# THE ECOLOGY OF HEALTH SERVICE UTILIZATION
## IN GRENADA, WEST INDIES

THE ECOLOGY OF HEALTH SERVICE UTILIZATION
IN GRENADA, WEST INDIES


BY

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# ABSTRACT

It is widely accepted that the home environment may act as a socio-geographic focus of both disease transmission and of learned health behaviour. Households also appear to be units of convergence for factors identified in the literature as relating to the utilization of health services. This thesis is devoted to an examination of the role of the home environment, as well as of personal characteristics and accessibility, in the utilization of health services in Grenada, West Indies.

The theoretical framework that informs this work is a holistic systems-oriented Socio-Ecological Model of Utilization. The empirical analysis draws upon the results of a detailed household survey conducted in five communities on the western portion of the island. Visits to homes containing children less than eight years of age isolated socio-demographic characteristics and information pertaining to residential mobility, household physical and behavioural environment, accessibility, self-reported morbidity and self-reported utilization. Records of patient visits over the previous two years for non-trauma events were abstracted from the medical records of area clinics, hospitals and physicians attending to the sample communities.

Bivariate analyses between components of variables were conducted at both household and individual service use levels. These indicated that 1) service utilization was highly clustered around "high user" households and individuals; 2) considerable discrepancies emerged between self-reported and actual utilization; 3) the complexity of relationships between elements of the home environment was highlighted ; and 4) there was a consistency with which certain elements of the home environment were statistically associated with health service use across a wide spectrum of illnesses. These observations were further confirmed in multivariate analyses, in which a small number of variables were able to retrospectively predict the presence or absence of service use by both adults and children with a high degree of model specificity and sensitivity.

The implications of this work for development and health care planning in Grenada is discussed. The meaningful application of this work in Grenada is seen to hinge upon the extent to which relevant variables are amenable to change or act as proxy variables whose underlying nature of association with utilization remains to be adequately explored. A number of suggestions are advanced concerning the manner in which the study of health service utilization might be approached in the future.

# ACKNOWLEDGEMENTS

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# CHAPTER ONE

# INTRODUCTION

## 1.1  Raison d'etre

Prevailing ideologies in health care (primary health care, basic needs, equality of access) emphasize the provision of adequate care and the promotion of appropriate utilization of available health services. Numerous attempts have been made to account for the determinants of utilization. Typically, they rely on the analysis of bivariate relationships along a limited set of dimensions of health service use, and the amount of variance 'explained' in such models is low.

Research on the factors influencing utilization, while extensive, has tended to ignore the very context in which service use is generated: that of the home environment. It is argued that the home provides a socio-geographic focus for both disease transmission and the transmission of learned health behaviour (such as predisposition to health service use). This ought to be particularly true of pediatric utilization, as children's daily life space is more limited to that of the home, and their health behaviour more closely linked to that of their

parents. The ability to correctly identify household correlates of utilization may be invaluable in the targetting of scarce health care resources, particularly in developing countries.

The present study was aimed at documenting the ecology of health service utilization in five communities in Grenada, West Indies. Its focus was on the nature of the home environment and its links with the health service utilization of its members. However, a variety of personal and locale-specific influences were also examined.

Within this purview, the study's mandate was several-fold: descriptive, explanatory, predictive, but above all exploratory. At the simplest level it sought to describe utilization patterns in the study area and to document their statistical covariance with elements of the household environment. The study is explanatory insofar as it seeks to account for observed patterns and relationships, although the cross-sectional nature of the data lends itself poorly to the proof of causal linkages rather than informed speculation. The ability to correctly distinguish between users and non-users on the basis of household environment, personal characteristics and accessibility was assessed in a multivariate component of the study. This component was concerned, then, with the (retrospective) prediction of utilization. The thesis is, by nature, exploratory insofar

as the role of the home environment in utilization has been neglected in the literature.

## 1.2 Context and theoretical framework

This thesis is part of a larger McMaster-Grenada Child Health Project which has the aim of developing a viable risk assessment tool for the prospective identification of childhood diarrhoea on the basis of facets of the home environment. The present study extends the analysis of the impact of (home) environment on health to an assessment of its influence on health service utilization.

The study is informed by a socio-ecological model of health (White 1981), whereby proximal and distal determinants interact with an individual to produce a variety of health-related outcomes. This systems approach to utilization provides a context within which to examine the influence of the home environment as a subsystem within the larger ecology of health service utilization. It also provides a powerful organizing framework for a discussion of the factors identified in the literature as impacting service use.

The subject matter and orientation of this dissertation span the traditions of disease ecology and health care delivery in medical geography. In this sense attention is brought to bear on both demand-side and supply-

side factors in the utilization of medical care.

## 1.3 Chapter outline

The thesis is organized in six chapters. Theoretical considerations are discussed in Chapter 2, data collection in Chapter 3, and empirical results in Chapters 4 and 5, the final being reserved for summary and concluding remarks.

The role of utilization studies in health planning and in medical geography is addressed at the beginning of the second chapter. This provides a context for the assessment of the literature regarding both demand-side and supply-side factors influencing the use of health services. It is proposed that the home environment be considered more explicitly and as a subset within a socio-ecological model of utilization. With these issues in mind, the mandate of the present study is related to that of the larger McMaster-Grenada Child Health Project.

Chapter 3 documents the collection of three parallel data sets whose combination form the basis of the empirical investigation. These comprise (a) census data, establishing baseline and sample populations; (b) survey data, recording dimensions of the personal, home and community environments; and (c) utilization data extracted from area medical records. Initial descriptive summary measures are reported at this stage.

Chapter 4 outlines the results of bivariate analyses conducted along four dimensions and at two geographic scales. The chapter begins by documenting the creation of morbidity-specific utilization measures and of independent variables, as well as the choice of statistical tests. Among the requisite dimensions of analysis, utilization measures at the household level are first discussed, as well as discrepancies in the self-reporting of morbidity and service use with respect to actual utilization by the study population. The complexity of the field environment is underlined in an analysis of relationships between independent variables. This is followed by an assessment of the role of the home environment in service use, first at the household, and subsequently at the individual, level. Four dimensions of the home environment are explored: residential composition (age-sex distributions), residential status (mobility), physical and behavioural environment. Components of accessibility are also examined at both household and individual scales, while personal characteristics are included at the individual level.

The results of multivariate analyses of select outcome measures are summarized in Chapter 5. This is preceded by comments regarding the choice and use of logistic modelling techniques and of the variable set isolated for examination.

The concluding chapter contains a summary of the study's findings and their suggested implications for health care resource management. A number of recommendations are included concerning the nature of future research in this area.

# CHAPTER TWO

## THEORETICAL AND EMPIRICAL PERSPECTIVES ON UTILIZATION: A REVIEW OF THE LITERATURE

This chapter will provide the context for this study of the dimensions of the home environment influencing the use of health services in Grenada, West Indies. The chapter opens with a discussion of the role of health and utilization studies in development and health care planning. The bulk of this chapter, however, is devoted to a review of the nature, substance and findings of studies of health service utilization. This was deemed appropriate for two reasons. Firstly, it was expected that aspects of the home environment would be reflected in variables employed in the utilization literature (factors such as income, age, health status). Secondly, it is argued that an examination of the role of the home environment in health service utilization complements and fits within existing knowledge in the field.

An attempt has been made to draw from literature on developing areas as well as the much larger North American literature. Faced with the daunting task of reviewing the literature on health service utilization, it must be acknowledged that this is but a brief summary of the

mainstream literature.

Discussion also centres on the genesis of the present study within the larger McMaster-Grenada Child Health Project. The rationale for a focus on the home environment from a socio-ecological perspective is placed in the context of ongoing research in the field of medical geography.

## 2.1 Health, health care and development

One of the basic tenets of contemporary western society is the belief in a universal right to health and personal well-being (White 1981). The terms 'well-being', 'quality of life', and 'basic needs' are largely inter-related, yet their definition remains elusive and frought with controversy.

Concepts and approaches to issues of health and disease in the developing world are perhaps best understood in the context of evolving paradigms of development. Definitions of development reflect prevailing ideology. By the 1960's (and certainly by the mid-seventies) the new 'paradigm' for Third World development was concerned with distributive and social justice as embodied in the 'basic needs' approach. Its aim is the provision of the basics of human survival such as clothing, food and basic health: in other words a minimum acceptable quality of life (definitions varying as per above). Health would appear to

be a _basic_ basic need:  on this all development paradigms agree, for clearly it is crucial to the  enjoyment of wealth and spiritual fulfillment, and a prerequisite to development itself.

Increasingly  holistic  definitions  of  health[1] have encouraged  a  wider  understanding  of  its  advantages, including, in these times  of  economic  austerity,  improved worker productivity  (Grosse and  Harkavy 1980), a long-time focus of Soviet medical geography (Pyle 1979a).

It is not  therefore  surprising  that health-related components  of  development  programs  have  been given high priority. International  bodies  such  as  the  World Health Organization and  the Pan  American Health Organization have been instrumental  in  the  development  of  regional health policy  and  planning  initiatives in cooperation with local governments and aid agencies.  Two  particularly influential approaches to  health care  have emerged in the past decade: selective primary health care  (see  for  example  Walsh and Warren 1980) and the risk approach to health care (WHO 1978, Backett et al 1984).  A considerable literature  is emerging on  these  issues,  such  that  it  is neither necessary nor desirable to replicate them here, but their central tenet is the concept  of targetting  scarce health  care resources on the basis of need.  This involves establishing the burden of illness  and  population  at  risk,  and  promoting  the

'appropriate' use of health care resources (leading presumably to concomitant improvements in health status, a point to which I will return).

## 2.2 The role of utilization studies in health care planning and evaluation

If one assumes (a) the limited nature of existing and potential health care resources, and (b) the unequal access to care based on market mechanisms alone, then the involvement of the state in prioritization and planning is implied (Daniels 1983). The nature and extent of state involvement in the health sector is predicated on prevailing concepts of social justice and individual entitlement to health. These philosophical bases have been extensively examined elsewhere (Jong and Rutten 1983, Eyles 1987, Rodwin 1987 and many others), and it is beyond the purview of the present discussion to engage the topic in detail. The approaches differ in how they view the optimal role of the state as opposed to individual responsibility for one's health, as well as whether issues of equity, equality, economic efficiency or effectiveness should dominate the planning process. Given the concern of much health planning with the improvement of equitable service provision (ie access to care on the basis of 'need'), it is suggested that an analysis of the relative importance of various determinants of health service use offers a viable means of

evaluating program 'success' (Andersen et al 1975). In this regard equity is considered maximized where (perceived and evaluated) need and demographic factors are observed to be central determinants of use, and the influence of social and economic factors is minimized (op.cit.).[2]

In theory then, utilization studies can provide valuable information concerning the appropriateness of health service use among potential consumers. In practice, such work is severely hampered by vague, unstandardized definitions of 'appropriate' use, 'need' and other parameters of utilization and its presumed antecedents. Indeed the shortfall between 'realized demand' (as utilization) and 'latent demand' (as need) presents serious difficulties in the analysis and interpretation of utilization data (see for example Culyer 1978). Attempts at developing social indicators of health status (as potential measures of need) have frequently been characterized by little agreement as to what to measure, let alone how to do so. In this context, and despite considerable heterogeneity within the health care system and the population it serves, an unfortunate amount of planning has relied on forecasts of future demand through the extrapolation of current utilization rates, in apparent ignorance of both (a) the influence of supply on demand, and (b) the adequacy with which current needs are being met in the community, and (c)

the likelihood that while needs may change, their presence may not.

My comments are intended, not to diminish the importance of rational planning in the health sector, but to point to the difficulties involved. The task, as previously stated, remains one of maximizing the efficiency, equity and appropriateness of the health care system. An analysis of the determinants of health service use may provide essential clues to the performance of the system vis a vis community (and individual) needs. It is to these issues that the bulk of the chapter is devoted.

## 2.3 Utilization studies in medical geography

A few introductory comments seem in order on the role of the present study, and utilization research in general, in medical geography. Despite a number of reviews (May 1952, Pyle 1976, Pyle 1979b, Shannon 1980, Barrett 1981, Learmonth 1981, Mayer 1982a, Mayer 1982b, Learmonth 1985, Paul 1985), explicit definitions of medical geography seem hard to come by.[3] Definitions naturally reflect an evolving conceptual framework within medical geography, and it is of no surprise that, with the early development of 'disease ecology' perspectives in the field, medical geography was seen as synonymous with the "ecology of health and disease" (May 1952). Subsequent definitions have emphasized the

inter-disciplinary nature of our approach to the "spatial aspects of human health problems" (Pyle, 1979a, p.9), stressing the superiority of a holistic perspective on the intrinsically multicausal phenomenon of human illness and service utilization (op.cit., Mayer 1982b, Paul 1985).

Several authors have sought to define medical geography implicitly through an appreciation of its historical evolution (Pyle 1977, Paul 1985, and to a more limited degree Mayer 1982b and others). These authors document the growth of several subfields within medical geography, notably: disease ecology (the interaction of people within their total environment), disease mapping (medical cartography), associative analysis (the statistical association of disease with hypothesized risk factors), disease diffusion (using formal geographical diffusion theory and modelling), nutritional geography, the geography of health care delivery, and the study of ethnomedicine and medical pluralism in developing countries (Paul 1985). These have frequently been categorized as either disease ecology or geography of health care study fields; the "two medical geographies" (McGlashan 1972, Learmonth 1978, Shannon 1980, Mayer 1982b, Paul 1985, Phillips 1985). The former group focus on the geography and etiology of disease as influenced by the interaction of May's (1950) environmental "geogens" and disease factor "pathogens".

Geographical perspectives on health care delivery, rooted in location theory, theories of public service provision, transportation geography and philosophical issues (Paul 1985), have only emerged as a significant body of literature since the mid-1960's. However, geographic perspectives on utilization have remained predominantly focussed on institutions of care rather than the individual consumer (Mayer 1982b, Paul 1985).

That it is possible to easily categorize much of the published material in medical geography into one or the other of these camps attests to the continuing lack integration of these streams within medical geography (Mayer 1982b). In contrast to largely rhetorical calls for the synthesis of efforts in medical geography into a single "geography of health" (Shannon 1980, Phillips 1985), Mayer (op.cit.) delineates three immediate issues whose resolution/investigation transcend the subdisciplines. These are: the relationship of non-uniform distributions of disease (and therefore of need and of population at risk) to issues of equity in health care planning; the impact of access to health care on health status and its implications for planning; and finally cross-cultural research into definitions of health mediating the use (or non-use) of different (typically parallel) medical systems. It would appear that increasing attention by medical geographers to

behavioural aspects of illness and health care utilization
as well as to the issues identified by Mayer, constitute a
partial synthesis of the "two medical geographies".

It is the author's desire that the present study on
the ecology of health service utilization in Grenada
represent a meaningful bridging of the divide between the
two medical geographies, insofar as the determinants of
health and service use are both addressed through the
analysis of the home environment as well as through both
system-related and individual characteristics. This is not
to imply that a proliferation of approaches to research in
medical geography is inherently harmful to the discipline,
but rather to suggest that a more synthetic and holistic
approach to geographic phenomena incorporating aspects of
both persectives might be preferable.


## 2.4  Models of utilization

The literature devoted to the utilization of health
care services and the correlates of such use is both
extensive and varied.[4]   Factors seen to be related to
service use have been conceptualized, grouped,
operationallly defined and measured in a multitude of ways.
Notwithstanding, commonalities exist in the dimensions of
factors addressed in the literature. At the broadest level
these 'determinants' can be grouped into demand-side and

supply-side factors, corresponding to attributes of the
population at risk or of the health care delivery system
respectively (Fiedler 1981, Thouez 1987). The distinction
is represented schematically in Figure 2.1.

Following the initiative of early pioneers in the
field (particularly Andersen 1968), models of utilization
behaviour continue to distinguish on the demand side between
"predisposing", "enabling" and "need" factors. Predisposing
characteristics establish a propensity for service use prior
to and independent of specific illness or medically-defined
need (Andersen and Newman 1973, Mechanic 1979). Some of
these may themselves be determinants of ill-health, they may
influence behaviour in the presence of existing ill-health,
or they may act as proxies for one or another of these
effects. In the main, they include both socio-demographic
and attitudinal variables. Several early models of
preventive health behaviour such as the Health Belief Model
(Rosenstock 1966), and the social network models of Langlie
(1977) and Suchman (1964) concentrated more exclusively on
these psychosocial determinants.

In the late sixties and early seventies the influence
of situational factors (particularly structural and
financial barriers to utilization) received more attention
(Crandall and Duncan 1981). Enabling factors such as income
and other individual or family parameters of service

**FIGURE 2.1   DIMENSIONS OF HEALTH SERVICE
UTILIZATION:   THOUEZ (1987)**
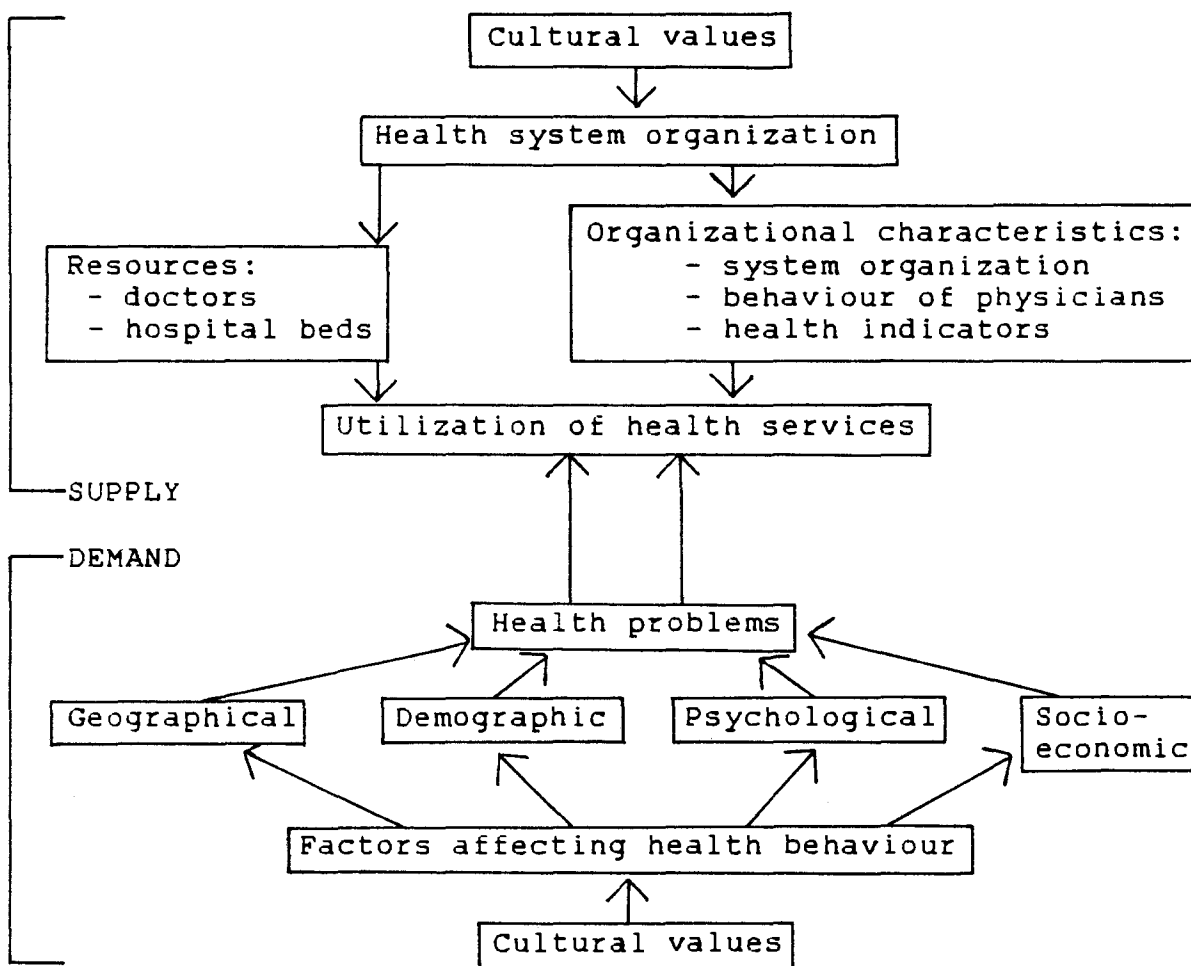


Source:   adapted from Thouez (1987)

accessibility were seen as crucial to the ability to follow through on the perceived need for medical attention. In addition, organizational characteristics of the health care delivery system (supply-side factors) were recognized as important influences.

The model of health care service utilization similar to that proposed by Andersen and Newman (1973), illustrated in Figure 2.2, has provided a conceptual template for much of the utilization research, although an added dimension of patient satisfaction (representing consumer perception of the health care system) has been appended in some studies (Fiedler 1981, Linder-Pelz 1982a, Thomas and Penchansky 1984, Ware 1978, Benyouseff and Wessen 1974, Kloos et al 1987, Mwabu 1986, Bamisaiye 1984).

In the sections that follow, consideration will be given to the evidence of a relationship of each identified factor to health care service utilization. Characteristics of the population at risk are addressed first, followed by those of the health care delivery system.

## 2.5 Demand-side factors influencing the utilization of health services

It must be acknowledged that the utilization literature is focussed more directly on the determinants of service use as manifest demand than on factors influencing latent demand (perceived 'need'), except when consideration

FIGURE 2.2      DIMENSIONS OF HEALTH SERVICE UTILIZATION:
                ANDERSEN AND NEWMAN (1973)

SOCIETAL DETERMINANTS
Technology
Norms

HEALTH SERVICES SYSTEM
Resources
Organization

Volume; Distribution

Access; Structure

Sanitation
Curative medical technology

Legislation
Prevailing belief systems
Health care financing

INDIVIDUAL DETERMINANTS
Predisposing
Enabling
Illness level

HEALTH SERVICES UTILIZATION
Type
Purpose
Unit of analysis

PREDISPOSING ──→ ENABLING ──────→ ILLNESS LEVEL

Demographic

Age
Sex
Marital status
Past illness

Social Structure

Education
Race
Occupation
Family size
Ethnicity
Religion
Residential mobility

Beliefs

Values concerning health & illness
Attitudes concerning health services
Knowledge about disease

Family

Income
Health insurance
Type of regular source
Access to regular source

Community

Population-resource ratios
Price of service
Region of country
Urban or rural characteristics

Perceived

Disability
Symptoms
Diagnoses
General state

(Clinically) Evaluated

Symptoms
Diagnoses

Source:  Adapted from Andersen and Newman (1973).

is paid to the translation of the latter into the former. The discussion to follow on influences on the demand for care is therefore similarly limited to the manner in which they impact actual rather than potential service use. This reflects the prevailing emphasis in the literature, rather than the judgement of the author concerning their relative importance.

## 2.5.1 Predisposing factors

The non-linear relationship between age and service use has been widely acknowledged to assume the form of a J- or U-shaped curve (Benyouseff and Wessen 1974, Feidler 1981). A number of studies both in North America (Mann et al 1970, Horowitz et al 1985, Dutton 1985, Newacheck and Halfon 1986, Wolfe 1980, Starfield et al 1985) and in developing countries (Chojnacka and Adegbola 1984, Gesler 1979a, Benyouseff and Wessen 1974) have demonstrated that among children age varies inversely with the likelihood of using medical services in a given period as well as with the volume of visits made. Among older residents the reverse appears to be the case (Foets et al 1985, Evashwick et al 1984, Thouez et al 1981, Feidler 1981). Morbidity-specific variations in utilization within age groups suggests that the influence of age on health service use is mediated by 'real' (professionally evaluated) differences in health

status (Chojnaka and Adegbola 1984). However, in regions of Africa, Kloos et al (1987) and Ogionwo (1973) found age differentials in education, mobility, economic resources and illness perceptions to be more important predictors of utilization and preventive health behaviour, with greater resistance to change observed among older community members.

The evidence for gender-based differentials in utilization is less consistent. Among children it appears that utilization by boys exceeds that for girls (Reinke 1976, Starfield et al 1985, Chojnacka and Adegbola 1984), while among adults the reverse appears to hold (Fiedler 1981, Benyouseff and Wessen 1974, Verbrugge 1982). While some researchers have found gender-based differentials to persist despite controlling for health status (Feidler 1981, Verbrugge 1982, Kloos et al 1987), others have not (for example Hershey et al 1975). In some cases the discrepancy can be attributed to the use of self-reported morbidity as the source of information on health status. It is widely recognized that in many societies (differences in) the socialization of women with respect to readiness to acknowledge illness, and in help-seeking and conformity with dependency may predispose them to be more sensitive to symptoms and to be more ready to act upon this knowledge than males socialized towards performance-based stoic denial (Verbrugge 1982). Similarly, the predominant reliance upon

female interviewees in household surveys suggests an artificial bias in the under-reporting of male illness (Muller 1986, Kloos et al 1987). It is likely that these effects combine with differentials in actual health status to produce the observed gender-based bias in the utilization of health care services.

While there is nothing intrinsic about marriage that confers relative health or ill-health, related conditions such as stress, lifestyle, social support and financial position may influence health status and service utilization (Morgan 1980), though it is not clear that the relationships are by any means consistent.

A number of socio-economic variables have been examined in relation to the utilization of health care services. Generally socio-economic status has been positively associated with the proclivity for service use in the developing world (Gesler 1979a, Habib and Vaughan 1986, Kloos et al 1987, Jelley et al 1984) and in the west (Townsend and Davidson 1982, Lalonde 1974, Cohen and Lee 1985, Fergusson et al 1984).

Unravelling the true (underlying) effects of socio-economic status on utilization is hampered by the multitude of operational definitions and measures employed for each. Socio-economic variables such as education, income, occupation and social position may act as both predisposing

and as enabling (access to health care) factors. Furthermore they may predispose to service use through their impact on 'objective' health status or through their influence on perception and behaviour in the presence of clinically-defined illness (and indeed, in the context of psychosomatic illness, in their absence). In the context of this latter point, socio-economic differentials in health behaviour mediate the relationship of utilization to 'need', and thus the 'effective' use of services. Finally, many of the socio-economic factors associated with utilization serve merely as proxy measures of underlying causal processes whose true nature remains to be satisfactorily elucidated (Shah et al 1987). It seems appropriate to examine these facets of socio-economic status individually in assessing the nature and extent of their influence on health status and on utilization.

Educational status has been associated with improvements in health status (Thomas and Penchansky 1984, Chojnacka and Adegbola 1984, Dutton 1985, Starfield 1982 and others) and with a tendency to use available health services (Rabin et al 1974, Feidler 1981, Ogionwo 1973, Mburu, Smith and Sharpe 1978, Newacheck and Halfon 1986). Education has been particularly linked to the type of service used, both in terms of (a) the dichotomy between modern and traditional health care in developing countries, and (b) the dichotomy

between preventive and curative health care services. Maternal education has been implicated in the differential use of both preventive and curative pediatric health care in the developing world (Akesode 1982) and in the west (Wilcox-Gok 1983, Campion and Gabriel 1985, Diaz et al 1986, Townsend and Davidson 1982). Chojnacka and Adegbola (1984) regard maternal education as a surrogate for the quality of the home environment, housing conditions, and the quality and nature of child care. They note a surprising frequency of diseases of hygienic and nutritional origin (infective, digestive, genito-urinary, musculoskeletal and endocrine-related ailments) amongst the children of the least educated mothers (relative risk of 3 with respect to the children of mothers with secondary school education). It is noted that education represents opposing influences on utilization insofar as it results in both improved health status (through greater awareness of health risks, appropriate personal hygeine etc) and greater predisposition for service use (Feidler 1981).

Occupational variations in health status and health service utilization have also been widely documented (Townsend and Davidson 1982, Gray 1982, Miles 1987, Chojnacka and Adegbola 1984). These may be related both to degree and to type of employment (ie employment status and occupational class), and to the economic, social and

psychological sequelae of each. While few efforts have been made to fully explore the experiential components of the relationship of occupation to health and utilization it is clear that they are not homogeneous with respect to gender, age, marital status, length of employment and previous income, and that the complexity so introduced prevents meaningful generalization of the relationship (Miles 1987).

This being the case, the relationship of income to health status and health services utilization involves an even more convoluted causal chain. There is of course nothing intrinsic about money per se that confers health. Indeed health can only be 'purchased' insofar as medicines are effective or through the relative advantages afforded by an improved standard of living (sometimes a double-edged sword). Nonetheless, marked income differentials in health status have persisted through time despite major shifts in the burden of illness. This is all the more surprising given inconsistencies in the measurement of health status and socio-economic status (Syme and Berkman 1976). The 'ecology of poverty' would thus appear to warrant closer attention in its impacts upon health and health service utilization.

Variations in living conditions can be considered partially responsible for income gradients in health. The etiological role of housing in the spread of communicable

disease through crowding and inferior sanitation has been extensively documented (Engels 1845, Gray 1982, Martin 1967, Young 1985, Haddock 1979, Shah et al 1987, among others). Other correlates of housing type and quality (education, finances, ethnicity and so-on) will also contribute to the association of housing with health.

Yet the steep income-health gradient transcends wide international and intra-national variations in living conditions. Syme and Berkman (1976) suggest that greater attention be devoted to the psycho-social sequelae of (relative) poverty (such as stress and differential coping ability among others) in lieu of the historical emphasis on a largely physical environmentally deterministic chain of causation. Indeed, it is in the behavioural correlates of poverty that many have sought explanation for economic variations in health. Differentials in education and culture are associated with variations in attitudes and beliefs towards health and health care and in knowledge of appropriate preventive health behaviour and knowledge of the health care system (Hershey et al 1975, Kirscht et al 1976, Luft 1978, Dutton 1985, Foets et al 1985, Shah et al 1987). This perspective has been extended to account for variations in pediatric utilization as indicated above.

That these relationships do not necessarily translate into higher utilization among lower income groups suggests

the influence of (a) socio-economic differentials in symptom recognition and the importance placed thereon, (b) socio-economic differences in the proclivity for service use in the presence of felt need,[5] and/or (c) differential access to health care on the basic of income (or race).[6] Regarding the latter, Horowitz et al (1985) point out that the distribution of (health care) services generally does not parallel or favour the spatial clustering of low-income groups. Issues of service accessibility are treated in greater detail below.

It is also noteworthy that not only the volume but also the type of utilization and source of health care varies between income groups. As indicated earlier, lower income groups make relatively less use of preventive health services but due to both attitudinal and fiscal constraints they rely more heavily on hospital and clinic-based care than on individual physicians (Wolfe 1980, Horowitz et al 1985, Shah et al 1987). This prevails despite the perceived efficacy of private as opposed to public health care that seems particularly prevalent in developing countries (Kloos et al 1987).[7]

Inevitably, discussions on the utilization of health care services come up against the issue of psycho-social determinants of use. Several models have sought to make explicit the role of beliefs, attitudes and values in the

development, maintenance and evolution of personal health-related behaviour (Kasl and Cobb 1966, Rosenstock 1966, Suchman 1964, Becker and Maiman 1975, Horn 1976, Langlie 1977). Better known among these is the Health Belief Model (HBM; Rosenstock 1966) illustrated in revised form (Becker and Maiman 1975) in Figure 2.3. While support for the existence of independent health belief dimensions similar to those posited by the HBM has been forthcoming from a number of studies (notably Steele and McBroom 1972, Maiman et al 1977, Jette et al 1981), their stability over time and across different cultural settings is to be questioned (McKinlay 1972, Kohn and White 1976, Poland 1987). Despite the appeal of the HBM, its emphasis on rational voluntary behaviour motivated primarily by health-related concerns on an individualistic basis and largely devoid of situational context or constraints raises serious concerