine into a single factor when the data are weighted. Finally, an aspect of technical complexity, concerning soil problems, emerges from the weighted data as a new factor. Recall that non-adopter women were significantly more likely than men to state soil problems although unsuitable soil was expected to be randomly distributed across the sample. It is possible that misunderstandings about soil for pit construction behind this new factor are gender-related.

The amount of variance extracted from the weighted data for the nine constraint factor solution is three to four percentage points less than that from the unweighted data ten factor solution. However, as mentioned above, the ten factor extraction from the weighted data produced few stable or meaningful factors. For the weighted data, factor 2 (misunderstanding) is correlated with factor 7 (space problems and disapproval) at -0.13 and with factor 10 (the merged high cost factor) at -0.16. Factor 10 is correlated with factor 1 (perceived benefits of open defecation) at 0.10.

In summary, of the ten constraint factors from the full unweighted sample, only six (1, 2, 3, 4, 6, and 9) appear stable. Lack of space and disapproval, while related, are not consistently paired in a single constraint. Furthermore, high cost, technical complexity, and poor latrine performance may merge for some population groups and be quite distinct for others. Because the role of constraints in the early phases of latrine diffusion is quite important, these instabilities should be further analyzed. By using the more extensive set of constraint variables available for the subset of non-adopters, which includes reasons for not adopting, a more thorough analysis of constraints and their association with market segments might be done.

7. SUMMARY AND CONCLUSION

This chapter has presented the results of factor analysis to reduce the large set of attitudinal data collected in the household survey of Chapter 5 into a coherent set of drive and constraint factors. These factors will be used in the next chapter as predictors of choice in developing models of latrine adoption behavior. The 37 drive-related candidate variables, after removal of indirect beliefs, were resolved into one composite attitude toward open defecation, six composite drive factors (three dominated by prestige motives

and three by well-being motives), two uncorrelated situational advantages, and distance to the respondent's open defecation site. Thus, the original 11 proposed drives of Chapter 3 are represented by 9 independent drive factors. Of the 31 candidate constraint variables, the latrine qualities were removed and the remaining group resolved into 10 composite factors representing the 13 constraints proposed in Chapter 3 and two additional ones. Together, this set of 19 independent drive and constraint factors has very little collinearity and is ready for testing in quantitative models of adoption choice behavior.

Stability of the composite factors is generally good. However, there is some evidence that sub-groups in the sample, such as females, male farmers, and male non-farmers, have their own perceptual structures for some drives motivating latrine adoption. Such differences are thought to result from the meanings and values associated with different lifestyles. In future work on market segmentation, perceptual differences can be examined by comparing separate factor analyses of drive and constraints for each segment.

CHAPTER 7

MODELING HOUSEHOLDS' LATRINE ADOPTION BEHAVIOR IN RURAL BENIN

1. INTRODUCTION

This chapter presents mathematical models of preference, intention, and choice to adopt a latrine by household heads in rural Benin estimated from data collected from 247 individuals in a survey described in Chapter 5. The main determinants of these related behavioral outcomes are motivating drives and constraints on adoption, as conceptualized in Chapter 3. Variables used to represent drives consist of composite factor scores from Chapter 6, importance ratings of advantages described in Chapter 5, and descriptive variables (e.g., estimated distance to the open defecation site). Constraints are represented by the composite factor scores from Chapter 6. The addition of open defecation and latrine quality variables to represent preference for latrines in models of intention and choice is investigated. Both linear regression and binary logit modeling techniques are used. Cases are not weighted because the intent of this modeling effort is to identify relationships of explanatory variables to individual choice. For such cases, with a choice-based stratified random sample, estimated coefficients from logit models (except for those of alternative-specific constants) are still consistent estimators of the true population values (Ben-Akiva and Lerman 1985). Any future work to develop aggregate models for forecasting aggregate latrine demand should consider weighting cases.

Several additional variables were tested to screen for behaviors associated with different population segments and data collection problems associated with possible

interviewer and supervision effects described in Chapter 5. This screening uncovered a problem with the measurement of intention by one of the four interviewers, as described in the next section. Consequently, the model results presented in this chapter are based on a reduced sample of 247 household heads after removing the 73 respondents interviewed by interviewer 2.

The theoretical and conceptual work in Chapters 2 and 3 indicates that a decision to install a latrine requires a positive preference and a strong intention. The first condition, a positive preference for latrines, is thought to arise from a combination of the following conditions:

- awareness and understanding of latrines;
- favorable feelings about latrines;
- perceived ability of latrines to satisfy aroused drives;
- absence or weakness of psycho-social constraints on latrine use and adoption; and
- absence of permanently and prohibitively perceived (binding) implementation-related constraints.

Non-binding permanently perceived implementation-related constraints operate in either of two ways depending on the strength of drives for latrines. They are expected to weaken intention without substantially affecting preference when drives are strong. In contrast, these constraints can reduce preference when drives are too weak to compensate for the constraint's presence. Short-term or temporarily perceived implementation-related constraints are thought to block choice without necessarily affecting either preference or intention. The models presented in this chapter support, in large part, these relationships

and reveal the drives, constraints, and latrine qualities that determine latrine adoption behavior in rural Benin.

The material presented in this chapter is organized in seven additional sections. Section 2 defines the independent and dependent variables and the model formulations analyzed. Sections 3, 4, and 5 present models of preference for latrines, stated intention to adopt, and choice to adopt, respectively. Section 6 reports the results of testing for possible effects of population segments on behavior and of any other data collection problems on the modeling results. Section 7 synthesizes the significance of model results. The chapter concludes with a summary in Section 8.

2. VARIABLES AND MODEL FORMULATIONS

Independent model variables can be categorized as either drive, constraint, or latrine quality factors (attitudes toward latrines). Dependent model variables indicate preference, intention, or choice. Model formulations for different behavioral indicators use different categories of independent variables. Depending on the type of dependent variable, either linear regression or binary logit analysis (equivalent to logistic regression) is used to estimate models of behavior from the data. In all modeling work, however, significant model variables are determined by a stepwise forward method with p_{in} set at 0.15 and p_{out} set at 0.20 (Norusis 1994). Variables and model formulations are discussed next.

TABLE 7-1. Drive and Drive-related Variables

	DRIVE SET 1	Code	Type	Description
1	prestige 2	DB2	Composite	drive factor score, Chapter 6, Table 6-2
2	prestige 3 & 4	DB3	composite	"
3	prestige 1	DB4	composite	"
4	health benefits	DB5	composite	"
5	personal protection & safety	DB6	composite	"
6	night-time problems	DB7	composite	"
7	rental income	ZADV7	single	increase rental income
8	old age/illness	ZADV12	single	facilitate defecation for aged and ill
9	distance	ZALTDIST	single	estimated distance to open defecation site
10	overall attitude towards o. d.	DB1	composite	factor score, Chapter 6, Table 6-2
DRIVE SET 2				
1	prestige 2	D1	composite	drive factor score, Chapter 6, Table 6-3
2	prestige 3 & 4	D2	composite	"
3	prestige 1	D3	composite	"
4	health benefits	D4	composite	"
5	personal protection & safety	D5	composite	"
6	night-time problems	D6	composite	"
7	rental income	ZADV7	single	increase rental income
8	old age/illness	ZADV12	single	facilitate defecation for aged and ill
9	distance	ZALTDIST	single	estimated distance to o. d. site
DRIVE SET 3				
1	gain prestige from visitors	M1	single	modified importance rating of advantage
2	make house more comfortable	M2	single	"
3	make my life more modern	M3	single	"
4	leave a legacy for children	M4	single	"
5	keep house/property clean	M6	single	"
6	protect feces from enemies	M8	single	"
7	avoid dangers at night	M9	single	"
8	reduce household's health expenses	M10	single	"
9	reduce flies in compound	M11	single	"
10	save time	M13	single	"
11	have more privacy to defecate	M14	single	"
12	feel royal	M15	single	"
13	avoid seeing/smelling feces in bush	M17	single	"
14	avoid snakes	M18	single	"
15	have more privacy for affairs	M19	single	"
16	feel safer	M20	single	"
17	avoid discomforts of o. d.	M21	single	"
18	increase my tenants' rent	M7	single	"
19	make defecation easier for age/ill	M12	single	"
20	distance	ZALTDIST	single	estimated distance to o. d. site
OPEN DEFECATION ATTITUDES				
1	open defecation (o.d.) is clean	Bclean	single	semantic difference rating of o.d. site
2	o.d. is comfortable	Bcomfort	single	"
3	o.d. is convenient	Bprivate	single	"
4	o.d. is healthy	Bntsmell	single	"
5	o.d. is not smelly	Bconvein	single	"
6	o.d. is private	Bsuitable	single	"
7	o.d. is safe	Bhealth	single	"
8	o.d. is suitable	Buseful	single	"
9	o.d. is useful	Bsafe	single	"

2.1 Independent Variables

Three different sets of independent variables are proposed in Table 7-1 to measure the arousal of drives for adoption. Each set is an alternative representation of the 11 drives hypothesized in Chapter 3. The reason for creating these three sets is to explore and compare how well different types of variables measure aroused drives for the purpose of mathematically modeling behavior. The need for such exploration arises from uncertainty about how well survey statements match the drives they were intended to measure and about how accurately the attitude scales to measure these statements were used. Both these issues also affect the reliability of the factor analysis solutions.

The first set in Table 7-1 consists of seven factor scores from Chapter 6 which include open defecation qualities, two situational advantage ratings, and estimated distance to a person's open defecation site. The second set consists of six factor scores from Chapter 6 that do not include open defecation qualities, along with the two situational advantages, and estimated distance. The third set consists of ratings of the original 19 listed advantages for installing a latrine (modified to reflect the three most important advantages as described in Chapter 5), along with estimated distance. These 19 advantages are the same ones used to create the composite drive factor scores and represent the two situational advantages in the first and second drive sets. This third set should show whether specific advantages produce better drive indicators than the composite factors. Models constructed using these different drive variable sets are compared in the modeling sections.

Drive variable sets 2 and 3 can be enhanced by including the nine open defecation site qualities given at the bottom of Table 7-1. Constraints are represented by the ten

factor score variables shown in Table 7-2. Attitudes toward latrines can be represented by the set of nine quality measurements, by their sum, or by their individual or summed relative quality ratings as shown in Table 7-3. While all factor scores are standardized in the factor analysis procedure, none of the other variables has been standardized except distance to open defecation.

TABLE 7-2. Constraint Variables

	Variable	Code	Type	Description
1	benefits of open defecation/ psycho-physical aversion	C1	composite	constraint factor score from Chapter 6, Table 6-4
2	misunderstanding	C2	composite	"
3	social/family interaction problems	C3	composite	"
4	unsuitable soil	C4	composite	"
5	technical complexity	C5	composite	"
6	O & M problems	C6	composite	"
7	lack space & disapproval	C7	composite	"
8	poor design & performance	C8	composite	"
9	lack finance	C9	composite	"
10	high cost	C10	composite	"

TABLE 7-3. Latrine Attitude Variables

	LATRINE QUALITIES	Code	Type	Description
1	latrine is clean	Lclean	single	semantic difference latrine rating
2	latrine is comfortable	Lcomfort	single	"
3	latrine is convenient	Lconvein	single	"
4	latrine is healthy	Lhealth	single	"
5	latrine is not smelly	Lntsmell	single	"
6	latrine is private	Lprivate	single	"
7	latrine is safe	Lsafe	single	"
8	latrine is suitable	Lsuitable	single	"
9	latrine is useful	Luseful	single	"
10	overall latrine attitude	Lqualtot	composite	sum of nine quality ratings
DIFFERENCE BETWEEN LATRINE AND OPEN DEFECATION QUALITIES				
1	clean	Dclean	difference	difference between latrine and o.d. site rating
2	comfortable	Dcomfort	difference	"
3	convenience	Dconvein	difference	"
4	healthy	Dhealth	difference	"
5	not smell	Dntsmell	difference	"
6	private	Dprivate	difference	"
7	safe	Dsafe	difference	"
8	suitable	Dsuitable	difference	"
9	useful	Duseful	difference	"
10	overall relative latrine attitude	Lbqualdi	composite	sum of nine quality differences

2.2 Dependent Variables

Six alternative dependent variables are defined in Table 7-4 and indicate preference, intention, and/or choice. The survey question measuring preference for a latrine failed to capture any variability across the 320 respondents (see Chapter 5). Instead, the sum of nine latrine quality ratings and the sum of nine quality differences between latrines and open defecation are used as two composite indicators of preference. The former is thought to measure favorable feeling toward latrines without reference to other alternatives while the latter scales that feeling relative to feelings about open defecation.

Three possible intention indicators are proposed in Table 7-4. The first, INTPROB, measures an individual's stated likelihood or probability, on a scale of one to seven, of installing a latrine in the next two years as explained in Chapter 5. The variable has been modified to include all cases by assigning a score of zero to individuals with no intention and nine to adopters. In essence, this variable measures gradations in the strength of choice. Although analyzing an ordinal variable with linear regression is not strictly correct, it can provide reasonable results if the measurements are fairly accurate.

One concern with the intention scale is how respondents interpret the neutral point labeled "neither probable nor improbable". Respondents may understand it to mean "in the middle" or "not applicable", two rather different things. The latter case would presumably signify a zero probability of intention and warrant a zero score instead of a four. As an alternative, two dichotomous intention variables were created from the INTPROB data. The first one, ADOPTINT, distinguishes those with any level of stated intention, as indicated by a "yes" response to the initial dichotomous question about

TABLE 7-4. Dependent Variables

Variable	Type	Description	Behavioral Outcome	Possible Values	Full Sample N=320		Reduced Sample N=247	
					Mean ^a	S.D.	Mean ^b	S.D.
LQUALTOT	ordinal-ratio	sum of nine latrine quality ratings	preference	9 to 63	57.49	5.33	57.41	5.44
LBQUALDI	ordinal-ratio	sum of nine differences between latrine and o.d. site quality ratings	preference	-54 to +54	37.67	11.96	39.41	10.85
INTPROB	ordinal	modified probability of installing a latrine in next 2 years	intention/ choice	0 to 9	2.36	3.42	1.63	3.11
ADOPINT	dichotomous	adopters and intenders	intention/ choice	0 or 1	0.357	na	0.252	na
ADOPINT5	dichotomous	adopters and intenders with likelihood greater than 4 (neither probable nor improbable)	intention/ choice	0 or 1	0.307	na	0.186	na
ADOPPLUS	dichotomous	adopters including intenders who have saved money or started construction	choice	0 or 1	0.137	na	0.105	na

^a At most 4 cases with missing data for LBQUALDI

^b At most 3 cases with missing data for LBQUALDI

intention (see Chapter 5), from those with none. The second one, ADOPINT5, separates individuals who say they are likely to install a latrine in the next two years (intentional probability index greater than 4) from those who say they are unlikely to do so (intentional probability index equal to or less than 4) or have no intention at all. ADOPINT5 eliminates the confusion and possible error associated with the neutral point.

Adopters are grouped with intenders in constructing both dichotomous variables to enrich the sample. However, developing intention models using the data when adopters are removed has two advantages over including them:

- The decision to adopt a latrine is examined from the same perspective before the decision is implemented. Pre-adoption is a more consistent and accurate viewpoint for measuring attitudinal, motivational, and other factors that influence choice because these can change with the passage of time. The experiences of installing, having, and using one's own latrine, and changes in personal circumstances and memory recall since adoption can affect attitudes, beliefs, and lifestyle.
- Excluding adopters who, on average in this data set, installed their latrines over 14 years ago is likely to provide a more realistic indication of drives motivating adoption among present-day consumers. Current drives are of the greatest policy interest, not motivations of adoption decades ago.
- Such models of positive intention can be compared with models of pure choice (see below), based on actual latrine installation, to identify any logistic-related constraints that can intervene after a positive intention is formed to block or delay the implementation of this intention (Chapter 3, Figure 3-1). The removal of such

logistic constraints by external intervention would be expected to have the greatest short-term positive impact on expressed demand.

On the other hand, removing adopters decreases the sample size and eliminates the one group of respondents with the only objectively measurable (i.e., observed) and therefore certain behavioral outcome.

Only one pure choice variable is proposed in Table 7-4, although all three intention indicators provide insight into the determinants of choice. ADOPPLUS consists of adopters with installed latrines plus intenders who have either begun latrine construction or already saved money to do so (see Chapter 5). ADOPPLUS includes 42 individuals in the full sample (13.7% of 320 household heads) and 26 in the reduced sample which excludes interviewer 2 cases (10.5% of 247).

2.3 The Reduced Data Set

A data collection problem associated with interviewer 2 was identified in the early phases of the modeling analysis. It appears that the two questions related to intention (see Chapter 5) were administered by interviewer 2 in such a way as to positively bias respondents' stated intention. The percentage of individuals stating a positive intention (probability index greater than 4) of installing a latrine in the next two years is unusually high and significantly different for interviewer 2 (71%) compared to the other three interviewers (19%) ($p < 0.0005$). This translates into higher mean values of the intention indicator variables in Table 7-4 for the full sample compared to the reduced one. Based on the way interviewees were assigned, all interviewers except interviewer 4, who was specifically assigned to interview female household heads, should have had a similar random percentage of intenders. When comparing interviewer 2 data to just the data of

interviewers 1 and 3 (with a similar random assignment of male interviewees), stated intention to adopt is still markedly higher and significantly different (71% to 22%, $p < 0.0005$). The rate of actual adoption of latrines is also higher for interviewer 2 compared to interviewers 1 and 3, but the difference is not significant ($p = 0.14$).

Also notable in Table 7-4 is the smaller mean sum of differences between latrine and open defecation ratings (LBQUALDI) for the full sample compared to the reduced sample. This arises from the significantly higher rating of open defecation qualities in the data collected by interviewer 2 compared to that of interviewers 1 and 3 ($p = 0.0005$). This result might, however, be explained by the significantly higher percentage of male farmers ($p = 0.037$) and lower percentage of females ($p = 0.30$) interviewed by interviewer 2 compared to the two others randomly assigned male interviewees. As shown in Chapter 5, male farmers rated open defecation highest and females rated it lowest of the three groups consisting of females, male farmers, and male non-farmers (see Chapter 5, Table 5-4).

Intention models of the full sample produced several counterintuitive and inconsistent results and were consistently correlated with a dummy variable for interviewer 2. In contrast, none of the other interviewer dummy variables was correlated with outcome in these models. Intention and choice models of the reduced sample produced consistent and reasonable results with no interviewer effects. These are the results presented in this chapter.

2.4 Model Formulations

Theoretically valid model formulations, based on conceptual behavior in Chapter 3, include the following:

1. Preference, Intention, or Choice = $f(\text{drives, constraints})$, where different constraints are expected to operate on the three different behavioral outcomes.
2. Intention or Choice = $f(\text{drives, constraints, preference})$, where including a preference indicator may improve model fit but may also change the significance of drive and constraint factors from those appearing in the first formulation.
3. Intention or Choice = $f(\text{drives, constraints, open defecation qualities, latrine qualities})$, where preference is, in effect, replaced by the eighteen individual latrine and open defecation quality ratings that together indicate preference, allowing the different qualities to have different weights in their effects on intention or choice. It is very likely that some attributes of latrines and open defecation are much more important than others, depending on which drives motivate latrine adoption. This formulation also allows more information about beliefs and attitudes to be represented in the model beyond what is captured by the limited number of drive and constraint variables.

Drives in these formulations can be represented by any of the three drive variable sets, alone or in combination, where appropriate, with open defecation qualities. Preference as an independent determinant of choice or intention in formulation 2 can be represented by one of the two composite latrine attitude indicators in Table 7-4. Different model formulations of intention and choice have been tested using different drive sets. Formulation 3 using drive variable set 3 (the 19 modified advantage ratings) produced models with the best fits as measured by R^2 for linear and ρ^2 for logit models. In the following sections, examples of different model formulations are presented along with the best ones to demonstrate the reliability of the behavioral modeling results. The results show that strongly significant variables operate consistently across models while

borderline significant variables enter only some models but with consistent directional influence on outcomes. They also show that different constraints operate at each stage in the decision process from initial preference through formation of intention to actual adoption.

3. MODELS OF PREFERENCE FOR LATRINES

Preference models estimated from the reduced sample are shown in Table 7-5 for the two preference indicators. Models using drive variable sets 2 and 3 are included. Linear regression is used in all cases. In this and subsequent tables, variables without coefficients and unlisted variables (e.g., unlisted modified advantages in Table 7-5) were not entered into the model because their contributions were insignificant in the stepwise method. The R^2 values are rather low but not unusual for behavioral models such as these. While there are certainly additional unmeasured determinants of these indicator variables, attitude measurement error, use of ordinal variables, and giving equal weight to each quality in the preference indicator also play a part in the low R^2 .

3.1 Models of LBQUALDI (Rating of latrines relative to open defecation)

The best fitting preference model with an adjusted R^2 of 0.17 is for LBQUALDI Model 1 using composite drive set 2 (excluding open defecation qualities). For this model, aroused drives for prestige 2, prestige 3 and 4, and for health benefits increase a person's relative overall rating of latrines compared to open defecation. Significant drive variables in LBQUALDI Model 3 (using modified advantages to represent drives) suggest that cleanliness, in the case of composite prestige 2, and reduced health care expenses, in

the case of health benefits, are the specific advantages of latrine installation that increase the favorableness of latrines over open defecation.

No drive factors operate negatively on preference in Model 1. However, in Model 3 an aroused drive for greater safety is associated with a significantly lower relative rating of latrines over open defecation. Independent samples t tests show that individuals who gave the greatest importance to the advantage of feeling safer for installing a latrine also were significantly more likely to perceive a problem with accidents and dangers of latrines (two tailed $p=0.004$). Modeling results of subsequent sections support the perception that latrines are not safe which may explain their rejection by household heads seeking greater safety. In the qualitative interviews (Chapter 3), the potential for such a conflict was identified for household heads motivated by well-being drives for personal and family protection of health and safety.

The constraints that act on preference in Model 1 are two implementation-related factors: technical complexity and high cost. The coefficients on these two constraints are not quite significant but their role in decreasing preference is supported by consistent results in other models of Table 7-5. The negative action of perceived technical complexity or high cost of latrines on preference demonstrates the case where a permanently perceived implementation-related constraint reduces preference when drives are too weak to compensate for the constraint's presence. In such situations, policies to reduce the technical complexity or high cost of latrines, without also stimulating drives, will have little effect on adoption because these individuals have weak motivation to adopt even without constraints. Individuals with strong drives for latrines who perceive technical complexity or high cost as constraints, however, will benefit from reductions in

TABLE 7-5. Linear Models^a of Preference for Latrines Using Composite Factors or Modified Advantages to Represent Drives

		Model 1		Model 2				Model 3		Model 4	
Label	Variable ^b	Dependent Cases	LBQUALDI No Intervr 2	LQUALTOT No Intervr 2	Dependent Cases	LBQUALDI No Intervr 2	LQUALTOT No Intervr 2	Dependent Cases	LBQUALDI No Intervr 2	LQUALTOT No Intervr 2	Dependent Cases
		coeff.	t-stat.	coeff.	t-stat.	coeff.	t-stat.	coeff.	t-stat.	coeff.	t-stat.
	Constant	39.52	57.38	57.55	164.5			24.42	5.50	53.68	23.66
	-					M11	reduce flies in compound			0.76	2.25
D3	prestige 1			0.76	1.46	M20	feel safer	-1.97	-2.41		
D1	prestige 2	1.13	1.57			M19	have more privacy for household affairs	1.39	1.71		
D2	prestige 3 & 4	3.71	6.12	1.10	3.46	M6	keep house/property clean	1.51	1.96		
D4	health benefits	1.74	2.67			M10	reduce household's health care expenses	1.36	2.02		
D5	personal protection					M4	leave a legacy for children	1.15	2.10		
D6	nighttime defecation					M15	feel royal	1.15	2.28	0.73	3.13
M7	rental income					M14	have more privacy to defecate			-0.67	-1.66
M12	old age/illness					M12	old age/illness			0.40	2.19
DIST	distance to open defecation					DIST	distance to open defecation				
C2	misunderstanding					C2	misunderstanding			-0.52	-1.56
C5	technical complexity	-1.21	-1.95	-0.65	-2.03	C5	technical complexity	-1.14	-1.80	-0.51	-1.58
C6	O & M problems			-0.87	-2.74	C6	O & M problems			-0.68	-2.14
C9	lack finance			0.84	2.54	C9	lack finance			0.93	2.89
C10	high cost	-0.91	-1.51	-0.57	-1.83	C10	high cost			-0.47	-1.50
	R ² adj.	0.17		0.12			R ² adj.	0.16		0.14	
	N	227		228			N	232		233	
	S.E. of mean	9.97		5.15			S.E. of mean	10.1		5.11	

^a Linear regression using stepwise forward method with $p_{in}=0.15$ and $p_{out}=0.20$

^b All 10 constraints were included in the analysis but those not listed were not significant (i.e., open defecation benefits/psycho-physical aversion, social interaction problems, unsuitable soil, lack of space/disapproval, and poor latrine design and performance)

^c All 19 modified advantages were included in the analysis but those not listed were not significant (i.e., avoid discomforts of the bush, gain prestige from visitors, avoid dangers at night, avoid snakes, save time, make my life more modern, make house more comfortable, protect feces from enemies, avoid smelling/seeing feces in bush, and increase my tenants' rent)

these factors. In the factor analysis of Chapter 6, technical complexity was most correlated with misunderstanding, a factor that contributes to weak drives.

The two psycho-social constraints on adoption (C1 and C3 in Table 7-2) were expected, according to theory, to reduce preference. However, neither is a significant influence in any preference models in Table 7-5 nor in any of the intention or choice models of this chapter. In preliminary models estimated from the full data set, perceived benefits of open defecation/psycho-physical aversion (C1), which represents lack of any motivating drive for and dislike of latrines, had a consistent and significant negative influence on both preference indicators. The decreased number of male farmers in the reduced data set may account for its absence in Table 7-5. Male farmers, who rate open defecation qualities higher overall, were more likely to perceive this constraint than both male non-farmers and females in the full sample, although the differences were not quite significant. Social and family interaction problems (C3), in the full data set, showed up as a significant barrier of intention only when considering the broadest possible group of intenders in ADOPTINT models.

3.2 Models of LQUALTOT (Overall latrine rating)

In LQUALTOT Model 2, using composite drive factors, only prestige 1 and prestige 3 and 4 are significant positive influences on overall favorable feeling toward latrines. While no composite drives reduce preference, the advantage “to have more privacy to defecate” has a negative but not quite significant influence on LQUALTOT in Model 4. Those who gave this advantage the greatest importance were more likely to be male farmers than females or male non-farmers ($p=0.18$). Specific advantages in Model 4 that are associated with a more favorable overall rating of latrines are “to reduce flies in

my compound” (a health-related benefit), “to feel royal” (prestige 4), and the situational drive of old age/illness.

Together the two alternative preference indicators confirm qualitative findings that the arousal of personal prestige makes a large, and possibly the largest, positive contribution to favorable attitudes toward latrines. Desires for health benefits increase preference for latrines when compared to open defecation but do not produce unqualified favorable attitudes toward latrines.

A notable difference between LQUALTOT and LBQUALDI models is the larger and more significant role of constraint factors on a person’s general rating of latrines (LQUALTOT). In Models 2 and 4, misunderstanding, technical complexity, operation and maintenance problems, and high cost are constraints that significantly or nearly significantly lower a person’s rating of latrines. These results suggest that some implementation-related constraints act early in the decision process to decrease preference, as discussed earlier. In contrast, lack of finance, an implementation-related constraint present for over 80% of non-adopters clearly does not reduce preference and actually correlates with a more favorable overall rating of latrines. The need for financing may be most strongly perceived after an individual starts to think actively about wanting to install a latrine. Further modeling results in the next sections support the hypothesis that lack of finance acts as a temporary constraint that blocks or delays latrine adoption only after a person has already developed preference for and formed an intention to adopt.

LQUALTOT models conflict with theory that preference is shaped without much interference from implementation constraints. In contrast, LBQUALDI (a measure of the overall comparative rating of latrines) seems relatively unaffected by implementation

constraints. As a preference indicator, it contrasts with LQUALTOT in its comparative nature. LBQUALDI synthesizes the effects of a large number of inputs required in the comparative evaluation of two alternatives. As a measure of desire for a latrine, LBQUALDI is probably the more robust and realistic of the two, using 18 variables to construct and coming closer to the implied meaning of preference in the comparative process of choice. LBQUALDI models also conform best to theory that determinants of preference are largely drive-related.

However, LQUALTOT models are useful in demonstrating how perceived constraints (problems with latrines) result in negative attitudes that diminish the favorable evaluation of latrines in the choice process. Estimating models from drive and constraint factors for each of the nine latrine qualities would give greater insight into the translation of specific drives and constraints into specific ratings. Such results would provide concrete information about how to enhance the attractiveness of latrine attributes that are important to consumer choice.

4. MODELS OF INTENTION TO ADOPT

Models of INTPROB presented in Tables 6 and 7 have been produced with the reduced data set from stepwise forward linear regression with p_{in} set at 0.15 and p_{out} set at 0.20. Table 7-6 shows a selection of model formulations using drive variable sets 1 and 2. Table 7-7 shows a selection of model formulations using drive variable set 3. In both tables, INTPROB models with and without adopters are shown. Under all formulations, models using composite drive factors in Table 7-6 generally do not fit the data quite as well as those using individual advantage ratings in Table 7-7. INTPROB models that include adopters had at most one case (an adopter) with a residual greater than three

standard deviations from the mean. Model 1 of Table 7-6 had none. When adopters were removed, as many as five cases occurred with residuals greater than three standard deviations, all intenders “likely” or “very likely” to install a latrine in the next two years whose intention was under predicted. Model 4 of Table 7-7 had the fewest such cases at three.

4.1 INTPROB Intention Models Including Adopters

Model 3 of Table 7-7 is the best fitting linear regression intention model with an adjusted R^2 of 0.37. The normal probability plot of standardized residuals from this model form a nearly perfect 45 degree line. The three most significant drive variables motivating adoption, in order of importance, are:

- estimated distance to a person’s open defecation site (a leading indicator of the drive for greater convenience and other well-being needs associated with decreasing availability of open defecation sites);
- a desire to make one’s house more comfortable (a leading indicator of the prestige 2 drive to express new experiences and lifestyle acquired outside the village); and
- a desire to increase rental income (a situational drive).

All other INTPROB model formulations in Tables 6 and 7 support the strong role of the first and third of these drive factors as motivators of adoption. Regarding the prestige 2 desire, all INTPROB models using this desire to represent an aroused drive for prestige 2 confirm its motivating role (Table 7-7). However, in models of Table 7-6 when the composite factor is used to represent prestige 2, it is not significant. This may be due to the major loading of the advantage “to feel safer”, negatively associated with preference in Table 7-5, on the prestige 2 composite factor (see Chapter 6, Table 6-2 and 6-3).

TABLE 7-6. Linear Models^a of Intention to Adopt a Latrine (INTPROB) Using Composite Factors to Represent Drives

Label	Variables	Model 1 ^b		Model 2 ^c		Model 3 ^b		Model 4 ^b		Model 5 ^c	
		Dependent Cases	INTPROB No Interv 2	INTPROB No Interv 2	INTPROB No Interv 2	INTPROB No Interv 2	INTPROB No Interv 2 & No adopters	INTPROB No Interv 2 & No adopters	Coef	t-stat	
	Constant	1.74	9.82	-2.56	-1.20	-2.25	-1.07	1.58	2.34	1.00	7.24
D3/DB4	prestige 1										
D1/DB2	prestige 2										
D2/DB3	prestige 3 & 4										
D4/DB5	health benefits					-0.26	-1.55				
D5/DB6	personal protection	-0.32	-1.95	-0.47	-2.85	-0.29	-1.82			-0.28	-2.28
D6/DB7	night-time defecation										
A7	rental income	0.64	2.98	0.56	2.64	0.64	3.04	0.38	2.16	0.36	2.03
A12	old age/illness	0.47	2.75	0.49	2.84	0.49	2.89				
DIST	distance	0.92	4.25	0.81	3.70	0.82	3.86	0.73	4.33	0.72	4.14
C1	open defecation benefits / psycho-physical aversion										
C2	misunderstanding	-0.67	-3.89	-0.64	-3.77	-0.68	-4.06	-0.42	-3.44	-0.39	-3.04
C3	social interaction										
C4	unsuitable soil										
C5	technical complexity										
C6	O & M problems	ni ^d		ni		ni		ni		ni	
C7	lack space & disapproval	ni		ni		ni		ni		ni	
C8	poor design & performance										
C9	lack finance	-0.68	-4.05	-0.78	-4.61	-0.75	-4.49				
C10	high cost										
DB1	o. d. satisfaction	na ^e				na		na			
Bclean	o. d. is clean	ni		na		0.46	3.12	0.50	4.21	na	
Bcomf	o. d. is comfortable	ni		na		-0.39	-3.07	-0.22	-2.32	na	
Lntsm	latrine is not smelly	ni		0.20	1.76	0.20	1.81				
Lhealth	latrine is healthy	ni		-0.27	-1.88	-0.30	-2.13	-0.16	-1.58		
Lsuit	latrine is suitable	ni		0.74	2.28	0.72	2.26				
	R ² adj.	0.24		0.27		0.31		0.20		0.14	
	N	229		228		229		218		208	
	S.E. of mean	2.66		2.61		2.55		1.88		1.95	

^a Forward stepwise linear regression using $p_{in}=0.15$ and $p_{out}=0.20$

^b Model using drive set 2 composite factors excluding open defecation qualities from scores

^c Model using drive set 1 composite factors including open defecation qualities in scores

^d Variable is not included in this model analysis

^e Variable is not applicable for this combination of analyzed variables

TABLE 7-7. Linear Models^a of Intention to Adopt a Latrine (INTPROB) Using Modified Advantages to Represent Drives

Label	Variables ^b	Model 1		Model 2		Model 3		Model 4	
		INTPROB	INTPROB	INTPROB	INTPROB	INTPROB	INTPROB	INTPROB	INTPROB
		No Interv 2		No Interv 2 & No adopters		No Interv 2		No Interv 2 & No adopters	
		coeff	t-stat	coeff	t-stat	coeff	t-stat	coeff	t-stat
	Constant	1.68	9.70	1.00	7.288	-2.36	-1.21	0.63	2.41
M8	protect feces from enemies							0.22	1.77
M19	have privacy for affairs							-0.22	-1.52
M20	feel safer	-0.68	-3.64	-0.32	-2.12	-0.71	-3.84	-0.29	-1.90
M4	leave a legacy for children			-0.31	-2.43			-0.32	-2.44
M2	make house more comfortable	0.66	3.36	0.41	2.52	0.72	3.81	0.49	3.07
M3	make my life more modern	0.29	1.54			0.32	1.76		
M15	feel royal	-0.56	-3.27			-0.54	-3.23		
M12	make defecate easier due to age/ill	0.34	2.14			0.35	2.22		
M7	increase my tenants' rent	0.59	2.75	0.28	1.49	0.56	2.63	0.37	2.04
DIST	distance to open defecation	1.04	4.77	0.78	4.38	1.03	4.87	0.86	5.04
C1	open defecation benefits / psycho-physical aversion								
C2	misunderstanding	-0.73	-4.40	-0.38	-2.92	-0.75	-4.65	-0.37	-2.96
C3	social interaction								
C4	unsuitable soil					-0.31	-1.76		
C5	technical complexity								
C6	O & M problems	ni ^c		ni		ni		ni	
C7	lack space & disapproval	ni		ni		ni		ni	
C8	poor design & performance								
C9	lack finance	-0.69	-4.29			-0.74	-4.68		
C10	high cost								
Bclean	o. d. is clean	ni		ni		0.49	3.46	0.51	4.47
Bcomf	o. d. is comfortable	ni		ni		-0.36	-2.94	-0.25	-2.66
Lusef	latrine is useful	ni		ni		0.84	2.77		
Lhealth	latrine is healthy	ni		ni		-0.31	-2.21		
	R ² adj.	0.31		0.17		0.37		0.25	
	N	237		217		236		216	
	S.E. of mean	2.53		1.92		2.42		1.83	

^a Stepwise forward with $p_{in}=0.15$, $p_{out}=0.20$

^b Advantages included in analysis and not significant are unlisted (i.e., gain prestige from visitors, avoid discomforts of bush, avoid dangers at night, reduce flies in compound, avoid snakes, avoid smelling/seeing feces, keep house/property clean, save time, reduce health care expenses, and have more privacy to defecate)

^c Variable not included in model analysis

Other advantages with positive coefficients in the best fitting Model 3 are “to make my life more modern” (another indicator of the prestige 2 drive) and “to make

defecation easier due to old age/illness” (the other situational drive). Two advantages, “to feel safer” and “to feel royal”, have significant negative influences on intention in Model 3 of Table 7-7. While the former result is consistent with its negative influence on preference, the latter result is unexpected. The composite prestige 3 and 4 drive factor, and specifically the desire “to feel royal”, was a strong positive influence on both indicators of preference for latrines. Oddly, the advantage “to make my life more modern” which contributes positively to intention also loads positively on the composite prestige 3 and 4 drive factor. Thus, while this composite drive factor makes a strong contribution to favorable attitude toward latrines, two of its key advantages (“to feel royal” in Models 1 and 3 of Table 7-7 when adopters are included, and “to leave a legacy” in Models 2 and 4 when they are removed) appear to be associated with negative intention. Possible explanations include:

- Modified importance ratings of advantages (as adjusted in Chapter 5 to include the three most important) show a different pattern of correlation with adoption from unmodified ratings used to create the composite factor scores in Chapter 6. The modified ratings may do a better job of capturing the role of advantages as drives (i.e., reasons for) rather than simply as benefits (i.e., positive side effects) of adoption which is what the unmodified ratings may tend to represent.
- Many individuals with aroused prestige 3 and/or 4 drives may share certain characteristics that lead them to perceive serious constraints on adoption and intention, but not on preference. For example, females have a strong aroused prestige 3 (intergenerational status) drive, higher overall ratings of latrines, lower overall ratings of open defecation, and therefore, more favorable feelings toward latrines than

- men, but they also perceive more and higher levels of constraints leading them to have very low rates of intention to adopt (see Chapter 5). The lifestyle characteristics significantly associated with individuals who gave greater importance to the prestige 4 drive “to feel royal” were old age which can act as a barrier to adoption due to its greater physical, economic, and health difficulties, and Voodoo religion
- While respondents with prestige 3 and/or 4 drives may prefer latrines over open defecation, they may view other non-sanitation alternatives as more appealing or attractive than latrines for satisfying these drives (i.e., “have other priorities”). Of the ten respondents (all non-adopters) who chose “to feel royal” as one of their three most important reasons for a latrine, four indicated they had “other priorities” and two were already using latrines to defecate.

INTPROB models including adopters in Table 7-6 (derived using composite drive factor variables) suggest that the drive for personal protection is associated with rejection. However, the contributions of the advantages “to feel safer”, “to feel royal”, and “to leave a legacy” to this composite factor score (see Chapter 6, Tables 2 and 3) may account for its overall negative effect. These three advantages show up as negative and significant in models of Table 7-7.

In Model 3 of Table 7-6 when adopters are included and individual open defecation quality ratings are allowed to enter the model, the composite health benefits drive is shown to reduce intention. At the same time, favorable views of the cleanliness of open defecation have a strongly significant positive association with intention. While composite health benefits were a positive and significant influence on the overall rating of latrines over open defecation as measured by LBQUALDI, they failed to contribute to an

unqualified favorable overall attitude toward latrines. More negative views of the cleanliness ($p=0.048$), smell ($p=0.087$), and healthiness of latrines ($p=0.30$) held by those giving high importance to both health advantages for latrines (as measured by scores ≥ 0.75 on the composite health benefits drive factor) may explain the low intention to adopt latrines by these individuals. A positive perception of the smell of latrines, in particular, might be an important attitude for adoption as seen in Models 2 and 3 of Table 7-6.

The constraint variables with consistently significant and negative coefficients in all INTPROB models when adopters are included in Tables 6 and 7 are misunderstanding, entered first, and lack of finance. In fact, misunderstanding was entered first among all drive, constraint, and quality variables in all INTPROB models with adopters included. Notable are the absence of technical complexity and high cost as constraints blocking intention to adopt in all models. The only other constraint shown to reduce intention is unsuitable soil in the best fitting Model 3 of Table 7-7 with adopters included.

It should be noted that intention and choice models have been estimated without including two constraint factors in the analysis: operation and maintenance problems (C6), and lack of space and disapproval (C7). In model development, these constraint factors were positively and significantly associated with choice to adopt. As explained below, these two variables were found to convey misleading information and were removed from the final analysis.

Operation and maintenance problems, concerning mostly cleanliness, were spontaneously cited by just six respondents in the full data set. As a group, these respondents were significantly more likely to be latrine users (of a relative's or neighbor's

latrine) (two tailed $p=0.001$), have more latrine use experience (two tailed $p=0.017$), and be familiar with communal latrines (two tailed $p<0.0005$) than respondents who did not mention these problems. The positive association of this factor with adoption is plausible if individuals with enough latrine use experience to be aware of such problems also have strong desires to own their own latrines. This is quite possible if these individuals only associate cleanliness-related maintenance and operations problems with having to share or use someone else's latrine or a communal one, and not with having their own "private" latrine. The general failure of respondents to identify operation and maintenance problems illustrates how unfamiliar most villagers are with latrines at this early stage in the adoption process in rural Benin.

The constraint regarding lack of space was only significant in choice models that included adopters. Its association with adoption might suggest that space problems, which can relate to siting the latrine, may only ensue in the course of planning construction once the decision to adopt has largely been made. Alternatively, it may reflect adopters whose latrines are getting full and are concerned about space and location for installing a replacement latrine. This latter hypothesis makes good sense in light of the fact that adopters' latrines were installed, on average, 15 years ago and many of them are likely to need replacement soon.

According to intention models that include individual open defecation and latrine quality ratings in the analysis (Models 3 and 4 of Tables 6 and 7), individuals who view the comfort of open defecation more negatively and the smell, suitability, and usefulness of latrines more positively than others are more likely to decide to adopt a latrine. Individuals who are more likely to adopt, however, also have more positive views of the

cleanliness of open defecation than those with lower intention and view the healthiness of latrines more negatively. The latter attitude may be logically possible if it is unimportant to adoption. This could very well be the case for individuals motivated by advantages other than improved health. Conversely, perceptions of health-related problems would be an important concern for those seeking health benefits from latrines and may explain why a drive for health benefits is negative or not included in models of intention and choice. Some caution with interpretation of significant attitudes is needed here because relationships with choice may reflect associations without necessarily being causal determinants.

A positive significant open defecation attitude may seem counterintuitive to the expectation that those more satisfied with open defecation would have little intention to adopt a latrine. Such a finding, however, is not necessarily inconsistent with the fact that latrines, in the choice situation analyzed here, are not being compared to open defecation for many of the drives motivating adoption. In a choice among non-comparable alternatives such as this, only those attributes important to satisfying aroused drives are expected to be ranked by adopters and intenders significantly higher for latrines and significantly lower for open defecation than by non-adopters and non-intenders. The models indicate that the four most important qualities related to intention, in terms of coefficient magnitude and significance, are open defecation discomfort and latrine suitability, usefulness, and lack of smell.

4.2 *INTPROB Intention Models of Non-adopters*

Intention models without adopters in both Tables 6 and 7 have much lower R^2 values and more outlier cases, all of which are level 6 or 7 intenders who are predicted

with no intention. Removal of adopters is thought to decrease the reliability of the INTPROB indicator by giving more weight to intenders stating a neutral intention of adopting (INTPROB = 4) for whom intention may actually be zero. Nine out of 37 intenders in the reduced data set fall into this category of ambiguous intention.

In contrast to INTPROB models based on all cases, several notably consistent similarities and differences appear in models based on non-adopters. Regarding constraints:

- lack of finance is no longer a significant factor of intention;
- misunderstanding remains the only significant constraint blocking intention;

Regarding drives motivating intention among non-adopters:

- distance to open defecation becomes the most important determinant of intention (entered first among all drive, constraint, and quality variables in all models) while rental income becomes less significant although still important as a motivator;
- the prestige 2 advantage “to make my house more comfortable” is consistently the second most important motivator of intention;
- the situational drive of old age/illness and the prestige 4 advantage “to feel royal” are no longer significant factors;
- the modified advantage “to feel safer” remains negative but is somewhat less significant;
- the modified advantage “to leave a legacy for my children” becomes significant and negative among non-adopters in its influence on intention; and
- the negative effect on intention of the composite drive for personal protection and safety is inconsistent and unreliable when adopters are excluded.

Non-adopter models show that latrine attitudes are no longer significant variables of intention, except possibly the perception that latrines are not healthy. However, open defecation attitudes concerning cleanliness and comfort are consistent in the direction and significance of their influence with that of models when adopters are included.

Recall the theoretical improvements of removing adopters from models of intention discussed earlier: a consistent decision perspective and avoidance of the confounding effects of time. The increased importance of distance over rental income as a drive motivating intention to adopt when adopters are removed from the data may reflect changing conditions over the last decade or two in rural Benin caused by population growth. The significance of the situational drive of old age/illness only when adopters are included could arise because adopters and their family members (e.g., parents) are now much older than when they made the decision to adopt, though they may have been motivated by other drives when they adopted. Old age can be a constraint on adoption through the difficulties of implementation created by lack of income, less physical strength, poor mobility or information access, etc. Thus, in models of non-adopters the old age/illness situation drive could be insignificant because of its conflicting effects as both a drive and constraint of intention. Hopefully, the use of separate constraint variables helps to separate the confounding effects of old age as both a motive and barrier of adoption.

The significant negative effect of the drive for intergenerational status (“to leave a legacy”) on intention among non-adopters reflects the combination of women household heads motivated by this drive more frequently than men while having very little intention to adopt due to the many more constraints they perceive. All three female adopters

picked this advantage as one of their top three reasons for adopting (thus, its positive influence in pure choice models presented in section 5.1). Overall, over 30% of females chose “to leave a legacy” as one of their top three reasons for adopting compared to only 5% of males. However, only 2 out of 62 non-adopter females had any intention of adopting, despite their more favorable attitudes toward latrines, compared to 36 out of 160 non-adopter males (excluding interviewer 2 cases).

5. MODELS OF CHOICE

In this section, results from binary logit models of choice are presented. A selection of representative results is shown in Tables 8, 9, and 10. All models are based on the stepwise forward likelihood ratio method with p_{in} set at 0.15 and p_{out} set at 0.20. No cases with predicted residuals more than three standard deviations from the mean occurred for any of these models. Models of ADOPPLUS, a unambiguous definition of choice, are built on data containing 24 adopters and two intenders who have already saved money or started latrine construction. These are discussed first, followed by models of ADOPINT5, where choosers consist of adopters and intenders who say they are likely to install a latrine in the next two years, and models of ADOPINT, where choosers consist of adopters and individuals with any kind of stated intention to adopt. The latter two choice/intention-to-choose indicators analyze increasingly broader groups of present-day potential adopters.

5.1 ADOPPLUS Choice Models

Table 7-8 shows ADOPPLUS models using composite drive variable set 2 under formulation 1 (no quality nor preference is included in Model 1), formulation 2

(preference is included in Model 2), and formulation 3 (alternative sets of latrine quality measurements are tested in Models 3 and 4). Preference, represented by LBQUALDI in formulation 2, contributes no additional information to the explanatory drive and constraint factors in formulation 1. All models have a similar good fit with an adjusted ρ^2 between 0.64 and 0.66. However, given the small proportion of choosers, just 10% after cases with missing data are removed, a market share model with only a constant has a ρ^2 of 0.54. The models were re-estimated without a constant to determine the real explanatory power of the entered variables. With the constant removed, adjusted (for degrees of freedom) ρ^2 values, ranging from 0.48 for Models 1 and 2 to 0.57 for Model 4 were obtained. Thus, the four drive and two constraint variables in Model 1, for example, explain 48% of the information in the data for the 229 respondents, after accounting for degrees of freedom (see Chapter 4, equation 2). This is considered a very good fit for these kinds of behavioral models.

The results in Table 7-8 are consistent across the first three models and support the main findings about key drives and constraints from INTPROB models when adopters were included. They show that prestige 2, both situational drives, and distance to open defecation motivate adoption as they did in INTPROB models, while misunderstanding and lack of finance hinder it. Of the four motivating factors, the coefficient on distance is the least significant and supports the previous hypothesis that drives motivating adoption in the past are different from those motivating it at present. There are no composite drive

TABLE 7-8. Logit Models^a of Choice to Adopt a Latrine (ADOPPLUS) Using Composite Factors to Represent Drives

Label	Model Dependent Cases Variable	1		2		3 ^b		4 ^c	
		ADOPPLUS No Interv2 β	ADOPPLUS No Interv2 sign.						
	Constant	-3.32	.000	-3.30	.000	-4.68	.000	-4.54	.001
D3	prestige 1								
D1	prestige 2	0.78	.111	0.79	.107	0.88	.073	1.06	.031
D2	prestige 3 & 4								
D4	health benefits								
D5	personal protection								
D6	nighttime defecation								
M7	rental income	0.42	.079	0.41	.082	0.38	.099	ni	
M12	old age/illness	0.68	.012	0.68	.012	0.58	.040	ni	
DIST	distance	0.35	.146	0.35	.150				
C1	open defecation benefits / psycho- physical aversion								
C2	misunderstanding	-0.63	.065	-0.63	.065	-0.69	.049	-0.51	.148
C3	social interaction								
C4	unsuitable soil								
C5	technical complexity								
C6	O & M problems	ni		ni		ni		ni	
C7	lack space & disapproval	ni		ni		ni		ni	
C8	poor design & performance								
C9	lack finance	-0.99	.000	-0.98	.000	-1.06	.000	-1.01	.000
C10	high cost								
	Lbqualdi	ni				na		na	
Lntsm	o.d.qualities (all nine)	ni		na		not sign.		na	
	latrine is not smelly	ni		na		0.28	.113	na	
	difference notsmell	ni		na		na		0.31	.053
	difference safe	ni		na		na		-0.36	.027
	difference suitable	ni		na		na		0.37	.164
	-L (0) : -L (c)	158.7	72.4	157.3	72.2	157.3	72.2	157.3	72.2
	-L (β) : -L (β) _{no}	48.6	76.0	48.4	76.0	48.1	69.5	50.1	62.1
	const. ρ^2 ($\beta/0$) _{adj}	0.66		0.65		0.66		0.64	
	N : N _{choosers}	229	22	227	22	227	22	227	22

^a Stepwise forward with $p_{in}=0.15$, $p_{out}=0.20$

^b All nine latrine and open defecation qualities included in analysis but those unlisted were not significant

^c Madv7 and 12 are removed from the analysis because no difference qualities were significant when Madv7 and 12 were included and the results duplicated those of Model 2. All nine difference qualities included in analysis for Model 4 but those unlisted were not significant.

TABLE 7-9. Logit Models^a of Choice and Intention to Adopt a Latrine Using Modified Advantages to Represent Drives

Label	Variables ^b	Model 1		Model 2		Model 3	
		Dependent Cases	ADOPPLUS No Interv. 2	ADOPINT5 No Interv. 2	ADOPINT No Interv. 2	ADOPINT No Interv. 2	ADOPINT No Interv. 2
		β	sign.	β	sign.	β	sign.
	Constant	-19.79	.000	-9.86	.000	-1.54	.322
M1	gain prestige from visitors	0.73	.011	0.55	.014		
M21	avoid discomforts of bush	0.55	.057				
M9	avoid dangers at night					0.36	.139
M11	reduce flies in compound			0.45	.058		
M8	protect feces from enemies			0.40	.059		
M17	avoid smelling/seeing feces in bush	0.71	.039				
M20	feel safer			-0.89	.017	-0.44	.053
M2	make house more comfortable	1.25	.004	1.25	.000	0.53	.030
M18	avoid snakes					-0.36	.088
M4	leave a legacy for children	0.56	.067				
M15	feel royal	-0.85	.002	-0.61	.002	-0.36	.009
M12	make defecate easier due to age/ill	0.57	.001	0.24	.062		
M7	increase my tenants' rent			0.67	.040	0.73	.012
DIST	distance to open defecation	0.59	.032	1.10	.000	0.74	.001
C2	Misunderstanding	-1.19	.004	-0.90	.002	-0.89	.000
C6	O & M problems	ni		ni		ni	
C7	lack space & disapproval	ni		ni		ni	
C8	poor design & performance			-0.67	.044		
C9	lack finance	-1.12	.000	-0.85	.000	-0.39	.024
C10	high cost			-0.47	.077		
	-L (0) : -L (c)	158.7	72.4	158.7	109.1	158.7	129.6
	-L (β) :	40.1		65.2		94.8	
	ρ^2 ($\beta/0$) _{adj}	0.68		0.51		0.35	
	N : N _{choosers}	229	22	229	42	229	58

^a Stepwise forward with $p_{in}=0.15$, $p_{out}=0.20$

^b Advantages not listed are not significant and include: keep house/property clean, save time, reduce health care expenses, have more privacy to defecate, have more privacy for affairs. Constraints not listed are not significant and include open defecation benefits/psycho-physical aversion, social/family interaction problems, soil problems, and technical complexity.

factors with significant negative coefficients in these models in contrast to some INTPROB models. Those rather odd findings may indicate problems with the reliability of the INTPROB scale, especially for the neutral point. Under formulation 3 in Table 7-8 (Model 3), when all 18 open defecation and latrine qualities are analyzed, distance is no longer significant and the situational drive of old age/illness becomes the most important

TABLE 7-10. Logit Models^a of Choice and Intention to Adopt a Latrine Using Modified Advantages to Represent Drives and Including Open Defecation and Latrine Qualities

Label	Model Dependent Cases Variables ^b	1		1A		2		2A		3		3A	
		β	Sign.	β	Sign.	β	Sign.	β	Sign.	β	Sign.	β	Sign.
	Constant	-82.90	.681	-17.07	.000	-25.40	.014	-7.31	.000	-15.28	.013	-4.62	.003
M1	gain prestige from visitors	0.82	.018	0.72	.021	0.76	.007						
M9	avoid dangers at night									0.68	.011	0.51	.052
M11	reduce flies in compound	0.50	.153			0.63	.047						
M8	protect feces from enemies					0.61	.015			0.36	.030	0.35	.038
M17	avoid smelling/seeing feces in bush			0.53	.139								
M19	have more privacy for affairs					-0.53	.100	-0.61	.045				
M14	have more privacy to defecate	0.86	.080										
M20	feel safer					-1.15	.009			-0.69	.010		
M2	make house more comfortable	1.38	.005	0.74	.055	1.59	.000	1.51	.001	0.66	.016		
M4	leave a legacy for children									-0.39	.051	-0.64	.002
M3	make my life more modern	0.87	.051	0.58	.123								
M15	feel royal	-1.04	.001	-0.95	.002	-0.77	.004			-0.36	.022		
M12	make defecate easier due to age/ill	0.52	.006	0.55	.002	0.30	.057						
M7	increase my tenants' rent			0.63	.146	1.21	.004			0.81	.010	0.95	.004
DIST	distance to open defecation	0.55	.083	0.50	.081	1.44	.000	0.73	.012	0.91	.000	0.74	.001
C2	misunderstanding	-0.79	.087	-0.79	.058	-1.01	.004	-0.77	.046	-1.14	.000	-0.84	.002
C4	unsuitable soil									-0.42	.102		
C6	O & M problems	ni ^d		ni									
C7	lack space & disapproval	ni		ni		ni		ni		ni		ni	
C8	poor design & performance					-0.81	.040	-1.33	.028				
C9	lack finance	-1.32	.000	-0.98	.000	-1.15	.000			-0.53	.009		
C10	high cost					-0.87	.042	-1.14	.072				

TABLE 7-10. Continued

Model Dependent Cases	1		1A		2		2A		3		3A		
	ADOPPLUS No Intervr 2		ADOPPLUS No Inter 2		ADOPINT5 No Intervr 2		ADOPINT5 No Interv 2 & No Adopters		ADOPINT No Intervr 2		ADOPINT No Interv 2 & No Adopters		
Label	Variables ^b		β	Sign.	β	Sign.	β	Sign.	β	Sign.	β	Sign.	
	open def. is clean			na		1.00	.0001	0.88	.0002	0.61	.0008	0.62	.0010
	open def. is comfortable			na						-0.45	.0131	-0.41	.0217
	open def. is convenient	-0.82	.0162	na									
	open def. is private			na		-0.35	.0655						
	open def. is healthy			na		-0.82	.0208	-0.70	.0337				
	open def. is safe	0.56	.0219	na									
	latrine is useful			na						1.85	.0341		
	latrine is healthy			na						-0.34	.0496		
	latrine is suitable	8.93	.7565	na		2.36	.0795						
	latrine is clean			na		-0.40	.0651						
	difference suitable	na		0.78	.0297	ni		ni		ni		ni	
	difference safe	na		-0.31	.0796	ni		ni		ni		ni	
	-L (0) : -L (c)	157.3	72.2	157.3	72.2	157.3	108.7	143.5	70.1	155.0	129.0	143.5	98.7
	-L (β) : -L (β) _{no const.}	33.1	47.8	37.2		48.45		42.5		78.3		69.9	
	ρ^2 ($\beta/0$) _{adj} :	0.71		0.69		0.57		0.65		0.40		0.46	
	N : N _{choosers}	227	22	227	22	227	42	207	22	225	58	207	38

^a Stepwise forward with $p_{in}=0.15$, $p_{out}=0.20$

^b Advantages not significant include : avoid snakes, keep house/property clean, save time, reduce health care expenses, and avoid discomforts of the bush.

^c Difference ratings between latrines and open defecation used instead of the 18 individual latrine and open defecation quality ratings

^d Variable not included in model analysis

drive factor . The only attitude included in this model is a more favorable view of the smell of latrines held by adopters, although the coefficient is not quite significant.

When difference ratings between latrines and open defecation were tested in the analysis, none were significant. Model 4 shows results after removing the two situational drives from the analysis while retaining difference ratings. Apart from the two removed situational drives, the significant drive and two included constraint factors are the same as those in other models. In addition, three qualities of latrines relative to open defecation are now included in the model: smell, safety, and suitability. Inclusion of these relative quality ratings reduces the significance of the misunderstanding constraint in Model 4. These results indicate that, consistent with INTPROB models of Table 7-6, individuals who perceive the smell and suitability of latrines relative to open defecation more favorably than others are more likely to be adopters. The perceived lack of safety of latrines by adopters, on the other hand, appears to indicate a real problem that needs addressing. This was hinted at in descriptive survey results which showed that adopters perceived accidents and dangers of latrines as a problem at similarly high levels as non-adopters (see Chapter 5, Table 5-11). A real safety problem with latrines as they are currently built in the area may explain why individuals seeking greater safety have lower preference for latrines and no intention of adopting.

The most important variable in models of ADOPPLUS, separating adopters from non-adopters, as determined by the order of variables entered into the model, is lack of finance. This constraint was entered first in all choice models of Table 7-8, 7-9, and 7-10 that include adopters in the analysis.

When modified advantages are used to represent drives in Model 1 of Table 7-9 under formulation 1 (using only drive and constraint factors in the analysis), a similar model fit is achieved for ADOPPLUS. Three of the most significant ($p < 0.05$) motivating drive variables are consistent with the significant drives of Table 7-8, namely the prestige 2 advantage, the situational drive of old age/illness, and distance. Absent is the situational drive to increase rental income. Other advantages that are positive motivators include those associated with drives for prestige 1, prestige 3, and comfort, and a desire to avoid the smell and sight of feces in the bush, related mainly to several different well-being drives. The modified advantage to “feel royal” is negative and highly significant as it was in INTPROB models with adopters included.

When all 18 open defecation and latrine qualities are considered in the analysis, either individually or as difference ratings of latrines relative to open defecation, the highest model fits are attained. ADOPPLUS Model 1 in Table 7-10, using separate latrine and open defecation ratings, achieves an adjusted ρ^2 of 0.71 and the 13 included variables explain 61% of the information in the data for the 227 respondents, after accounting for degrees of freedom. Key consistent motivating drive variables are again the prestige 2 advantage “to make my house more comfortable”, distance to open defecation, the situational drive of old age/illness, and the prestige 1 advantage “to gain prestige from visitors”. As before distance is the least significant of these motivations of past adoption. The prestige 4 advantage “to feel royal” is the only negative and significant drive factor, as it was for the ADOPPLUS model in Table 7-9. Five other drive variables show up as positive motivators of adoption in either Model 1 or 1A (using difference ratings to represent latrine and open defecation qualities) of Table 7-10 but

their coefficients are not quite significant. The action of four of them (“reduce flies in my compound”, “avoid smelling/seeing feces in the bush”, “make my life more modern”, and “increase rental income”) is consistent with results in one or more other intention (Table 7-7) or choice models (Tables 9 and 10). In the faactor analysis of Chapter 6, the first two (“reduce flies in my compound” and “avoid smelling/seeing feces in the bush”) loaded on the composite night-time defecation drive.

Regarding qualities of importance to choice, more negative perceptions of the convenience of open defecation and more positive views of the suitability of latrines are associated with adoption. These two qualities coincide with drives related to distance and to prestige, respectively. Again, latrine safety, especially relative to open defecation, is perceived more negatively by adopters than non-adopters (Table 7-10, Model 1A) in part, it seems, because adopters rate the safety of the bush higher than non-adopters (Table 7-10, Model 1).

To get a sense of whether some significant factors of choice are influenced by changes that occur after a choice is made, or are different for present-day adopters, one can compare these results to those of choice models that include individuals planning to adopt now or in the near future.

5.2 ADOPINT5 Models (Adopters and Intenders Likely to Adopt in the Next Two Years)

ADOPINT5 models include individuals who say they are likely to install a latrine in the next two years (intentional probability index greater than 4). Tables 9 and 10 show ADOPINT5 models using modified advantages to represent drives with and without including adopters in the data set. A greater variety of drives motivate adoption in ADOPINT5 models than in ADOPPLUS models. In addition to prestige 1 and 2,

distance, and the two situational drives, the health benefit “to reduce flies in compound” and the personal protection advantage “to protect my feces from enemies” are significant or nearly significant motivators of adoption. In contrast with ADOPPLUS models, the coefficient on the situational drive of old age/illness is less important and not significant. In addition to the advantage “to feel royal”, “to feel safer” also appears as a significant drive reducing intention to adoption when adopters are included in the analysis.

When adopters are removed from ADOPINT5 models, only distance and prestige 2 remain as significant drives for adoption. In fact, distance becomes the most important variable explaining present-day intention to adopt (as indicated by the order of variables entered in the model). Neither of the previously negative advantages “to feel safer” and “to feel royal” is significant in ADOPINT5 models that exclude adopters. Instead, a desire for household privacy among current non-adopters reduces intention as it did in INTPROB Model 4 of Table 7-7 when adopters were excluded.

ADOPINT5 models indicate that constraints play a greater role in reducing intention among non-adopters than they did in ADOPPLUS models separating adopters from non-adopters. High cost and poor latrine design and performance are additional barriers to adoption whose negative influence on intention increases when adopters are removed from the analysis. High cost probably reduces intention indirectly by reducing preference (see LQUALTOT models of Table 7-5). The poor latrine design and performance constraint consists of perceptions of safety and odor problems, some of which appear to be real concerns with latrines in the study area. In contrast to high cost, lack of finance has no negative effect on the intentions of non-adopters in ADOPINT5 models that exclude adopters from the analysis, also the case for INTPROB models of

non-adopters. This result, taken together with the strong association of lack of finance with positive preference and its negative action on actual adoption (i.e. installation), point to finance difficulties as mainly a short-term barrier that delays or prevents latrine installation for those who actively want to adopt latrines. This is an important insight into the lack of expressed demand for latrines and suggests that much higher rates of adoption would occur by a single intervention to facilitate the financing of household latrine construction.

Non-adopters with positive intention are more positive about the cleanliness and convenience of open defecation but more negative about its healthiness, safety, and privacy than adopters (compare open defecation coefficients in Models 1 and 2 of Table 7-10). It is difficult to know whether these perceptual differences between past adopters and present choosers of adoption reflect post-decision attitude adjustment on the part of adopters or changes over time to the conditions of the bush. Compared to those with negative intentions, only a higher cleanliness and lower health rating of open defecation are significant differences in attitudes of intenders (Model 2A of Table 7-10).

5.3 ADOPINT Models (Adopters and All Intenders)

When the broadest possible group of intenders, including those stating any intention to install a latrine in the future but unlikely to do so in the next two years, are considered in ADOPINT models of choice, different drive variables become significant. In particular, night-time defecation problems and personal protection (“protect my feces from enemies”) are now additional significant motivators of intention to adopt among current non-adopters. Distance remains, however, the most important motivator, followed by the situational drive to increase rental income. Only the drive to leave a

legacy remains a significant negative factor on choice when adopters are removed. As mentioned before, its strong presence among females who have almost no intention of any kind to adopt (only 2 out of 62 female non-adopters said they had considered installing a latrine) is thought to account for the negative significance. Neither of the two prestige 1 and 2 advantages, nor the situational drive of old age/illness, all strong motivators in ADOPPLUS and ADOPINT5 models, is significant for this broad group of intenders when adopters are excluded from the analysis.

In general, when the broadest possible group of intenders is examined, prestige-related advantages are no longer significant motivators of adoption. Instead, distance and night-time defecation difficulties associated with decreasing availability of open defecation sites, and personal protection, all related to well-being, become more important motivators of latrine adoption. Only increasing rental income remains a significant situational drive for adoption, and appears to be more important for present-day than for past adoption.

Only one constraint, misunderstanding, significantly blocks stated intention to adopt when adopters are removed from ADOPINT models. It is the most important variable explaining intention in all ADOPINT models. Unsuitable soil and lack of finance have negative effects on adoption (Model 3 of Table 7-10) only when adopters are included in the analysis. The latter result is consistent with the results of ADOPINT5 and INTPROB models of intention among non-adopters showing that lack of finance is not a constraint on intention to adopt. It confirms the importance of finance as mainly a short-term barrier to latrine installation for those with intentions of adopting.

Poor latrine design and performance, a significant constraint on higher levels of intention (ADOPINT5), is not significant in ADOPINT Models (compare Models 2 and 3 of Tables 9 and 10) nor in models of preference (Table 7-5). Perceptions of poor latrine design and performance only in reducing higher levels of intention suggests that as greater evaluative information about latrines is gained in the decision-making process these problems lead some people who are interested in latrines to actively reject them.

Constraints that act negatively on preference do not show up as significant barriers of intention as broadly defined here, although some of them did in ADOPINT5 models. The inclusion of latrine and open defecation attitudes may mask their role. However, ADOPINT is a weaker measure of intention, including almost anyone who has ever thought about the idea of installing a latrine, and even some individuals who may have thought of it for the first time in the course of the survey interview. It is also more likely than any of the other choice/intention indicators to include respondents giving false answers in hopes of influencing some future project who were weeded out by the subsequent intention question measuring likelihood of installation in the next two years.

Views about open defecation of intenders and non-intenders are consistent with other models and indicate that intenders perceive open defecation as significantly cleaner but significantly less comfortable than non-intenders perceive it to be (Models 3 and 3A of Table 7-10). The most important difference in attitude of intenders toward latrines from that of non-intenders confirms the importance of the perception of their usefulness. Consistent with INTPROB model results, intenders and adopters appear to perceive latrines as significantly less healthy than non-intenders. The view that latrines are not particularly healthy could explain why individuals motivated by health benefits do not

intend to adopt. The underlying value of health is compromised for these individuals who want a latrine for the health benefits of avoiding open defecation. The case of safety may be similar when well-being safety advantages of latrines conflict with the perceived dangers of latrines from accidents and probably also from the smell and sight of feces.

6. HETEROGENEOUS BEHAVIOR AND DATA COLLECTION PROBLEMS

Table 7-11 defines six dummy variables developed to test for heterogeneous behavior and any other data collection problems beyond the interviewer 2 data problem already treated. Evidence of heterogeneous adoption behavior on the part of females and male farmers was encountered in Chapter 5. The first two dummy variables test for any systematic differences in behavior of females or of male farmers from each other and from male non-farmers. Chapter 5 mentioned interviewer problems and difficulties using the attitude measurement scales which might have affected the data collection. The attitude scale problems were largely corrected after the external supervision. The last four variables in Table 7-11 test for the presence of any of these data collection problems.

TABLE 7-11. Dummy Variables to Test the Presence of Population Segments with Heterogeneous Behavior or Data Collection Problems

Variable	Description	Full Sample	Reduced Sample
FEMALE	female respondents	22%	26%
MALEFARM	male farmer respondents	35%	30%
INTERV1	Respondents interviewed by interviewer 1	27%	34%
INTERV2	Respondents interviewed by interviewer 2	23%	0%
INTERV3	Respondents interviewed by interviewer 3	25%	33%
INTERV4	Respondents interviewed by interviewer 4	25%	33%
POSTSUPR	Respondents interviewed after supervision	31%	31%

All models presented in sections 3, 4, and 5 were analyzed using a second block of variables consisting of the FEMALE and MALEFARM dummies, followed by a third block consisting of a dummy for each interviewer and for post-supervision data. At the end of the stepwise process for the first block of behavioral variables which produced the models presented so far, the next block was tested using the same stepwise procedure and criteria. Upon testing for significance of the two population segment variables, the analysis proceeded to the third block to test for significance of any data collection problems. The interviewer 2 data problem was identified in this manner in the preliminary round of analysis.

Analysis shows that male farmers have a significantly more negative overall view of latrines even after drives and constraints are factored into models of LQUALTOT in Table 7-5. It appears that male farmer attitudes toward latrines, in general, are more negative than females' or male non-farmers'. However, relative to open defecation in models of LBQUALDI they are not significantly different from the other two segments (females and male non-farmers). There is also no indication that the current set of drive, constraint, and attitude variables fails to capture male farmer intention and choice behavior as the MALEFARM dummy variable was not significant in any such models.

In contrast, the FEMALE variable was not significant in any preference models but was consistently negative and significant, or nearly so, in most intention models of Table 7-6 and 7-7, particularly when adopters were removed, and in all ADOPINT models. Constraints are the main factors that intervene to block positive preference from becoming an intention to adopt. These results, in conjunction with results in other chapters (5 and 6) support the likelihood that females face more negative barriers to

adoption than males and that constraints operate in a more negative manner on intention for females than for males. One barrier that has not been represented in these models is lack of decision-making capability and may be a constraint on intention that is more prevalent among women household heads. The significance of the FEMALE dummy variable points to the need to develop separate models for women to identify the unique way in which drives and constraints determine female adoption behavior.

Indications of data collection problems with other interviewers appeared in models of preference but these were consistent with the ways in which particular interviewers were inappropriately using the semantic difference scales for latrine and open defecation quality measurements before the supervision. Furthermore, in the preference models of LBQUALDI the post-supervision dummy indicator was consistently significant and negative. This result conforms with expectation from Chapter 5 that most of the pre-supervision errors on the part of the interviewers reduced the 7-point semantic difference scale to a simple binary response of 1 (negative rating) or 7 (positive rating). In this case, the post-supervision correction would be expected to lead to consistently smaller differences between the latrine and open defecation ratings for data collected after the supervision. The post-supervision dummy was also included with a negative but not significant coefficient in ADOPINT models of Table 7-10 and two INTPROB models without adopters that included all 18 open defecation and latrine quality ratings in their analysis (i.e., Model 4 of Table 7-6 and Model 4 of Table 7-7).

7. DISCUSSION

In this section the various model results of the previous sections are synthesized into a single set of findings about adoption behavior. The most important barriers to

adoption in rural Benin (shown in Figure 7-1) and their impacts on behavior are discussed first, followed by an assessment of the significant drives motivating adoption (shown in Figure 7-2). In general, drive factors are more prominent determinants of preference while constraints are more important influences on the formation of intentions leading to a decision to adopt and on the ability to implement that decision. Latrine and open defecation quality rating variables (shown in Figures 7-3 and 7-4) serve to complement and enhance interpretation of the action of underlying drive and constraint factors on choice and intention.

Figures 7-1 through 7-4 display the mean standardized scores of adopters, intenders, and non-intenders for significant latrine adoption model variables. The full set of 320 respondents was used to standardize variable scores but mean values are for the reduced set of 247 respondents (excluding interviewer 2 cases). These graphs show clear differences between and trends across adopters (N=24), non-adopters with a positive probability of installing a latrine in the next two years (probability index between 5 and 7, N=22), non-adopters with a negative probability of installing a latrine in the next two years (probability index between 1 and 4, N=16), and non-adopters with no intention whatsoever of installing a latrine (N=184).

7.1 Constraints on Adoption

Key findings about constraints on adoption include the following:

1. Lack of finance is a very important reason for so little adoption in rural Benin. While it has no negative effects on preference or intention to adopt, it acts to seriously delay or prevent a person from being able to fulfill his or her preference and intention to install a latrine.

2. Fundamental in suppressing interest in adoption is misunderstanding about how latrines function, their cost, their durability, and their smell, among other things. Misunderstanding is extremely important in blocking intention to install a latrine and somewhat so in reducing positive attitudes toward latrines. Perceptions that latrines smell (Figure 7-3) and that not much can be done about bad smell is a key belief that causes household heads to reject latrines. It may be important to discover the cause of this perception about bad smell and how it can be overcome. A clue comes from noting that adopters have been using their latrines for years and do not perceive their latrines to smell, according to survey results. It may be that privately installed latrines function very well in keeping odors under control while the basis of many non-adopters' perceptions is limited to poor experience with public or institutional latrines that tend to smell badly. Another explanation for adopters' more positive views of the smell of latrines could be the result of post-choice dissonance-induced adjustment of attitudes.
3. An important constraint reducing intention to adopt is the poor design and performance of latrines related in large part to the pit or slab collapsing (poor structural integrity), their production of bad odors (design and operational problems), and probably also to their lack of safety for children. Perceptions that latrines are unsafe appear to be founded on some real problems and experiences that adopters also share according to their lower rating of the safety of latrines than non-adopters (Figures 7-3 and 7-4). Evidence from the qualitative investigations of the number of pit cave-ins among adopters supports this reality. On the other hand, associating bad odors with danger is part of a fundamental and probably unchangeable set of beliefs

- among the Fon, and widely held in many pre-industrial societies, about feces, defecation, defilement, misfortune, and taboos discussed extensively in earlier chapters. Perceptions of poor latrine design and performance appear to reduce the strength of intention to adopt without significantly affecting preference for latrines, and may even be associated with greater awareness of the advantages of having one. Its greater significance and principal role in models of higher levels of intention suggest that awareness of these problems is gained later in the decision-making process when evaluative information is gathered, possibly from current adopters. This constraint may therefore be an important and serious reason for active rejection of latrines.
4. Perceptions of two implementation-related constraints, technical complexity and high cost, negatively affect adoption by reducing a person's preference or favorable feeling toward latrines, especially when drives are weak. Technical complexity includes difficulty finding specialists, difficulty getting materials and tools, and lack of technical/construction knowledge. Technical complexity and high cost may block preference for a small group of individuals but appear less important than misunderstanding and lack of drives in explaining weak demand.
 5. Neither of the two psycho-social factors are significant constraints on behavior in models of the reduced data set, although both are negatively associated with intention to adopt in Figure 7-1.
 6. Unsuitable soil, operation and maintenance problems, and lack of space/disapproval are not generally barriers to intention or choice in this sample of households.

FIGURE 7-1. Mean Scores of Latrine Adopters, Intenders, and Non-intenders for Significant Constraint Factors

(No Interviewer 2 Cases)

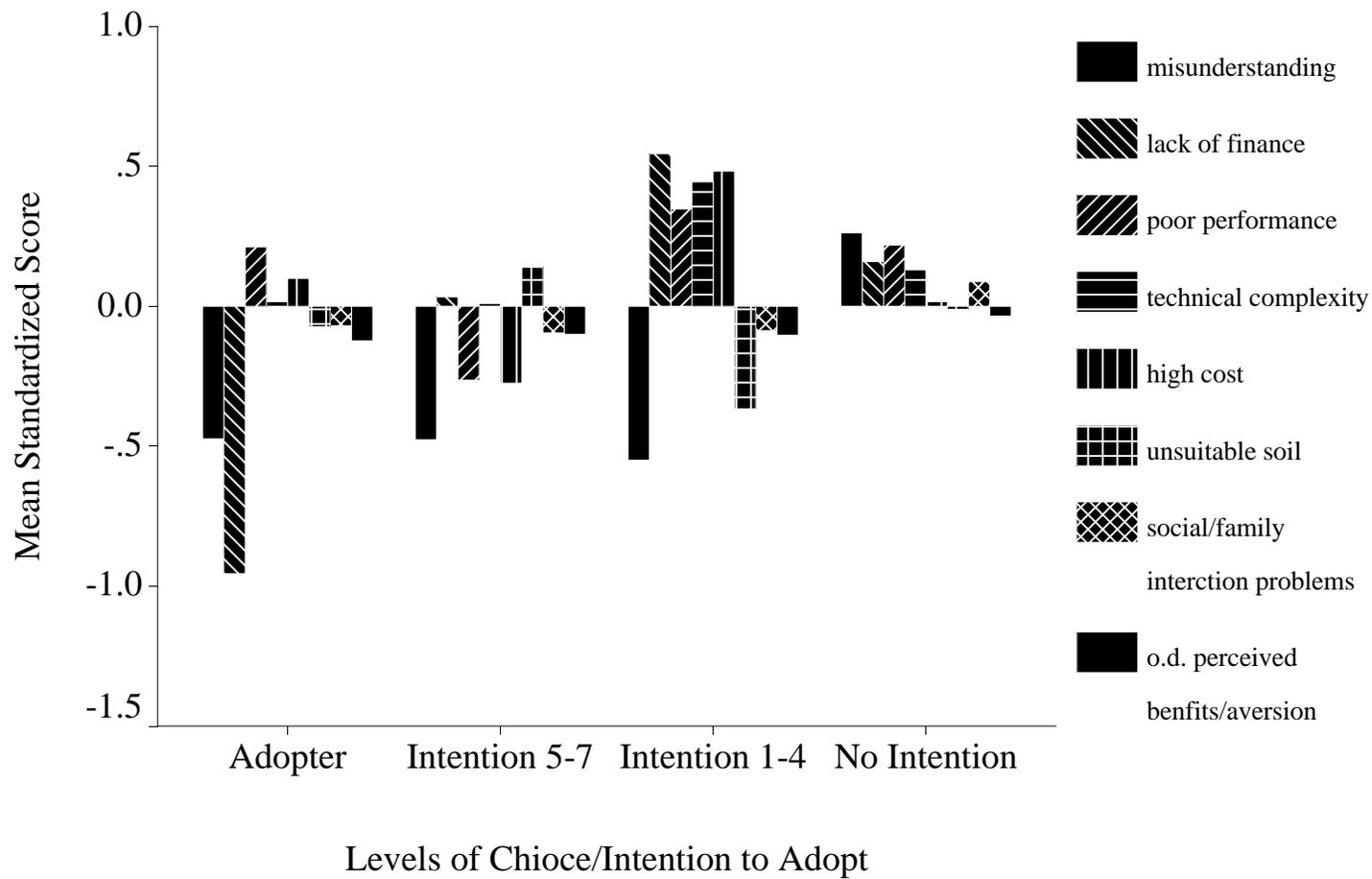
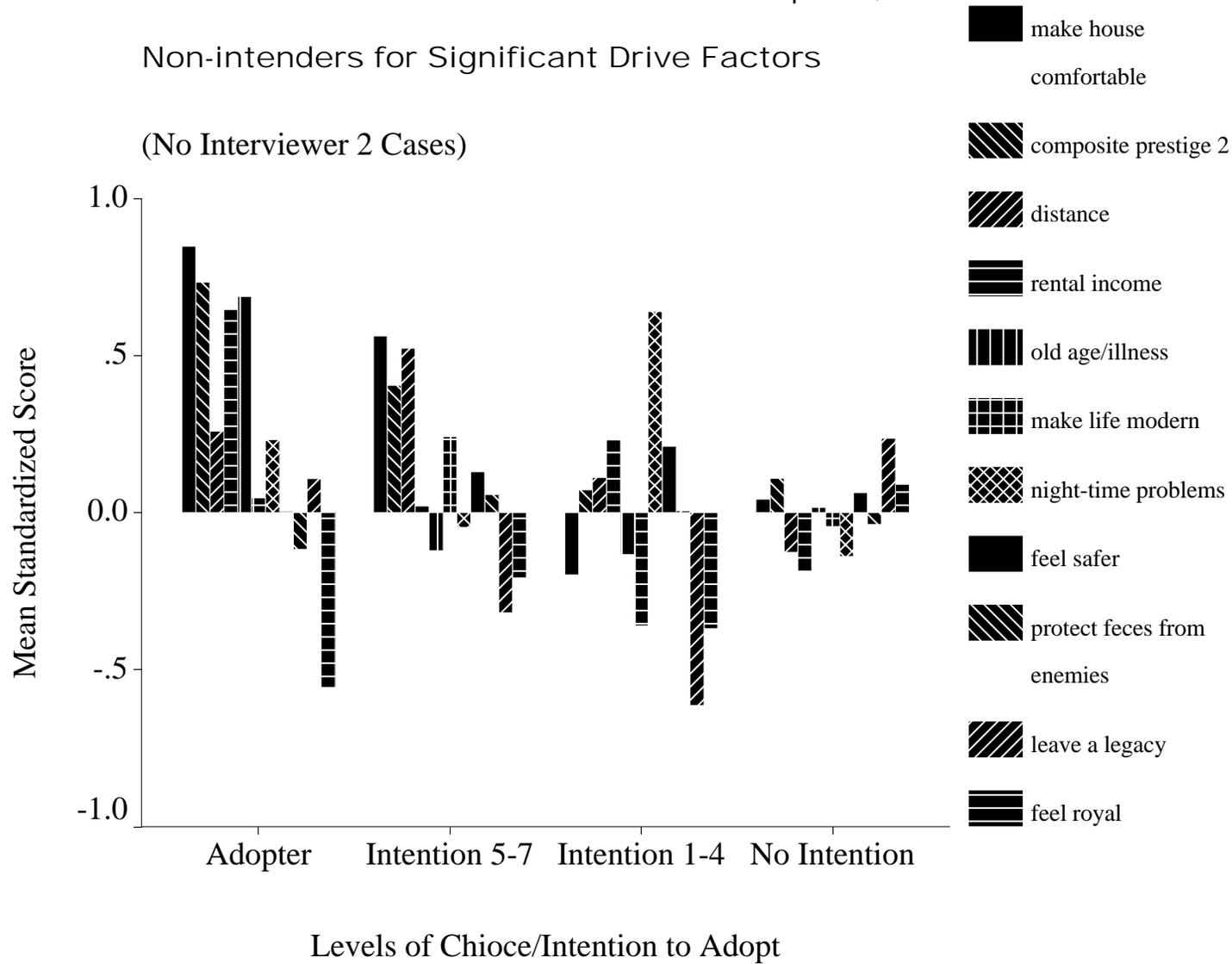


FIGURE 7-2. Mean Scores of Latrine Adopters, Intenders and Non-intenders for Significant Drive Factors

(No Interviewer 2 Cases)



However, operation and maintenance problems related to cleanliness significantly lower the overall rating of latrines.

7. Constraints appear to operate more negatively on the adoption behavior of female household heads than on males despite females' more positive attitudes toward latrines. Specific differences between men and women's adoption behavior can be identified by developing separate mathematical models of preference, intention, and choice for men and women household heads. This is an important effort to properly understand the adoption behavior of female household heads.

7.2 Motivation to Adopt

Key findings about the drives that motivate adoption include:

1. Distance to a person's open defecation site, a reflection of the decreased availability of defecation sites in a village, is the strongest motivator of intention and choice to adopt a latrine (Figure 7-2). This finding is consistent with the finding from Chapter 4 that population density is a key village-level condition for arousing demand for latrines.
2. Present-day drives for latrine adoption appear to have changed somewhat from when the first rural households adopted latrines, on average 10-20 years ago. Whereas prestige 1 and 2 drives seem to have dominated drives for adoption before, population growth has increased village population density so that problems related to lack of open defecation sites are becoming a more important motivator of present-day rural adoption. In particular, these problems concern defecation at night and may also involve personal protection and safety. Increasing rental income appears to be an important motivator of past and present-day adoption for a small group of people. As

- mentioned earlier, individuals seeking rental income are an important group of early adopters who introduce the innovation of private household latrines into a village for the first time.
3. All evidence from these models clearly shows that although a desire for health benefits, in particular to reduce household health care expenses, positively contributes to preference for latrines over open defecation, it is not associated with a decision to adopt latrines in rural Benin. Perceived problems with the healthiness of latrines, related to their smell and cleanliness, may cause individuals seeking health benefits from avoiding open defecation to reject latrines.
 4. Among prestige 1, 2, and 3 drives which are all positive motivators of adoption, the drive to express new experiences and lifestyle acquired outside the village, as represented by the advantage “to make my house more comfortable”, closely associated with a number of well-being advantages of latrines (Chapters 3 and 6), is the most significant and important. It precedes distance and certainly rental income as the most important motivator (as measured by coefficient value and significance and by model entry order) of past adoption and remains a strong drive of present adoption. This finding is also independently supported in Chapter 4 by the finding that demand for latrines increases significantly with the percentage of non-agricultural households who are more driven by prestige 2. The importance of prestige 3, to leave a legacy for descendants, as a positive motivator of adoption, is confounded by its greater prevalence as a key reason for adoption among female household heads who, as mentioned earlier, either face greater constraints on adoption, or weight those constraints more negatively, or both. It seems that individuals desiring to leave a

legacy are driven to adopt but have trouble being able to do so (see Figure 7-2). The prestige 4 drive to feel royal consistently leads to rejection while at the same time increasing overall preference for latrines over open defecation. It is hypothesized, but untested, that individuals motivated by prestige 4 reject latrines in favor of other more satisfying non-sanitation expenditures. Future work to incorporate other constraint-related and rejection data into the modeling analysis of intentional behavior of non-adopters should be able to test for this particular explanation of rejection.

5. The other situational drive for adoption related to old age/illness does not appear to be an important motivator of adoption among current non-adopters (see Figure 7-2). Its association with past adoption is thought to reflect the aging of adopters and their parents with the passage of time. It is possible that the set of constraint variables do not adequately separate out the confounding influences of old age/illness as a barrier to adoption. These conflicting influences of old age/illness as both a drive and constraint could explain why this situational drive is insignificant among non-adopters.
6. An aroused desire for greater safety is the only other drive besides the one to feel royal that leads to rejection of latrines. The hypothesis is that latrines are rejected because they suffer from a very poor image when it comes to safety.

7.3 Perceptions of Latrine Qualities

Key findings about perceived qualities of latrines include:

1. Attributes of latrines that appear to significantly increase adoption include perceptions (beliefs) that latrines are useful, do not smell, and are suitable (Figures 7-3 and 7-4).

FIGURE 7-3. Mean Scores of Latrine Adopters, Intenders and Non-inte
for Significant Latrine and Open Defecation Qualities

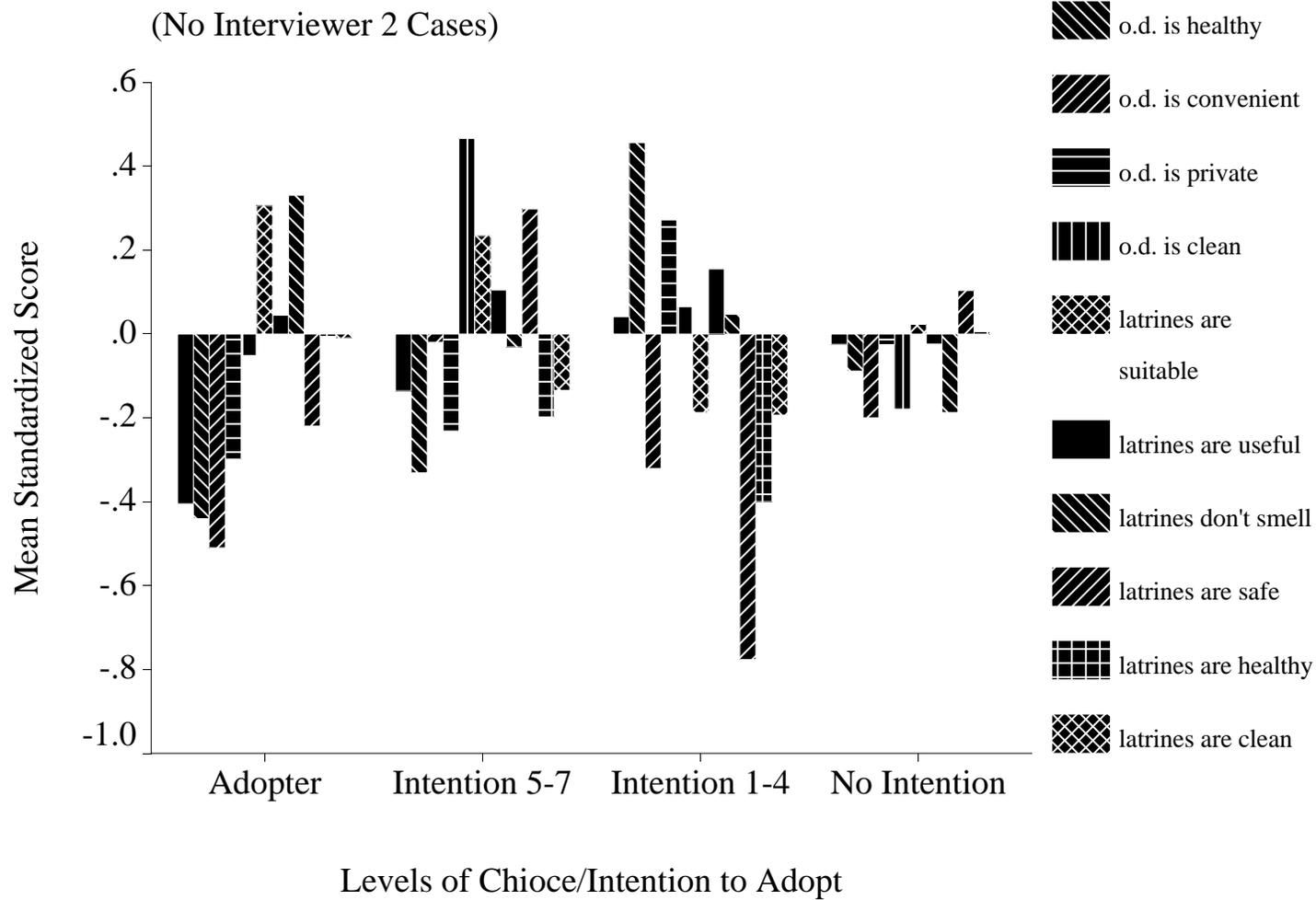
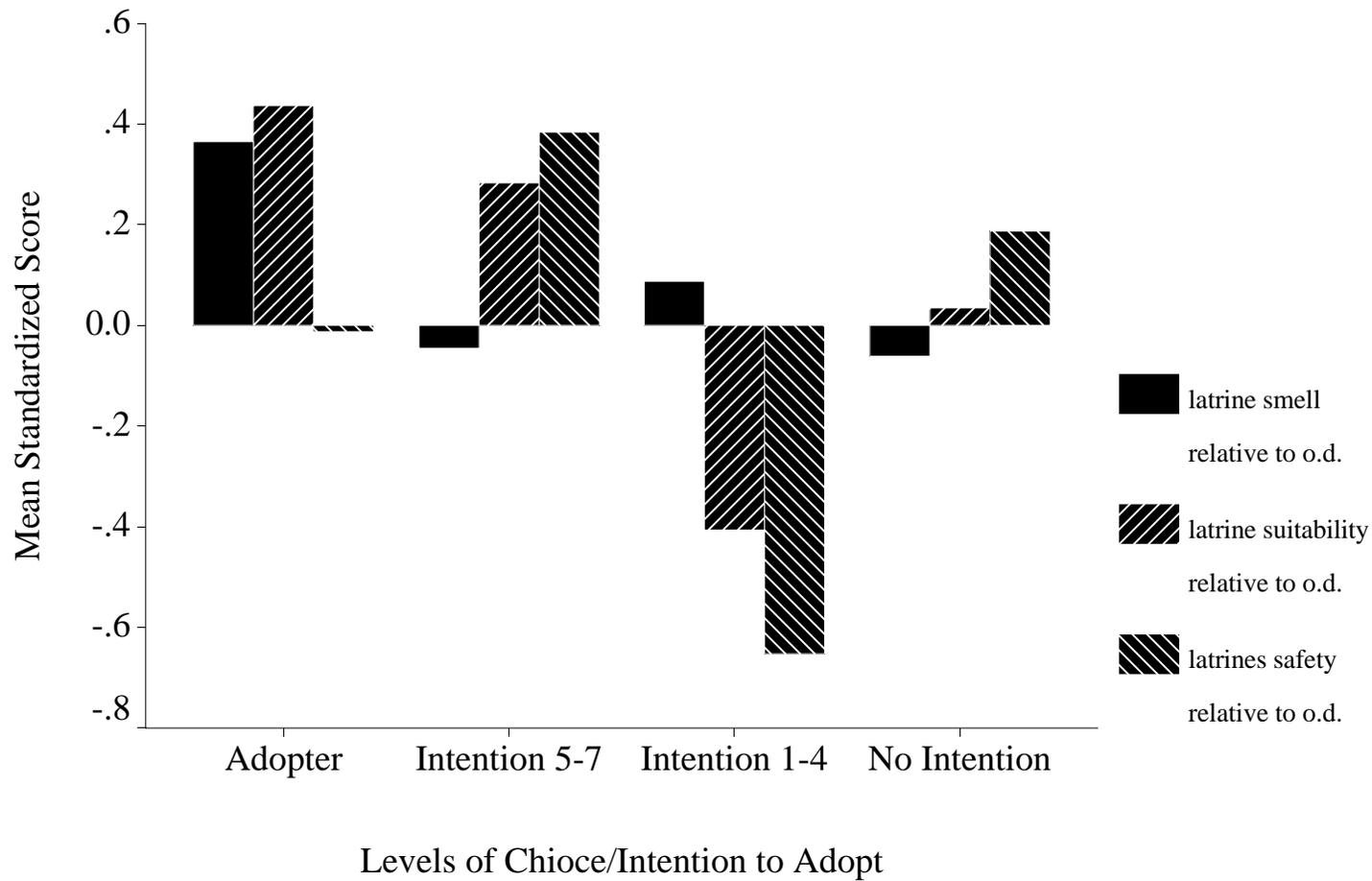


FIGURE 7-4. Mean Scores of Latrine Adopters, Intenders and Non-intenders for Significant Differences Between Latrines and Open Defecation (No Interviewer 2 Cases)



2. Negative attributes of open defecation that appear to significantly increase intention to adopt include perceptions that open defecation is not comfortable, and to some degree not private or not healthy, although the last two are not consistently significant in their influence.
3. Non-adopters seriously considering adoption do not appear to perceive problems with the cleanliness of open defecation, and in fact, rate this attribute more positively than individuals not considering adoption.
4. Negative views of the safety of latrines appear to be founded on adopters' experiences with safety-related problems installing and using their own latrines over the last several decades. These experiences, when propagated among potential adopters, negatively affect the decision to adopt a latrine.
5. The only other attributes of latrines that appear to have some influence or association with intention to adopt are healthiness and cleanliness. For both these qualities, less positive views of latrines are associated with greater intention to adoption, however, they are less clearly associated with past adoption as was the case with negative views of the safety of latrines (Figure 7-3). Greater awareness and evaluative information gained about latrines as decision-making progresses to higher levels of intention may account for the development of these negative perceptions. However, such beliefs about latrines would have little impact on intention if an individual gave them little value, the case when health is not an important outcome of adoption. Such an hypothesis can be more fully investigated with analysis focused on the relative attributes of latrines over open defecation and on developing separate models of population subgroups. Evidence was found suggesting that male farmers' attitudes

toward latrines are formed differently from females' or male non-farmers'. This is an additional reason to develop separate models.

8. SUMMARY AND CONCLUSION

This chapter culminates the third and final phase of research undertaken to study latrine adoption behavior in rural Benin to identify more effective ways to promote improved sanitation. In the first phase, qualitative and theoretical approaches were used to develop hypotheses about the latrine adoption decision-making process and its determinants. In the two subsequent phases, quantitative data needed to statistically test these hypotheses were obtained first at the village and then at the household level and analyzed in a series of steps leading to the mathematical models of household latrine adoption behavior presented in this chapter. Results of these models about the most important drives motivating individual households to adopt latrines (distance to open defecation and prestige to express new experiences and lifestyle) are consistent with the most important village-level conditions (village population density and non-agricultural population percentage) for arousing demand for latrines identified in the village analysis.

Behavioral Implications

In this chapter, separate models of behavior measuring preference for latrines, intention to adopt, and choice to adopt were developed to test the relationship and evolution of these three decision-process stages. The distinction between factors that determine preference from those that influence intention and choice has important implications for strategies to stimulate demand. Such strategies can be separated into those aimed at arousing desires for latrines or preference and those targeted at removing

barriers to intention and choice where preference is positive and strong. Certain aroused drives, particularly prestige-related ones, are the most important factors operating on preference. However, some implementation-related constraints, namely technical complexity and high cost, especially when perceived to be permanent, can also reduce preference. Misunderstandings about how latrines function and perceptions of the poor design and performance of latrines, particularly related to safety, smell, and health, are largely responsible for reducing intention to adopt while distance to open defecation, two prestige drives (to express new experiences and lifestyle and to affiliate with the urban elite), and the situational drive to increase rental income increase it. When intention is positive, the most significant barrier to adoption is lack of finance. On its own, finance does not significantly affect intention to adopt and is correlated with positive preference. These findings confirm what other behavioral research has demonstrated about the importance of developing separate models of preference and choice for designing policies to increase demand (Koppelman and Pas, 1980; Mokhtarian and Salomon 1996a, 1996b).

Methodological Implications

The approach taken in this analysis to measure and model both stated intention and observed choice has been an important methodological step beyond separating preference and choice. It has permitted drawing conclusions about:

1. past and present adoption motives and their likely evolution across villages;
2. lack of finance as a temporary constraint blocking a latent or unexpressed demand for latrines whose estimated size has a significant implication for planning any service delivery that would be needed if this constraint were removed;
3. problems with safety of latrines being real and not consumer misunderstandings;

4. the need for real technical improvements to the design and construction of privately installed latrines in the study area, followed by communication of these enhancements to potential consumers.

Another methodological feature of these models is that socio-demographic variables, commonly used to model demand, were specifically excluded from the main set of drive and constraint factors analyzed here. The drive and constraint independent variables were intentionally created to measure underlying motivational attitudes that are not well-predicted by socio-demographic factors. As other research has shown, socio-demographic variables are often very poor indicators of attitudinal factors that actually determine behavior (Salomon and Ben-Akiva 1983; others). Their confounding associations with behavior usually result in statistically weak quantitative models. Instead, the analysis in this chapter tested the statistical significance of adding key socio-demographic indicator variables into the fully developed attitudinal models of behavior to identify the presence of any population subgroups with systematic differences in behavior from the general population. Gender and male occupation were thus tested for the models analyzed in this chapter. Female gender produced a consistently significant negative effect on intention to adopt pointing to the need to develop separate behavioral models of latrine adoption for men and women heads of household. This is an important endeavor given that nearly 24% of rural households in Zou Department were female headed in 1992 (INSAE 1993).

The modeling of households' level of stated intention to adopt sometime in the future and within some fixed period of time has benefited in this analysis from the development of both linear and logistic regression models. Oral presentation of any type

of ordinal scale to measure likelihood of intention is prone to subjectivity on the part of both the interviewer and interviewee. This subjectivity reduces the statistical strength of linear regression models of intentional likelihood. By converting ordinal intention measurements to dichotomous variables and modeling these outcomes with logistic regression, differences in factors influencing strong levels of present intention from those influencing weak levels of future intention were ascertained. Policy implications of these modeling results are synthesized, together with findings from other chapters, in the concluding chapter of this dissertation.

CHAPTER 8

CONCLUDING INSIGHTS AND IMPLICATIONS FOR SANITATION PROMOTION

This research began with conceptual and qualitative work to understand the decision of private households to install a latrine in rural Benin. Hypotheses about motives and barriers of this decision, and the factors that stimulate or suppress consumer demand for latrines in rural Benin were developed. To test these hypotheses, first, village-level latrine adoption data were obtained and analyzed. Then, data on the adoption behavior of individual households were collected in a survey, analyzed, and finally used to develop mathematical models of preference for latrines, stated intention to adopt, and observed choice to install a latrine. From these investigations and analyses of latrine adoption behavior, a much deeper and clearer understanding has been gained of the underlying reasons for and obstacles to adoption of improved sanitation in rural Benin, and more generally among third world populations. This chapter concludes the dissertation with a review of its main insights about sanitation demand and a synthesis of policy and program design implications for promoting demand and accelerating sanitary coverage levels in rural Benin and in general. Lastly, some methodological contributions and lessons of this research for studying consumer behavior, particularly in developing countries, are noted at the end.

1. INSIGHTS FOR UNDERSTANDING SANITATION DEMAND

Important insights for understanding sanitation demand concern its motivating and foundations, the importance of lifestyle and environment for explaining the

presence of motivation, and the action of constraints on individual choice and aggregate demand.

1.1 *Motivating Foundations*

The foundation for understanding demand for latrines and other sanitation improvements lies in the real reasons why households choose to invest in such facilities and decide to change one of their most basic biological and social behaviors. The underlying motives that drive such a choice or change are neither static nor homogenous across rural households and affect sanitation demand in the following ways:

- Without strongly felt personal motives for a latrine or other sanitation improvement, an individual will have be uninterested in such a change. Programs to encourage demand related to affordability or acceptability of a sanitation technology or design will have little impact on individuals with weak or no preference.
- Each potential motive for sanitation adoption also leads to consideration of other alternatives to satisfy aroused needs for change. An individual chooses a latrine, for example, by comparing its attributes advantageously with those of other available options for drive satisfaction. For many of the drives motivating latrine adoption, especially those related to prestige, the competing alternatives have nothing to do with sanitation. These alternative investments reveal important attributes and provide new avenues for enhancing the attractiveness of latrines as discussed below under policy implications.
- Reasons for adoption determine much of the preferred design and use of latrines as described in Appendix A. This is because a person's evaluative criteria for and desired outcomes of adoption directly reflect his or her underlying motives. Thus,

different design features and attributes will be important to different households, depending on their reasons for wanting latrines. Likewise, latrine use by different groups of people may be more or less compatible with satisfying each drive and/or with a particular preferred design. These consequences of the motivational foundations of demand have implications for “product” development and public health education.

In rural Benin, contrary to what practitioners and experts alike have assumed, health is not an important motive for choosing improved sanitation. Evaluations of sanitation projects indicate this is true generally in developing countries. Analyses of both individual (household) and aggregate (village) latrine adoption behavior conducted for this research show that prestige and increasing distance to an acceptable open defecation site are the two most important reasons for latrine adoption in rural Benin.

Prestige gained from latrine adoption in rural Benin differs in its meaning depending on the lifestyle, as discussed below, of the individual concerned. Of the four types of prestige motivating latrine adoption, the most important one is a desire to express new experiences and a new lifestyle acquired outside the village. The arousal of this desire is associated with non-agricultural occupations and with migration and travel to towns and urban centers in Benin or in neighboring countries. The interviews and the factor analysis of advantages of adoption reveal that the new experiences and lifestyles of these individuals are associated with a greater value of time and money saved, of personal comfort, convenience, and privacy, and of the well-being of nuclear family members including cleanliness, safety, and health. However, health concerns related to the

prevention of infectious diseases are often understood in terms of traditional beliefs about disease transmission.

Increasing distance to open defecation is a symptom of the decreasing availability of defecation sites in the village as population density increases. Population density and the percentage of non-agricultural households are two of the most important conditions explaining village-level demand for latrines. The decreasing availability of defecation sites is accompanied by problems of greater inconvenience, less visual privacy, more exposure to the smell and sight of feces, and increased dangers defecating in the open. In contrast to the lifestyle-orientation of the formerly mentioned prestige desire, increasing distance as a motive reflects well-being concerns that are becoming more widely perceived as villages become integrated into the regional economy, and develop and grow.

Several other reasons for latrine installation significantly motivate adoption in rural Benin when they are active. These include other dimensions of prestige, a situational advantage to increase rental income, personal protection and safety from enemies stealing your feces for sorcery against you, and difficulties of night-time defecation to which increasing distance is a contributing factor. Desire to increase rental income is a very important motive for a small group of early adopters who are often responsible for introducing private latrines into a village for the first time.

1.2 The Importance of Lifestyle and Environment

Differences in individual lifestyle and village environment account for the presence or absence of drives to install a latrine in rural Benin. These two factors are likely to play a universal role in explaining the motivational foundations of sanitation

consumer behavior. However, the specific lifestyle characteristics and environmental conditions involved will depend on local context.

In addition to occupation, mobility, and travel mentioned above, gender, lifecycle (household age and structure), education, social linkages, and wealth were identified as important characteristics of individual lifestyle that explain differences in latrine adoption motives in rural Benin. Specifically, household heads engaged in traditional subsistence-based agriculture, with little mobility and travel, no formal education, few urban social linkages, and little wealth are unlikely to have any drives for latrines. Female household heads are driven to adopt for reasons somewhat different from those of males. For example, prestige is a less important reason for female adoption except for intergenerational prestige (“to leave a legacy for descendants”) which appears to capture a unique “maternal instinct” of women. Females also have greater preference for latrines and more negative attitudes toward open defecation than men, but have much less intention of installing a latrine because they perceive barriers to adoption more negatively than males. Much of these gender differences can be traced to the distinct lifestyles of men and women in rural Benin.

As mentioned above, the availability of open defecation sites is an important environmental condition explaining the arousal of well-being drives for latrines. A key indicator of decreasing availability is population density, but the extent and intensity of land cultivation and rules about defecation in agricultural fields also affect it. Other conditions of the village’s physical and social environment that influence the arousal of both prestige and well-being drives for latrines in rural Benin are: greater social differentiation (of clan, class, ethnicity, occupation, etc.) for which size and the level of

commercial, economic, or administrative activity are indicators; the degree of regional integration and exposure for which urban proximity and road access are indicators; the amount of infrastructure development, in particular the presence of piped-water; and finally, the aggregate level of private latrine adoption in and around the village which promotes awareness of the benefits of latrines, stimulates favorable attitudes toward them, and enhances the feasibility of their installation. These village conditions for drive arousal indicate that small, remote, off-road, mostly agricultural and socially homogeneous villages without much infrastructure will produce very little demand for latrines. On the other hand, larger, denser, socially and occupationally diverse, near-road, economically integrated villages provide the circumstances for awakening much stronger demand for latrines where well-being drives are widely felt in addition to strong prestige needs.

1.3 The Action of Constraints on Individual Choice

Demand for a sanitation improvement occurs when that improvement is “possible, preferred, and chosen” by an individual (Mokhtarian and Salomon 1996a). The modeling analysis of household latrine adoption behavior in rural Benin demonstrates the varied roles of constraints on preference, stated intention, and choice to adopt a latrine. These roles provide a clearer set of explanations for individual rejection of latrines that can be used to identify strategies to increase demand. As suggested by this research, in addition to when no drive is aroused, latrine rejection occurs in rural Benin when:

- lack of awareness and understanding of latrines prevent a person from forming a preference;

- the permanently and prohibitively perceived technical complexity and high cost of implementing latrines block preference from developing early in an individual's decision process by making latrines appear as an infeasible and unattainable alternative, particularly when drives for adoption are weak;
- implementation-related constraints which are not prohibitively but still permanently perceived, such as soil problems and technical complexity, and misunderstandings about how latrines function, their cost, their durability, and their smell in rural Benin, reduce intention to adopt although preference is positive and drives are active;
- psycho-social constraints such as extended family interaction problems, fear of disrupting social relations, psycho-physical aversion, and perceived benefits of open defecation produce negative attitudes toward latrines, the case for a rather small group of household heads;
- qualities that are negatively perceived, such as the safety, smell, and healthiness of latrines, happen to conflict with an individual's principal motive for adoption, the case for individuals seeking greater safety or health benefits in rural Benin;
- the poor performance of existing latrine design and construction (e.g., structural integrity, production of odors, and safety for children) leads to their rejection among those who desire latrines;
- a temporarily perceived lack of finance prevents or delays adoption for individuals who both prefer and intend to adopt latrines.

External constraints on adoption, such as lack of awareness, misunderstanding, lack of finance, and other implementation-related factors, can be reduced by appropriately designed policies and program interventions. On the other hand, psycho-social

constraints internal to an individual and his or her community are more difficult to affect in the short- or mid-term. Reducing implementation-related constraints with supply-side programs, however, has little effect on demand where drives are weak or lacking. Where drives are strong and preference is generally positive, programs to reduce the most widespread implementation-related constraints will have the most impact for stimulating demand.

2. POLICY AND PROGRAM IMPLICATIONS FOR SANITATION PROMOTION

Strategies to promote sanitation that emerge from these insights about demand and from other findings of this research are organized into three sections: marketing and communications strategies, delivery and support programs, and latrine design.

2.1 Marketing and Communications

Lessons for latrine marketing and communications strategies, which may be the most important interventions for latrine promotion and demand creation, are wide-ranging.

1. Promotional Messages:

Messages to arouse interest in and stimulate desires for latrines and other sanitation improvements should focus on the actual advantages perceived by consumers in adopting these changes. Such messages should reflect the cultural values that underlie these advantages and draw attention to the inadequacy of present conditions in terms of these same advantages and values. In rural Benin, this means changing the focus from disease prevention and health to prestige as it relates to different lifestyles and to well-being in terms of greater comfort, convenience, privacy, cleanliness, safety, and

protection. If messages about health benefits are used, they need to be redesigned to communicate economic and other benefits of disease reduction in terms consistent with existing beliefs even if those beliefs about the transmission of disease are not wholly scientific.

2. Market segments and targeting:

A single set of promotional messages and communications strategies to arouse drives is unlikely to work for all segments of the population. Messages should be adapted and targeted to the main lifestyle groups (i.e., based on gender, occupation (farmer/non-farmer), mobility and travel, and other characteristics of lifestyle in rural Benin) and social/physical environments (i.e., the four village types in rural Benin identified in Chapter 4) that account for differences in motivation.

3. Information campaigns:

Information dissemination, in parallel with promotional advertising, should seek to correct specific misunderstandings about and increase basic awareness of latrines. In rural Benin, campaign topics should include the functionality, costs, performance (odors and safety), operation, and durability (filling, emptying, or replacement) of private household latrines, especially among groups with low levels or low quality of exposure to latrines. (Public latrines are perceived quite differently.) Patterns of information communication underlying the present diffusion of latrine adoption in rural Benin suggest that creating opportunities for personal experience with private household latrines in and around the village is a promising strategy for effective information communication.

4. Latrine exposure and experience:

The quality and frequency of a person's exposure to latrines or to another new

sanitation facility or service provide two basic ingredients for shaping a person's beliefs about them. In rural Benin, exposure to private household latrines belonging to a person of social, familial, or occupational importance to the individual increases perception of advantages and positive attitudes, stimulates drives, and leads to stronger preferences for latrines. Latrine exposure in institutional or public settings (such as schools, health clinics, markets, military, etc.) does not appear to be important, and may even be counter-productive if these are the only latrine exposure experiences.

Individual lifestyle, through the related dimensions of occupation, mobility and travel, and social linkages, proximity to an urban center where latrines are widespread and valued, and the level of latrine adoption within a village, all play important roles in determining the quality and frequency of a person's latrine exposure in rural Benin. Given these relationships, strategies to increase awareness and improve understanding of latrines should focus on interpersonal communication through key influence networks for each lifestyle group, and on creating opportunities for exposure to private household latrines (within these networks) rather than institutional/public latrines. However, the people affiliated with certain institutions, in particular, teachers and health workers, are often highly valued interpersonal sources of information considered "modern", and were most frequently cited as a source of beliefs regarding infectious diseases in motivating preference for latrines to protect health.

5. Communicating latrine design enhancements:

Technical design enhancements to the structural integrity, safety (especially for children), and odor production of latrines in rural Benin need to be communicated to those who desire latrines but are discouraged from adoption by these apparently real

problems with performance. Collaboration between the public and private sector will be needed to research, develop, and disseminate these design enhancements.

6. Public health education:

To achieve the public health benefits of adoption, education is still needed to encourage latrine use by all household members, especially when the drives motivating household heads to adopt latrines ignore the needs of other members such as children. This tends to be the case for adopters motivated by restricted mobility, personal protection, and some aspects of prestige in rural Benin (see Appendix A). Promotional messages for drive arousal should seek to enhance the image of latrine use by children and family members in the same terms and values associated with the most widely appealing drives. In public health education campaigns, child/family use of latrines should be portrayed as having a modern/better lifestyle, what urbanized elite value, increasing convenience and comfort, providing greater privacy and cleanliness, and for the health and safety advantages.

2.2 Delivery and Support

While marketing and communications are critical to stimulate interest in and preference for latrines or other sanitation improvements, supply-side delivery and support for construction are critical for removing implementation-related barriers that reduce intention or block adoption. The following suggestions are made for rural Benin:

1. Removing implementation-related constraints:

The implementation-related constraints that yield the greatest increases in demand when relaxed should be the focus of supply-side interventions. Examples of delivery and

support strategies to reduce implementation-related barriers to adoption in rural Benin, based on the most important constraints, might consist of:

- providing better information, as discussed above, about factors perceived to be implementation constraints such as technical complexity and high cost of latrines, or design and performance problems;
- improving access to technical support and to inputs for design and construction;
- developing and disseminating new latrine construction methods and designs to overcome real cost, soil, space, or performance problems; and
- creating schemes for financing.

These interventions should be targeted at consumers who already have positive preference and active drives for improved sanitation (i.e., urban fringe villages and major sub-prefecture capitals in rural Benin with the potential for strong demand).

2. Financing Schemes:

Schemes to help finance latrines through loans may be the most effective single action to stimulate demand. Finance has been identified in a growing number of studies and projects as a critical factor for stimulating demand in developing countries for both sanitation improvements and new water supply systems (Singh et al. 1993; Varley 1995; Cotton and Saywell 1998; McCommon et al. 1998). It appears that cash flow problems are a major barrier blocking a latent demand for latrines from being expressed. Finance schemes should be carefully targeted where intention to adopt is strong or drives for latrines are already aroused.

3. Bundling latrines with other home improvements:

The alternatives to latrines for a number of drives, such as cleanliness,

convenience and comfort, privacy, health and safety, and prestige often consist of other infrastructure to improve housing and property. In Benin for example, rainwater catchment cisterns are often built to satisfy each of these drives, and when compared to latrines are generally more highly preferred. Bundling the promotion of latrines and the delivery of support activities for latrine construction with other housing improvements, in particular with highly desired items, may be an effective way to improve the image of latrines, and to increase access to critical information, resources, and other inputs aimed at removing barriers to adoption. Bundling could include such things as offering credit loans for a housing improvement or for highly attractive options on condition that family latrines are also built, targeting private sector cistern builders for training and information dissemination on latrine design and construction, and linking latrines to highly desired housing improvements in publicity campaigns.

4. Regional strategies:

Several directions for regional planning of delivery and support strategies derive from this research. These systematic approaches for large-scale sanitation promotion should be more effective for accelerating latrine adoption among rural households:

- Use existing urban-rural linkages, specifically private (social and family) and professional (occupational and educational) linkages, for publicity and dissemination of information (i.e., for structuring a general social mobilization campaign on latrines) and even for delivery of and access to some support activities.
- Take advantage of an apparent hierarchy of villages in terms of potential for adoption, dominant type of market segment, and inter-village spatially structured processes of diffusion (see Chapter 4) to select an initial set of villages with high adoption

potential as regional market or government diffusion centers. Concentrate first on activities aimed at raising adoption levels within high-potential villages and creating structures to support activities for out-lying villages. Then, expand efforts to nearby villages with a sequenced package of appropriately targeted publicity, information campaigns, exposure activities, latrine design and technical/construction support activities to the dominant market segment of each village. The same networks acting in urban-rural linkages are likely to exist between villages correctly selected as diffusion centers and their affiliated surrounding villages.

- Use the most widely appealing and powerful drive(s) motivating latrine preference to develop messages for conducting a mass publicity campaign at the regional level.

2.3 Latrine Design

This research, particularly the insights about the motivational foundations of latrine adoption, points to a new direction for the consumer-based design of sanitation technologies. Here are a few preliminary implications of the research findings for latrine design:

1. Product differentiation:

Besides targeting sanitation marketing and communications strategies and delivery and support interventions, different latrine “products” in terms of design features, construction materials, performance and operating characteristics, and cost will need to be developed for different segments of consumers. This is because, as seen in Benin, the attributes and qualities that are important to a person’s choice depend on his or her underlying reasons for adoption. Initially, efforts might focus on developing flexible latrine designs that have different interchangeable features intended to appeal to two or

three of the largest segments of latrine demand. For rural Benin, three such segments might consist of : i) those motivated by desires for personal prestige; ii) those motivated by convenience and comfort; and iii) those motivated by safety and health-related benefits. Segments might also divide based on cost and/or finance.

2. Public health aspects of design:

Some design features of latrines may be critical for facilitating latrine use by children, by both women and men in a household, or by other subordinate members, and therefore have major importance for achieving the public health benefits of adoption. Technical development and dissemination of latrine design styles should promote those features (e.g., double cabins and others discussed in Appendix A) that facilitate family and child use without damaging the value of the latrine for satisfying major drives. It will be vital to provide support activities that follow up latrine adoption with public health education, as mentioned above, to encourage the use of latrines by family members and for disposal of young children's feces.

3. METHODOLOGICAL CONTRIBUTIONS AND LESSONS

Some of the more important methodological contributions and lessons of this research are summarized below.

3.1 Roles of Qualitative and Quantitative Research

1. Indispensability of qualitative research:

The qualitative in-depth interviews with consumers and latrine inventory were the most crucial and valuable part of this research for understanding behavior, the motivational foundations of demand for improved sanitation, and the implications of

behavior for market-based promotion. If well done, such qualitative fieldwork provides reliable information about the important motives and barriers to adoption even without further quantitative survey work. In fact, the quantitative survey could not have been designed, nor its results properly interpreted without the basis of meaningful and in-depth qualitative research.

2. Policy value of quantitative research:

Quantitative analysis is useful and may be necessary to identify the most important reasons for and obstacles to demand for improved sanitation, particularly in deciding how to spend limited resources on promotion. Mathematical models of behavior help to test hypotheses, assess the impacts of different factors on demand, and identify the characteristics and behavior of different market segments. Such models can also be used to forecast the impacts of suggested policy proposals on individual behavior and aggregate demand, although this has not been demonstrated in this dissertation (Ben-Akiva and Lerman 1985).

3. Quantitative data and analysis options:

The dissertation has demonstrated the use of two different kinds of data and analyses to model demand for improved sanitation. Both are useful for identifying policy implications. Behavioral modeling of individual consumers requires a survey to collect appropriate attitudinal data. While attitudinal surveys are difficult, complicated, and may be quite costly, they provide data about the real determinants of behavior needed to develop marketing approaches to sanitation promotion. Analyzing demand at higher levels of aggregation (e.g., village, neighborhood, etc.) can be done by creating proxy variables to represent the motivational and constraining actions of appropriate lifestyle

and environmental factors from secondary socio-demographic, geographic, infrastructure, census, and other such databases. Multiple analyses using different data sets and approaches provide independent ways to verify the reliability of findings. In both cases, hypotheses from the qualitative research provide the critical foundation for the development of appropriate variables and the application of appropriate model formulations and analytical methods.

3.2 Lessons For Attitude Measurement

As learned in the survey research conducted for this dissertation, the application of attitude measurement techniques in interviews with illiterate populations in developing countries is tricky and prone to error. From this experience, several recommendations and thoughts emerge to improve efforts to measure attitudes and behavior in developing countries:

1. Use of the 4-point scale to measure the importance of advantages of latrine adoption did not fully capture respondents' different values. A more effective way to measure the relative importance of advantages and disadvantages of a behavior change was found by asking respondents to compare the importance of pairs of advantages and to rank the importance of lists of advantages.
2. Presentation of the semantic differential scale to respondents was problematic for some interviewers. This scale does appear to be an effective way to measure attitudes as long as the introduction and phrasing of the choice of responses in the two stages used to implement the scale are carefully and consistently executed by interviewers. There is a risk, otherwise, of reducing the 7-point scale to a dichotomous response.

3. Intention to adopt or to change a behavior and preference or liking for it, in such a survey, should be measured with more than one question using different kinds of indicators to improve reliability. This is especially important when adoption of the object or behavior has social status implications which can bias stated preference or intention in face-to-face interviews with interviewers who are often of a higher social status than rural villagers. Indirect preference indicators, such as a composite attitude toward latrines composed of individual quality ratings, and the intentional measurement of the likelihood or probability of performing specific actions or behaviors clearly defined in terms of place, timeframe, subject, and object, are effective ways to improve accuracy and avoid bias in such surveys.
4. The neutral point, particularly for dependent variable measurements, may need to be very carefully phrased and verified with a follow-up question to distinguish between “not applicable” and “in the middle” responses.

3.3 Modeling Individual Behavior

Some methodological contributions from the household survey and the work in Chapter 7 modeling individual choice behavior are reviewed below.

1. Measuring and modeling preference, intention, and choice:

An improved understanding of demand was gained by measuring and modeling preference, stated intention, and observed choice to adopt a latrine. Often such surveys only measure and model choice. Significance of different constraints in models of preference, intention, and choice revealed the critical role of lack of finance in suppressing the expression of a latent demand for latrines in rural Benin. The role of this constraint would not have been as well understood if models of choice had only been

analyzed. Modeling these three related behavioral outcomes may be particularly important when studying the adoption of an innovation early in the diffusion process.

2. Attitudinal versus socio-demographic independent variables:

An important methodological approach taken in this research has been to model choice behavior using attitudinal variables rather than socio-demographic variables. Although there are linkages between socio-demographic variables and choice through, for example, the influence of lifestyle on drives for adoption, such linkages are diluted by their interactions with other individual characteristics and with environmental conditions. Consequently, socio-demographic variables tend to produce poor models of demand when used as the main modeling variables and are not good predictors of attitudes when used singly. Socio-demographic variables were used in fully developed models in Chapter 7 to test for systematic differences in behavior of potential market segments and the need to develop separate models of the behavior of sub-groups in the population.

4. The effects of time in a cross-sectional survey of behavior:

Measuring and modeling stated intention to adopt a latrine and the likelihood of acting on that intention in the near future, in addition to actual choice, has been useful for assessing the changing motivations for latrine adoption in rural Benin over time. Again, this goal may be most important in the early stages of adoption. Results suggest that as diffusion progresses, the dominant motives for latrine adoption are evolving from early lifestyle-dominated prestige ones to more universally perceived well-being concerns. However, the critical role played by prestige in the initial adoption of improved sanitation must be recognized as demand-driven sanitation programs are considered. Results also

suggest an important role of introducing latrines into a community for the small group of households who adopt latrines to increase rental income.

3.4 Modeling Aggregate Behavior

Some lessons for modeling aggregate village-level demand for latrines are suggested below from the work in Chapter 4.

1. Cost-effective quantitative analysis with geographic information systems:

Village-level analysis using freely obtained secondary and census data has been a very effective and efficient approach to test hypotheses from the initial qualitative work about the factors that stimulate demand. Its effectiveness was aided by the geographic component of the analysis. Using a geographic information system (GIS) proved to be very helpful in the early exploration of patterns of adoption behavior in rural Benin. This exploration generated questions for the qualitative work and helped to refine hypotheses. Later on GIS was crucial for constructing important proxy variables representing the influence of different village environment conditions on the demand for latrines.

2. Using external variables to model aggregate demand:

Aggregate models of demand based on external variables, such as those developed in Chapter 4, can be effectively developed and useful only when the intermediary behavioral linkages are fully understood. As opposed to statistically mining large amounts of available secondary data, the work in Chapter 4 shows that a much more fruitful and powerful approach for such quantitative analysis must start with a comprehensive set of hypotheses from conceptual and qualitative work. From these, a coherent set of proxy variables can be selected or created from existing databases to represent the hypothesized factors of influence. From such models, market segments can

be identified and large scale quantitative forecasting of demand under different policy scenarios could be made.

This research has developed a conceptual model of sanitation choice behavior and demonstrated its application in a case study of demand for improved sanitation in rural Benin. Data were collected and analyzed to develop models of latrine adoption behavior at household and village level from which marketing strategies and programmatic interventions to stimulate demand and accelerate private adoption of improved sanitation were derived. Lessons were learned in the use of qualitative and quantitative methods of analysis. Together these contributions should stimulate new directions for assessing sanitation demand in developing countries, in particular, the application of behavioral analysis to the choices being made by consumers, and advance the use of demand-responsive approaches to promote improved sanitation.

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APPENDIX A

LATRINE DESIGN AND USE PREFERENCES IN THE STUDY AREA

Findings from the interviews and the inventory of 25 installed latrines in the qualitative investigation presented in Chapter 3 suggest that a strong direct relationship exists between a person's drive and his or her preferences for:

- design of the latrine;
- siting the latrine and its accessibility to different members of the household and extended family; and
- the subsequent pattern of latrine use in the household.

Key attitudes and beliefs are thought to modulate these drive-based preferences, while constraints, such as those related to siting and cost, will influence the choices actually made here. Tables A-1 and A-2 summarize apparent tendencies in preferences for latrine design features and for latrine use as a function of drives motivating latrine installation identified in the study area (see list of villages studies in Chapter 3, Table 3-4).

Latrine Pit Depth, Durability, and Smell

Pit depth is considered important for both durability and odor reduction. These two attributes vary in importance for different drives as suggested in Table A-1 from the fieldwork. Smell may be more critical for drives for personal protection, prestige to affiliate with urban elite, and possibly for cleanliness than for other drives. At the same time, degree of sensitivity to the odor of feces and belief in its power to transmit illness influence the importance a person places on this latrine attribute. Durability, in terms of pit depth, slab construction, and superstructure materials, is the critical design characteristic for satisfying an intergenerational prestige drive among men. In other

drives, concern for the pit depth relates to how fast it will fill when the number of intended users is large. However, in general there was not good information on how the rate of fill related to the number of users.

Informants stated that when the pit fills to within a meter or two of the top, a latrine starts to have a serious odor problem, leading to a common belief that any latrine less than four meters deep will be a bad design for smell. Consequently, there was much skepticism in one village (Djidja) about the newly promoted VIP (ventilated improved pit) composting latrines specifically because of the shallowness of their double vault pits. Ideas about how to reduce odor in the pit circulate among latrine owners, indicating that this is an important maintenance concern. These ideas included diluting the feces with water by discharging shower drainage into the pit, and adding kerosene, “carbure” (a residue from soldering), or other products, when odors become unpleasant. In fact, most of the inventoried latrines were clean with only a mild odor detectable when standing over the hole. A strong odor of feces was detected in and around only one latrine, a VIP composting latrine with a shallow pit. Odor management is a consideration for some adopters in selecting the distance and orientation of the latrine site from the house and yard, especially when the depth of the pit is constrained for some reason.

Number of Cabins

The construction of one or two cabins over the pit is a fundamentally significant design issue, reflecting the interaction of a person's drive(s) with cost and other constraints, and with important cultural beliefs. The importance of various beliefs about:

- visual privacy and separation of men and women within one household;

- male personal vulnerability to superstitious threats through body-related contact (e.g., shared seat) with social inferiors or possible enemies;
- the separation of men's socio-occupational domains from women's and children's domestic domains; and
- concern for keeping the cabin clean, presentable, and available for the head of household or visitors;

must be balanced with drive satisfaction from installing the latrine, and any operating constraints, in the decision of how many cabins to build, and in the rules established for latrine use. The number of latrine cabins built is probably the most crucial variable for determining household use patterns, discussed in more detail later. Basic biological, functional, and social differences between men and women, as well as the need not to be seen uncovered, are reasons stated for the importance of separating cabin use by sex. On the other hand, when status issues, authority, and personal vulnerability are more dominant concerns, it is more important to separate cabin use by status, grouping women (wives) and children with lower status men (unmarried, cousins, brothers, domestic workers, etc.) in one cabin, and reserving the other for the household head (adopter), perhaps also his father, and important visitors (i.e., people perceived as having higher status than the head of household). For some drives, a single cabin latrine design is of no use at all and will guarantee its rejection, despite a lower cost.

Adopters driven by personal health and safety, restricted mobility, or individual privacy needs expressed no reason to expend resources to build more than one cabin (see Table A-1) because other household members were not perceived to share the adopter's need for the latrine. The latrine was viewed by these adopters as a personal and private

facility. However, for personal privacy involving mostly women, less concern for status and personal vulnerability made women more flexible about sharing the cabin. When the adopter's motive was exclusively a need for prestige to affiliate with urban elite, only one cabin was likely to be built. By reserving this cabin for exclusive use of the household head and prestigious visitors, the adopter was able to preserve the latrine and assure that it remained in good condition for visitors.

Adopters motivated by cleanliness, family health and safety, expression of new experiences/lifestyle, intergenerational prestige, or rental income were much more likely to indicate a preference for multiple cabins to accommodate many users and different classes of users (i.e., children and women, renters, extended family, clients, non-family dependents, as well as the head of household and important visitors). When these adopters had only one cabin (usually due to cost, cash, or siting constraints), shared household use for all members was typically practiced. However, exclusion of extended family members and neighbors was sometimes enforced to prevent the pit from filling quickly, or because of privacy, conflict, or accountability reasons.

One important aspect of multiple cabin latrines is that they allow the adopter to jointly satisfy several different drives with the installation, each of which may require different design and use features. Otherwise, a single cabin design might require choosing which drive to satisfy with the latrine while leaving the other needs unfulfilled. For example, someone motivated by prestige to affiliate with urban elite and family health and safety wants a latrine appropriate for urbanized visitors, yet safe and usable by children and available for the rest of the family to use liberally. Multiple cabins offer the possibility to adapt the cabin and hole design to meet these different requirements.

Multiple cabins are particularly relevant in the context of hole design for children, discussed latter in this appendix.

Combined Shower

Combining a shower/bathing feature into the latrine design appears to be universally attractive for all drives when awareness of this design possibility exists. This is probably because privacy for adults is an even greater felt need in bathing than in defecation. Practical constraints (unstable soil, the need for vaulted or partially lined pits, and increased cost) may preclude doing this. Alternately, other adequate bathing arrangements may already exist. Several different design arrangements for incorporating bathing into the latrine design were seen: building a bathing cabin adjoining the latrine cabin with a pipe in the floor to drain the gray water into the latrine pit; building an adjoining cabin with a pipe to drain the gray water into a separate soak pit; putting a second (small) drain hole into an enlarged latrine cabin floor and using the cabin for both bathing and defecating.

Latrine Hole Style

Latrine hole styles varied from simple to elaborate, from standard to exotic, reflecting personal preferences, exposure (through mobility and travel) to variations in hole or seat style, and innovation and experimentation by local masons. Simple holes (round or rectangular), built-up foot stands (pedestals) of different shapes and sizes, and seats in several styles including one with a back support were seen.

Seats appeared to be a more recent innovation and an emerging preference in some situations. They were mostly associated with distinctly personal use of the latrine by the adopter. Adopters with restricted mobility and convenience/comfort drives,

especially age-related, were attracted to seats over the hole. In other cases, the seat was another way to express prestige and the enjoyment of “modern” comforts. However, men’s beliefs about the undermining of one’s authority and power from having a lower status person or enemy sit where you have sat, can result in seat latrines being used exclusively by the household head. Seat designs also create a greater concern for keeping them clean and cause much more discrimination in who is judged capable of using the latrine correctly. Controlled access to seat latrines was seen in their more frequent siting either inside the house of the adopter or within an inner private courtyard several meters from the adopter’s room.

Foot stand designs frequently imitated the standard style in private latrines in Bohicon and Abomey (the regional twin urban centers), or were chosen by the mason, while seats reflected personal innovation by an adopter based on his or her experiences abroad or imitation of a seat innovator in the village. Masons specialized in latrine construction were an important source for spreading hole and other design innovations.

An important consideration of many informants in the hole style is prevention of accidents and injuries for small children, especially if children are permitted to use the latrine. Even if children are forbidden to use the latrine, fears that they will go into the latrine can be one reason for some adopters to keep the latrine locked. Many adopters stated that children less than 6 to 10 years of age were not allowed to use the latrine because of risks that they could injure themselves by slipping into the hole, especially when the hole was large (relative to the size of a child's foot or limb or bottom) or unprotected. However, two adopters pointed out specific hole modifications they had built to avoid these child safety problems. One man built a special raised platform (for

the foot stand) around the hole that was high enough to prevent children from slipping, tripping, or stepping onto the platform and falling into the hole, yet was accessible for them to dump out a potty into the pit. His young children were trained to defecate in plastic potties, and by themselves to carry and empty the potties into the latrine's raised hole which stood at the height of a child's waist or hip. The latrine door was left unlocked and fully accessible. Adults and bigger children could still climb up onto the raised pedestal (30-40 cm above the floor) and stand on the foot rests, but smaller children were too short to do this.

Multiple cabins were often associated with an interest in adapting holes for children's safe use. These efforts to re-design the latrine hole for children's safety were associated with adopter motives for cleanliness, family health and safety, intergenerational prestige, and the expression of new experiences and lifestyles. In the expression of new experiences and lifestyle, the adoption and display of new habits by one's wife (or wives) and children, and not just by the household head alone, seemed to be an important dimension of fulfilling this drive.

Modern Materials and Novelty Features

Other design aspects of the slab and cabin construction, such as type of construction, choice of materials, and decision to build walls, roof, door, or vent pipe, relate to cost and cash considerations and to drives (see Table A-1). Strong attraction to a vent pipe in the latrine stemmed from an idea that it could eliminate feces odors, though often there was no understanding of how the vent pipe worked or of its effectiveness. Those motivated by prestige to affiliate with urban elite and to express new experiences and lifestyle were most explicit in wanting features that reflect modernity and the urban

standards they are emulating, such as cement block walls, hinged doors that can be shut or locked, modern tin or concrete roofs, vent pipes, and fancier foot stands or even seats for the hole. On the other hand, those driven by cleanliness, health and safety, restricted mobility, convenience and comfort, or privacy were more willing to forgo such costly features, to dig shallower pits, and to use traditional or re-cycled building materials (“kake” wood instead of reinforced concrete for the floor, “bonco” mud walls, old tin scraps to block doorways, roofless or doorless cabins, simple mat enclosures for walls, and in one case no structure at all) in order to install a latrine that satisfied their needs with limited resources.

Latrine Siting and Access

Sites selected for latrine placement varied in their distance from the house, in their level of public (extended family and neighborhood) accessibility, and in the degree to which someone going to the latrine could be observed. Among those seen were latrines:

- built into the house with interior cabin access (2 cases);
- attached to the house with exterior cabin access (2 cases);
- built close to the house (within 3-4 meters) in an inner courtyard reached by passing through the house or through inner compound gates (9 cases);
- built farther from the house (5-10 meters) in an open yard (7 cases); and
- build at a far extreme point of the property or compound (10-30 meters) perhaps several courtyards away from the house (7 cases).

Concern for smell combined with use by many different classes of users (family, extended family, visitors, clients, renters) lead informants to prefer remote sites. Often knowledge of prevailing wind was used to pick the orientation of latrines sited farther

from the house to carry odors outside the compound. Informants who wanted control over access generally had in mind purely personal or very restricted use (see drive-based preferences for controlled access in Table A-1). These adopters tended to site the latrine very close to their room so that anyone approaching the latrine would be observed and forced to ask permission to use it. Building the latrine into the house, considered unfeasible by many adopters because of odor or intended use, was driven by a need for prestige, especially tied to expression of personalized experiences and identity associated with foreign cities, sometimes involving indoor plumbing, a strong status and convenience appeal, or a desire not to be observed going to defecate. Restricted mobility, age, and illness problems also stimulated desires to have the latrine located within a few meters of the user's bedroom. Where an adopter built multiple cabin latrines or even several latrines to accommodate many users, sometimes one cabin or one latrine would be accessed through the house and the others accessed in the general yard area.

Apart from preferences in siting, locked doors was another design feature used to control use of the latrine, as an alternative to close siting, especially when smell was a major concern and could not be eliminated by pit depth. In multiple cabin designs, the operation of prestige with other non-prestige drives was evident where one cabin was kept locked (for the head of household and his visitors) while the other had no lock to allow unrestricted access to family members.

Shared or individual financing of the latrine in extended family situations and communal decision-making contexts also influences latrine siting. Individual financing, when extended family members are unwilling to contribute or are excluded from that possibility, leads an adopter to site the latrine to prevent their using it. Cost or cash

constraints, which may prevent an adopter from digger the pit as deep as preferred, may lead to compromises in siting to alleviate smell problems, or to restricted use so that the pit fills more slowly.

Latrine Use

When the latrine design included multiple cabins, several use policies were observed:

- one cabin was reserved and locked for the head of household and his visitors (and other higher status persons) only, with all other users (brothers, wives, children, etc.) using the other cabin;
- one cabin was designated for men, and the other for women and children;
- one cabin was for the renter's household, the other for the landlord's; or
- no rules were enforced or followed.

Often latrine adopters admitted to changing or relaxing the original intended rules for use after the latrine was built, as unanticipated uses of the latrine arose, and as attitudes and experiences changed. It appears that when only one cabin is built, if the motives for the installation are purely personal needs, the latrine is likely to be off limits to the rest of the household. Four cases were encountered where the latrine was designated for the private use of the adopter and all other household members were excluded.

Use of latrines by children reflects various ideas and beliefs, in addition to the drive motivating adoption (see Table A-2). Since children's feces are not considered as "dirty" and "dangerous" as adult feces (see Chapter 2), they can be disposed of openly in and around the house and on the garbage pile, with less perceived problems. This avoids several potential problems from children using the latrine, i.e., the pit filling too fast,

injuries from children slipping, falling, and playing in the latrine, and having someone assist, train, or supervise them to properly use the latrine without making a mess over the hole. Generally the larger the hole in the latrine the greater the risk (perceived and real) of children's accidents. If the hole can be protected by a raised platform or a seat, this reduces the perception of risk but prevents children from being able to defecate in the latrine without help. However, as indicated earlier, children can be taught to use potties and safely empty them in the latrine hole.

Summary of Preferences

These explorations of drive-based preferences for various latrine design features, siting, and access suggest the following relationships between latrine use patterns and active drives (summarized in Table A-2):

1. The prestige drive to affiliate with urban elite, if operating alone, leads to exclusive personal use of the latrine for a single cabin design, or exclusive use of one cabin in a multiple cabin design. Controlled access to the latrine or one of its cabins is enforced by choice of siting or by using a lock and key.
2. The prestige drive to express new experiences and lifestyle is more likely to lead to broader use patterns, by at least the nuclear family (wives and children), and perhaps a limited number of special extended family members. Because this drive is frequently combined with other well-being drives that support larger use patterns, it usually involves preference for multiple cabins.
3. The intergenerational prestige drive (among men) is linked to a strong desire for latrine use by extended family members and all descendants of the adopter. It shows a

preference for more public siting of the latrine and unrestricted access. However, the latrine must be clearly identified as a legacy of the adopter.

4. Latrine use under the prestige drive to feel royal tends to be limited to the head of household and other adult male family members. Wives, but not children, might be included if separate cabins are built. Controlled access and locked doors are crucial, while unobservable access is desired.
5. Many of the personal threats to health and safety are perceived as purely personal needs so the latrine is seen as personal. Other family members who are not perceived to be exposed to these risks have no need for using a latrine.
6. The drive for more family-oriented health and safety clearly concerns the needs of different family members, including children. Latrine design and access preferences tend to directly address use by family and especially children.
7. The drive for cleanliness may involve the broadest intended use of the latrine, including children, extended family members, clients, visitors, and even neighbors. Here there is less concern for cabin rules but greater need for enough cabins to accommodate so many users.
8. The convenience and comfort drive is generally associated with latrine use for nuclear family adults, but use for children or other groups is less clear.
9. Drives for privacy tend to result in exclusive latrine use for the individual(s) affected by the felt need for privacy, either individual use by an adopter seeking individual privacy, or nuclear family use only for adopters seeking household privacy.
10. Situations of restricted mobility lead to use being restricted generally to the individual concerned.

11. For rental income, if the property is shared with the landlord, latrine use is shared between the renter's and landlord's nuclear families. Extended family members are excluded to reduce impacts on filling the pit.

Personalization of Design

Evidence was found in the latrine inventories of substantial personalization of latrine design and of the latrine by the adopter. The potential importance of personalization for latrine appeal and satisfaction is seen in the following two situations:

In prestige drives, personalization of the latrine (i.e., adding unique details to the design and personalized features which help to express the identity of the owner) represents a commonly practiced possession ritual associated with consumer objects that hold cultural meaning and communicate important unspoken information about such things as one's status, position, image, and identity to others in collective culture (McCracken 1986). The personalization of a consumer object, by the act of putting some unique mark of one's identity into it, helps to transfer the cultural information possessed by the object to the new owner. Personalization strengthens the owner's identity and sense of ownership when installing the latrine and is highly effective for assuring that the latrine will be cared for, maintained, and operated properly. During investigations of many latrine designs, owners took pains to point out details they had incorporated in the design, operation and use of their latrine for which they seemed particularly proud. These features were often unique to and largely obscure, decorative, or symbolic in nature, but served the gain the owner a strong attachment to the latrine and much personal satisfaction with the design.

Personalization of design may be an important consideration in product development under demand-responsive approaches to satisfy the diverse range of drives operating in rural Benin and to accommodate adopters who have multiple drives in their desire to install a latrine. This will help assure that latrine designs suit different needs and can be tailored to each adopter's unique combination of aroused drives. In the latrine inventories, adaptations of standard features were encountered in some latrines including hole style, size and shape of the pit and cabin to accommodate siting and access preferences, use of windows and vent holes to release "dangerous" odors from the latrine, and so on. Explanations given by adopters for these personal adaptations showed that they were important for satisfying drives. This phenomenon is exemplified in the adopter who created his own design for a modified foot stand to allow his children to safely use the latrine without supervision (see the previous discussion on hole styles). He installed the modified foot stand in one cabin of the latrine and a more standard urban foot stand (from the regional capital) in the other for himself and his visitors. In this way, he was able to satisfy successfully his combined drives for family health and safety, cleanliness, and prestige. Similarly, when differences in the strength or importance of cultural and other beliefs operate with some drives, personalization of the latrine design functions to help reduce dissonance from cultural beliefs that may conflict with latrine use under a standard design.

TABLE A-1. Latrine Design Preferences in Seven Villages of Zou Department, Benin, 1995.

Drive	Feature: double cabin	deep pit	modern construction of super-structure	door	locked door	smell reduction	durability	modern features (hole style, vent pipe, indoors)	child-safe hole	seat	low cost	access control	private access
Affiliate with urban elite		+	++	++	++	+		+	--		--	++	
Express new experiences/lifestyle			+	+				++	+	+	-	+	
Intergenerational legacy/status	++	++	++	+	-	+	++		+	--	+	-	
Aspire to Fon royal status		+	+	+	+	+	+		--		-	++	++
Cleanliness	++			-	--	+			++	--	+	--	--
Personal health/safety		+		+	+	++			--		+	+	+
Family health/safety	++				--			+	++	--	+	-	-
Convenience & comfort	+					+	+	+		+	+	-	-
Privacy				+				-			++	++	+
Restricted mobility - age & illness	--	--					-	--	--	++	++	++	++
Restricted mobility - Voodoo	++			++	++		++	--	--	--		++	++
Rental income	++		+	++	++		++			--	--	+	

Note: Importance of latrine design features and attributes assessed from qualitative interviews with 40 informants and design inventories of 25 latrines in seven villages of Zou Department, Benin, 1995 (see Chapter 3 for a description of the fieldwork). Important for each drive (see Chapter 3, Table 3-4) is indicated on a scale of very important (++), important (+), neutral (), unimportant (-), or not at all important (--).

TABLE A-2. Latrine Use Preferences in Seven Villages of Zou Department, Benin, 1995^a.

Drive	household head	adults sons	nuclear family	extended family kin members	children	neighbors, clients, renters	special visitors	cabin use by sex	cabin use by status
Affiliate with urban elite	Yes	? ^b	No	No	No	No	Yes	?	Yes
Express new experiences/lifestyle	Yes	?	Yes	?	?	No	?	?	?
Intergenerational legacy/status	Yes	Yes	Yes	?	?	No	?	Yes	No
Aspire to Fon royal status	Yes	Yes	No	No	No	No	Yes	Yes	Yes
Cleanliness	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No
Personal health/safety	Yes	?	?	No	No	No	No	?	Yes
Family health/safety	Yes	No	Yes	No	Yes	No	No	?	?
Convenience & comfort	Yes	No	Yes	?	?	?	No	?	?
Privacy	Yes	?	?	No	?	No	?	?	?
Restricted mobility - age & illness	Yes	No	no	No	No	No	No	NA ^c	NA
Restricted mobility - Voodoo	Yes	No	No	No	No	No	Yes	Yes	No
Rental income	?	No	?	No	No	Yes	No	No	No

^a Findings extrapolated from 40 informant interviews and a design inventory of 25 installed latrines in seven villages of Zou Department, Benin, 1995 (see Chapter 3 for a description of the fieldwork)

^b ?= maybe, depends on the presence of other factors and drives

^c NA= not applicable, since preference is to build just one cabin

***APPENDIX B:
SURVEY QUESTIONNAIRE***

**Questionnaire Individuel: L'Adoption de Latrines en Milieu Rural
MS/DHAB et UNICEF
Version Finale 14/11/96**

A. Identification d'Enquete

NumQ

____|____|____|

____|____|____|

	Date	Visa	No Photo	No Picule
Interview	____ ____ ____	____ ____	____	____
Controle	____ ____ ____	____ ____	____	____
Codification	____ ____ ____	____ ____	____	____

____|____|____|
____|
____|

1. Village:..... 2. Quartier:.....
3. Enquêté : Nom..... Prénom:.....
4. Propriétaire Latrine (de Recensement) 1 ____| Oui 2 ____| Non
5. Sexe 1 ____| Homme 2 ____| Femme
6. Occupation (de Recensement):.....

____|
____|
____|
____|

7. Heure de DEBUT ____|____|:____|____| 8. Heure de FIN ____|____|:____|____|
- 8A. Completé 1 ____| Oui 2 ____| Non
9. Verification de NomPrénom.....

____|____|____|
____|

B. Pratiques de Defecation

1. D'habitude où allez-vous pour aller à la selle? (*Cochez autant qu'il cite*)
- 1 ____| Brousse = **NON-UTILISATEUR**
- 2 ____| Champs (de:.....) = **NON-UTILISATEUR**
- 3 ____| Tas d'ordure = **NON-UTILISATEUR**
- 4 ____| Derrière la maison = **NON-UTILISATEUR**
- 5 ____| Autre = **NON-UTILISATEUR**
(Precisez:.....)
- 6 ____| Latrine = **UTILISATEUR**

____|
____|
____|
____|
____|
____|

1A. Si vous utilisez une latrine, qui a construit la latrine que vous utilisez?

- 1 ____| Moi-meme = **ADOPTEUR**
- 2 ____| Autre Personne = **NON-ADOPTEUR**
(precisez :.....)

____|

Pour UTILISATEUR, Vas à Q 6A sur page 2

NON-UTILISATEUR Continuez avec Q2 à Q5 sur page 2

2. Avez-vous l'habitude de retourner au même endroit pour déféquer chaque jour?

1 Oui

2 Non

4A. Cet endroit, est-elle PROCHE ou LOIN d'ici?

PROCHE

NLNL

LOINS

1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7
très assez peu peu assez très

4B. Quelle est la distance d'ici à cet endroit?

mètres

5. La ou vous allez à la selle, on voudrait savoir les qualités que vous appréciez de cet endroit. Pour vous personnellement d'aller à la selle à cet endroit est comment?

a. SALE

NLNL

PROPRE

1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7
très assez peu peu assez très

b. DANGEREUX

NLNL

SECURISANT

1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7
très assez peu peu assez très

c. ENCOMBRANT

NLNL

PRACTIQUE

1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7
très assez peu peu assez très

d. ODORANT

NLNL

AGREABLE

1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7
très assez peu peu assez très

e. INUTILE

NLNL

UTILE

1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7
très assez peu peu assez très

f. MAUVAIS POUR LA SANTE

NLNL

BON POUR LA SANTE

1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7
très assez peu peu assez très

g. GENANT (ou inconmode)

NLNL

AISE (ou commode)

1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7
très assez peu peu assez très

h. INDISCRETE

NLNL

INTIME

1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7
très assez peu peu assez très

i. INCONVENABLE

NLNL

CONVENABLE

1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7
très assez peu peu assez très

NON-UTILISATEUR --> Fin de Partie B --> Vas à la Partie C sur page 4

Pour UTILISATEUR continuez avec Q6A jusqu'à la fin de Partie B

6A. A quelle fréquence utilisez-vous votre latrine quand vous êtes chez vous?

JAMAIS ou

TOUJOURS ou

presque jamais très peu parfois souvent presque toujours

1 ----- 2 ----- 3 ----- 4 ----- 5 ---> Vas à Q 8 sur page 3

6B. Si la response n'est pas 5 (toujours), pour quelles raisons n'utilisez-vous pas votre latrine tous le temps?.....

8. Combien de personnes environs utilisent cette latrine quotidiennement?

Nombre d'adultes y compris lui-meme

Nombre d'enfants

9. Qui sont ces personnes? (*Cochez les categories cites*)

1 Mon menage

5 Locataires

2 Membres directs de ma famille

6 Voisins

3 Parents allies (belle famille)

7 Autrès (precisez:.....)

4 Domestiques, travailleurs

10. Si vous n'aviez pas eu cette latrine, ou iriez-vous pour defequer?

1 Brousse

2 Champs (de:.....)

3 Tas d'ordure

4 Deriere la maison

5 Autre (Precisez:.....)

11A. Cet endroit, est-elle PROCHE ou LOIN d'ici?

PROCHE

NLNL

LOINS

1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7
 très assez peu peu assez très

11B. Quelle est la distance d'ici à cet endroit?

metrès

12. On voudrais savoir les qualities que vous appreciez (trouvez) de cet endroit. Pour vous personnellement d'aller à la selle à cet endroit est comment?

a. SALE

NLNL

PROPRE

1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7
 très assez peu peu assez très

b. DANGEREUX

NLNL

SECURISANT

1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7
 très assez peu peu assez très

c. ENCOMBRANT

NLNL

PRACTIQUE

1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7
 très assez peu peu assez très

d. ODORANT

NLNL

AGREABLE

1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7
 très assez peu peu assez très

e. INUTILE

NLNL

UTILE

1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7
 très assez peu peu assez très

f. MAUVAIS POUR LA SANTE

NLNL

BON POUR LA SANTE

1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7
 très assez peu peu assez très

- g. GENANT (ou incommode) NLNL AISE (ou commode)
 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7
 très assez peu peu assez très
- h. INDISCRETE NLNL INTIME
 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7
 très assez peu peu assez très
- i. INCONVENABLE NLNL CONVENABLE
 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7
 très assez peu peu assez très

C. Experiences de Latrines

1. Avez-vous entendu, vu ou utilise les latrines?
 1 Entendu 2 Vu 3 Utilisé
 4 Ni entendu, ni vu, ni utilise --> *Donnez l'explication d'une latrine familiale.*
Confirmez qu'il n'a jamais entendu, ni vu, ni utilise de latrines. En suite, vas à Q 8 sur page 5

4. Donnez-nous la personne ou l'occasion qui vous a apporte le plus grand nombre d'informations sur les latrines:

5. Avez-vous quelle age au moment ou vous avez utilise une latrine pour la premier fois?
 1 0 à 9 ans 4 26 à 35 ans
 2 10 à 19 ans 5 36 à 45 ans
 3 20 à 25 ans 6 plus de 45 ans
 99 jamais utilise une latrine (non-applicable) --> *Vas à Q 8 sur page 5*

6. Citez tous les endroits ou vous avez utilise une latrine.
(Demandez qu'il cite tous les latrines dont il peut rapeller, y compris sa premiere experience.)
- | | <i>Cite</i> | <i>Confirme</i> | | |
|---|--------------------------|-----------------|--------------------------|--------------------------|
| 1A J'ai/ai eu une latrine chez moi dans ce village | <input type="checkbox"/> | Oui Non | <input type="checkbox"/> | <input type="checkbox"/> |
| 1B J'ai ou j'avais une latrine chez moi ailleurs | <input type="checkbox"/> | Oui Non | <input type="checkbox"/> | <input type="checkbox"/> |
| 1C Dans la maison que j'ai loue ailleurs | <input type="checkbox"/> | Oui Non | <input type="checkbox"/> | <input type="checkbox"/> |
| 2 Chez mere / pere / grand-parents | <input type="checkbox"/> | Oui Non | <input type="checkbox"/> | <input type="checkbox"/> |
| 3 Chez autrès parents allies (freres, oncles, tantes etc) | <input type="checkbox"/> | Oui Non | <input type="checkbox"/> | <input type="checkbox"/> |
| 4 Chez ami / voisin | <input type="checkbox"/> | Oui Non | <input type="checkbox"/> | <input type="checkbox"/> |
| 5 Chez colleague / client / patron / bureau de travail | <input type="checkbox"/> | Oui Non | <input type="checkbox"/> | <input type="checkbox"/> |
| 6 Chez chef / notable / Dah / autorite / fonctionnaire de village | <input type="checkbox"/> | Oui Non | <input type="checkbox"/> | <input type="checkbox"/> |
| 7 Centre de sante | <input type="checkbox"/> | Oui Non | <input type="checkbox"/> | <input type="checkbox"/> |
| 8 Marche | <input type="checkbox"/> | Oui Non | <input type="checkbox"/> | <input type="checkbox"/> |
| 9 Gare (taxi, train, aeroport, etc.) | <input type="checkbox"/> | Oui Non | <input type="checkbox"/> | <input type="checkbox"/> |
| 10 Ecole | <input type="checkbox"/> | Oui Non | <input type="checkbox"/> | <input type="checkbox"/> |
| 11 A l'etranger | <input type="checkbox"/> | Oui Non | <input type="checkbox"/> | <input type="checkbox"/> |
| 12 Autre | <input type="checkbox"/> | Oui Non | <input type="checkbox"/> | <input type="checkbox"/> |
| (precisez:.....) | | | | |

D. Preference et Intention d'Adopter une Latrine

1. Imaginez qu'une latrine soit disponible à la maison chez vous ici, à partir de demain. Il vous est donné la possibilité d'utiliser soit cette latrine pour aller à la selle ou soit

NON-UTILISATEUR => l'endroit ou vous avez l'habitude d'aller à la selle

UTILISATEUR => l'endroit ou vous iriez à la selle si vous n'aviez pas votre latrine

- 1A. Quand vous êtes chez vous, quelle fréquence choisissez-vous cette latrine pour aller à la selle?

presque jamais très peu parfois souvent presque toujours
1 ----- 2 ----- 3 ----- 4 ----- 5

- 1C. Quelle fréquence choisissez-vous cette latrine pour vos enfants d'aller à la selle?

presque jamais très peu parfois souvent presque toujours NA Ne sais pas
1 ----- 2 ----- 3 ----- 4 ----- 5 9 8

2. Est-ce que vous connaissez l'idée d'une latrine commune?

1 Oui 2 Non

(Donnez une brève description de cette latrine publique "cabins séparés par sexe, entretien et nettoyage par une comité villageois")

Imaginez qu'il y ait une latrine commune disponible pour tout le village à utiliser qui est située à un endroit à environ 500 pas d'ici, à partir de demain.

Cette fois-ci il vous est donné la possibilité d'utiliser soit cette latrine commune ou soit

NON-UTILISATEUR => l'endroit ou vous avez l'habitude d'aller à la selle

UTILISATEUR => l'endroit ou vous iriez à la selle si vous n'aviez pas votre latrine

- 2A. Pour vous même quand vous êtes à la maison, quelle fréquence choisissez-vous cette latrine commune pour aller à la selle?

presque jamais très peu parfois souvent presque toujours
1 ----- 2 ----- 3 ----- 4 ----- 5

3. Combien estimez-vous que ça va vous coûter de construire une latrine ici chez vous aujourd'hui?

_____ Montant en CFA

888 Ne sais pas

T

NON-ADOPTEUR --> Vas à Q5A sur page 7

Q4 est pour ADOPTEUR seulement

4. Quand vous avez décidé de construire votre latrine ici chez vous, parmi ces problèmes que je vais citer, lesquels avez-vous eu rencontrés face à la construction de cette latrine?

A. Vous manquez des connaissances de la bonne technique pour construire une latrine. Oui Non NSP

C. Vous manquez l'espace chez vous pour situer la latrine. Oui Non NSP

- 6.11 Oui Non Parce que vous avez d'autres priorités que une latrine.
- 6.9 Oui Non Vous n'êtes pas capable de prendre une telle decision
- 6.10 Oui Non Ca vous causera trop de problemes avec les membres de votre famille ou certains autrès personnes.

6C. Parmi vos raisons, ceux que vous avez cites spontanément (Q 6A) et ceux que vous avez choisis de la liste (Q 6B), la quelle est la plus importante pourquoi vous n'avez pas jusqu'a present decider d'installer une latrine ici chez vous?

(Re-lisez si necessaire ces raisons, et ecrivez le numero de raison la plus important)

numero de raison (1 à 4 de Q 6A, ou 6.1 à 6.11 de Q 6B)

7. Si vous decidez un jour de construire une latrine ici chez vous, parmi ces problemes que je vais citer, les quels pourront vous causer des difficultes pour la construction?

- | | | | | | |
|----|--|-----|-----|-------------|--------------------------|
| A. | Vous manquez des connaissance de la bonne technique pour construire une latrine. | Oui | Non | Ne sais pas | <input type="checkbox"/> |
| C. | Vous manquez l'espace chez vous pour situer la latrine. | Oui | Non | NSP | <input type="checkbox"/> |
| D. | Le type de sol chez vous pose des difficultes pour faire la fosse | Oui | Non | NSP | <input type="checkbox"/> |
| E. | La nappe d'eau chez vous est peu profond. | Oui | Non | NSP | <input type="checkbox"/> |
| F. | Vous ne trouvez pas ici les specialistes (mason, creuser de fosse) en technique de construire une latrine. | Oui | Non | NSP | <input type="checkbox"/> |
| G. | Vous aurez de difficulte de trouver les materiaux ou materiels pour construire. | Oui | Non | NSP | <input type="checkbox"/> |
| I. | Vous ne savez pas accumuler assez d'argent pour la construction. | Oui | Non | NSP | <input type="checkbox"/> |
| J. | Autrès
(precisez:.....
.....) | Oui | Non | NSP | <input type="checkbox"/> |

E. L'Importance des Avantages et des Desavantages de Latrines

1. Quelles sont les avantages ou les conséquences positives qui peuvent vous motiver de decider de construire une latrine à la maison?

(Après qu'il cite tous les avantages, demandez le degré d'importance de chaque avantage)

Avantage 1:.....

Quelle est l'importance de cet avantage pour vous? peu assez très important
2 -----3----- 4

Avantage 2:.....

Quelle est l'importance de cet avantage pour vous? peu assez très important
2 -----3----- 4

Avantage 3:.....

Quelle est l'importance de cet avantage pour vous? peu assez très important
2 -----3----- 4

Avantage 4:.....

Quelle est l'importance de cet avantage pour vous? peu assez très important
2 -----3----- 4

2. De temps en temps des autres personnes ont cité d'autres conséquences d'avoir une latrine qui sont positives pour eux. L'avis est partagé, ce n'est pas unanime. Alors on voudrait savoir si ces autres conséquences vous concernent d'abord et en suite si ils sont des avantages importants ou non, pour vous personnellement. ***(D'abord après avoir lu chaque avantage, demandez s'il le concerne. Si oui, demandez sa degré d'importance pour lui personnellement relative aux autres avantages déjà cités.***

2.1 Avoir un prestige devant mes visiteurs

1 ----- 2----- 3 ----- 4
pas important peu assez très important

2.7 Avoir la possibilité d'augmenter le loyer de mes locataires

1 ----- 2----- 3 ----- 4
pas important peu assez très important

2.2 Etre bien installé chez moi

1 ----- 2----- 3 ----- 4
pas important peu assez très important

2.12 Facilité la défécation parce que je suis vieux ou malade

1 ----- 2----- 3 ----- 4
pas important peu assez très important

2.6 Maintenir la propreté chez moi

1 ----- 2----- 3 ----- 4
pas important peu assez très important

2.4 Laisser un héritage pour mes enfants et les générations qui me suivent

1 ----- 2----- 3 ----- 4
pas important peu assez très important

2.8 Protéger mes selles des enemies

1 ----- 2----- 3 ----- 4
pas important peu assez très important

2.3 Rendre ma vie plus moderne

1 ----- 2----- 3 ----- 4
pas important peu assez très important

2.9 Eviter les dangers de la nuit

1 ----- 2----- 3 ----- 4
pas important peu assez très important

2.10 Diminuer mes dépenses de soin pour mon ménage

1 ----- 2----- 3 ----- 4
pas important peu assez très important

2.11 Reduire la quantité de mouches dans ma concession (maison)

1 ----- 2----- 3 ----- 4
pas important peu assez très important

2.14 Etre plus discrete quand je vais aux selles

1 ----- 2----- 3 ----- 4
pas important peu assez très important

2.13 Gagner le temps quand je vais à la selle

1 ----- 2----- 3 ----- 4
pas important peu assez très important

2.15 Se sentir royal chez moi

1 ----- 2----- 3 ----- 4
pas important peu assez très important

2.17 Eviter les risques de sentir ou voir les selles qui sont depose en brousse

1 ----- 2----- 3 ----- 4
pas important peu assez très important

2.18 Eviter les serpents en brousse

1 ----- 2----- 3 ----- 4
pas important peu assez très important

2.19 Avoir plus de discretion dans les affaires de mon menage

1 ----- 2----- 3 ----- 4
pas important peu assez très important

2.20 Se sentir plus en securite chez moi

1 ----- 2----- 3 ----- 4
pas important peu assez très important

2.21 Eviter les genes de la brousse, comme la rose, pluie, boue, epines, et de salir les vetements

1 ----- 2----- 3 ----- 4
pas important peu assez très important

3. Parmi ces avantages que vous avez dit sont importants, quels sont les premiers trois le plus importants pour vous? (*Inscrivez le Numero de l'avantage de Q1 ou de Q2.*)

- Avantage de premiere importance
- Avantage de deuxieme importance
- Avantage de troisieme importance

4. Quelle sont les desavantages ou les consequences negatives qui peuvent vous decourager ou vous empêcher de decider d'avoir une latrine chez vous ici? (*Après qu'il cite tous les desavantages,, demandez le degreé d'importance de chaque desavantage*)

Désavantage 1:.....

Quelle est l'importance de cet desavantage pour vous? peu assez très important
2 -----3----- 4

Désavantage 2:.....

Quelle est l'importance de cet desavantage pour vous? peu assez très important
2 -----3----- 4

Désavantage 3:.....

Quelle est l'importance de cet desavantage pour vous? peu assez très important
2 -----3----- 4

5. De temps en temps des autres personnes ont cité d'autres consequences d'avoir une latrine qui sont negatives pour eux. Alors on voudrait savoir si ces autres consequences sont des desavantages qui vous concernes et ensuite s'ils sont importants ou non, pour vous personnellement. (*D'abord après avoir lu chaque desavantage, demandez s'il le concerne. Si oui, demandez sa degreé d'importance pour lui personnellement relative aux autres desavantages déjà cités.*)

5.7 Les cochons ou les chiens ne vont pas manger

1 ----- 2----- 3 ----- 4
pas important peu assez très important

- 5.5 Je crains la jalousie ou les conflits de certains gens si je construis une latrine
 1 ----- 2----- 3 ----- 4
 pas important peu assez très important
- 5.11 Ca va me coûter trop cher
 1 ----- 2----- 3 ----- 4
 pas important peu assez très important
- 5.6 Je serais obligé de respirer des mauvaises odeurs avec une latrine
 1 ----- 2----- 3 ----- 4
 pas important peu assez très important
- 5.1 Si je construis une latrine, il serait difficile pour moi de refuser son utilisation par mes relations et autres, même à ceux qui n'ont pas voulu cotiser.
 1 ----- 2----- 3 ----- 4
 pas important peu assez très important
- 5.2 Ca va diminuer la fertilité de mon champ
 1 ----- 2----- 3 ----- 4
 pas important peu assez très important
- 5.3 En allant aux selles dans une latrine j'aurais moins de discrétion que je souhaiterais
 1 ----- 2----- 3 ----- 4
 pas important peu assez très important
- 5.4 Avec la latrine on manquerait les occasions de saluer et visiter avec les amis sur la voie en allant en brousse.
 1 ----- 2----- 3 ----- 4
 pas important peu assez très important
- 5.8 J'ai peur des accidents et des dangers avec les latrines
 1 ----- 2----- 3 ----- 4
 pas important peu assez très important
- 5.12 Mes cochons vont se perdre en allant ailleurs pour manger
 1 ----- 2----- 3 ----- 4
 pas important peu assez très important
- 5.9 Certaines personnes influentes à moi n'accepteraient pas la latrine.
 1 ----- 2----- 3 ----- 4
 pas important peu assez très important
- 5.10 Je ne saurais pas quoi faire quand la fosse est pleine
 1 ----- 2----- 3 ----- 4
 pas important peu assez très important
6. Parmi ces désavantages à qui vous avez donné d'importance, les quels sont les premiers trois en ordre de l'importance pour vous? (*Inscrivez le Numéro du désavantage de Q4 ou de Q5*)
 Désavantage de première importance
 Désavantage de deuxième importance
 Désavantage de troisième importance

F. Croyances et Attitudes Indirectes

Nous vous demandons votre opinion sur des croyances, des conditions de village et autres aspects de selles. Je lis une phrase, en suite je vous demande votre accord ou désaccord avec cette phrase. Comme chaque individu est unique avec ces expériences personnelles de la vie, ces espoirs, ces sentiments, ces connaissances, ces raisons, etc.

7. Rencontrer un serpent en brousse qu'on va à la selle est mauvais signe.
 DESACCORD NLNL ACCORD
 1 ----- 2 ----- 3----- 4 ----- 5 ----- 6 ----- 7
 très assez peu peu assez très

4A. A combien estimez-vous le cout totale de votre participation à la construction de cette latrine?
|_____| Montant en CFA dans annee de construction 88 |___| Je ne sais plus

4B. Y a-t-il d'autres personnes qui ont participe au cout de latrine?

1 |___| Oui 2 |___| Non

5. De quelles sources ou revenus avez-vous eu l'argent que vous avez depense pour construire?

(Cochez autant qu'il cite.)

- 1 |___| Culture (quel:.....)
- 2 |___| Elevage (quel:.....)
- 3 |___| Commerce (quel:.....)
- 4 |___| Artisanat (quel:.....)
- 5 |___| Tontine
- 6 |___| Don (de qui:.....)
- 7 |___| Salaire
- 8 |___| Credit (de qui:.....)
- 9 |___| Transformation produit agricole
- 10 |___| Enterprise (quel:.....)
- 11 |___| Cotisation d'autres personnes
- 12 |___| Autre (precisez:.....)

6B. Ou se trouve votre latrine?

(Demandez de voir et de prendre une photo de la latrine. S'il veut, l'enqueteur peut entrer dans la photo et nous allons le lui donner d'ici deux semaines.)

- 1 |___| acces dans la maison
- 2 |___| acces dans la cour interieure en passant par l'interieur de la maison
- 3 |___| acces dans la cour centrale de la concession sans passer par l'interieur de la maison
- 4 |___| acces dans une autre cour de concession eloignee de la maison
- 5 |___| acces eloigne de la maison dehors de la concession
- 6 |___| autre (precisez:_____)

6B. Numero prise de PHOTO Numero de PELICULE:.....

7. Estimez et notez le distance de la maison: |___|_|_|_|_| en metre

8. Nombre de cabines/trous de defecations: |___|

9. Profondeur de la fosse: |___|_| metrs

10. Materiaux de construction de plancher:

- 1 |___| Dalle en beton arme 3 |___| Bois avec terre/sable (pas de ciment ou fer)
- 2 |___| Bois avec ciment (pas de fer) 4 |___| Autre (precisez:.....)

11. Autres utilisations associees à la latrine à part la defecation?

(Demandez chaque chose sur la liste ci-dessous)

- 1 |___| Douche 3 |___| Stockage
- 2 |___| Uriner 4 |___| Autres (precisez:.....)

12. Quel est la source d'eau le plus proche de la maison que vous utilisez?

- | | |
|---|---|
| 1 <input type="checkbox"/> Citerne de pluie | 3 <input type="checkbox"/> Puit |
| 2 <input type="checkbox"/> Forage/pompe | 4 <input type="checkbox"/> Ruisseau, marigot, mare, etc.. |
| | 5 <input type="checkbox"/> Autre (precisez:.....) |

13. Estimez la distance entre la latrine et ce point d'eau: en metre

H. Indications sur l'Enquete

1. Age de l'enquete:

- | | |
|------------------------------------|---------------------------------------|
| 1 <input type="checkbox"/> 15 à 19 | 5 <input type="checkbox"/> 41 à 50 |
| 2 <input type="checkbox"/> 20 à 25 | 6 <input type="checkbox"/> 51 à 60 |
| 3 <input type="checkbox"/> 26 à 30 | 7 <input type="checkbox"/> plus de 60 |
| 4 <input type="checkbox"/> 31 à 40 | |

2B. Avez-vous jamais vecu ailleurs au Benin?

Où?.....
Combien d'années au total:

2C. Avez-vous vecu ailleurs (ou visité) à l'étranger?

Où?.....
Combien d'années:

2D. Dans les deux dernier mois, avez-vous voyagé?

- | | |
|--------------------------------|--------------------------------|
| 1 <input type="checkbox"/> Oui | 2 <input type="checkbox"/> Non |
|--------------------------------|--------------------------------|

2F. Si oui,

Où?

Pour quel but?	1 <input type="checkbox"/> Travail
	2 <input type="checkbox"/> Visite sociale/famille
	3 <input type="checkbox"/> Autres (precisez:.....)

3. Vous pratiquez quelle religion?

- | | |
|---|--|
| 1 <input type="checkbox"/> Vodoun (animiste) | 4 <input type="checkbox"/> Christianisme celeste |
| 2 <input type="checkbox"/> Catholique | 5 <input type="checkbox"/> Musulman / islam |
| 3 <input type="checkbox"/> Protestant / evangelique | 6 <input type="checkbox"/> Vodoun (animiste) et Catholique |
| | 7 <input type="checkbox"/> Autre (precisez:.....) |

4. Vous êtes de quelle groupe ethnique / coutume?

5. Quel est votre situation matrimoniale?

- | | |
|---|---|
| 1 <input type="checkbox"/> Mariée sans co-épouse | 4 <input type="checkbox"/> Marié monogame |
| 2 <input type="checkbox"/> Mariée avec co-épouse(s) | 6 <input type="checkbox"/> Marié polygame |
| 3 <input type="checkbox"/> Divorcée | 7 <input type="checkbox"/> Veuf (homme) |
| 4 <input type="checkbox"/> Veuve (femme) | 8 <input type="checkbox"/> Divorcé (homme) |
| | 9 <input type="checkbox"/> Autre (precisez:.....) |

6. Combien de personnes etes-vous dans votre menage, y compris vous-meme?

Nombre d'adultes (plus de 15 ans)de famille nucleaire:

Nombre d'adultes (plus de 15 ans) autres categorie:

Nombre d'enfants de 0-6 ans:

Nombre d'enfants de 7-15 ans:

7A. Quel est le niveau de scolarité le plus élevé parmi vos enfants?

1 Cours primaire 3 Cours superieur

2 Cours secondaire 4 Aucun

7C. Etes-vous scolarisé?

1 Oui

2 Non

7D. Si oui, combien d'années avez-vous été à l'école?

1 Cours primaire 3 Cours superieur

2 Cours secondaire 99 NA

8. Occupations de l'Enquete: (*Cochez autant qu'il cite. Encerclez l'activite principale.*)

1 Cultivateur 7 Preparation produit agricole

13 Travailleur agricole 8 Tailleur

3 Vendeur/se 2 Commerçant

4 Fonctionnaire 10 Chauffeur taxi/zemi/camion

5 Retraité 11 Artisan (quel:.....)

6 Feticheur 12 Apprentis (de:.....)

9 Geurisseur 14 Autre(precisez:.....)

8B. Si il est cultivateur / agriculteur, travaillez-vous sur votre propre terrain ou sur le terrain des autres? (*Cochez autant qu'il cite*)

1 Je cultive mon propre terrain

2 Je cultive le terrain des autres

3 Je travail comme main d'oeuvre pour quelqu'un

9. Autres sources de revenu occasionnelles:

10. Où classez-vous dans la gamme de revenu par jour indiquee ci-dessous?

1 moins de 250 FCFA/jour

2 250 - 500

3 500 - 1000

4 1000 - 2500

5 plus de 2500

6 sans revenu

11. Si l'enqueté a un(e) épous(se), quelle est l'occupation principale de l'épous(se):

Epous(se) 1.....

Epous(se) 2.....

Epous(se) 3.....

12. Employez-vous de main d'oeuvre / travailleur dans vos activités?

Nombre de mains d'oeuvre payés une salaire

Nombre de mains d'oeuvre non-payés

13A. Observation de type de maison:

1 maison en terre de barre avec toit en paille

2 maison en terre de barre avec toit en tôle

3 maison en dure avec toit en tôle

4 maison en terre de barre crepise avec toit en tôle

5 maison en pierre et ciment avec toit en tôle

6 maison en pierre et ciment crepise avec toit en tôle

7 autres (precisez:.....)

13B. Avez-vous loué cette maison ou est-elle à vous?

1 Nous l'avons loué 2 Elle est à nous

14. Avez-vous une citerne ou puits?

Citerne: 1 Oui 2 Non

Puits: 1 Oui 2 Non

15. Quelqu'un de votre ménage possede-t-il

un velo? Oui Non

une radio? Oui Non

une mobylette ou moto? Oui Non

une television? Oui Non

une groupe-electrogene? Oui Non

16. De quelles structures ou groupes sociales etes-vous membre?.....

.....
.....

17. Heure de FIN :| (Mettez les observations sur l'autre cote de page)

Je vous remercie beaucoup pour l'entretien. Pour l'effort et le temps que vous avez nous accorder. Nous voulons prendre votre photo pour vous donner comme un tres petit souvenir de ce jour et notre rencontre. Si vous etes d'accord. Nous allons vous envoyer le photo d'ici 2 a 3 semaines par le canal de l'Assistant Social et le CC et VV du Ver de Guinee de votre village.

18. Numero Prise de PHOTO: Numero PELICULE: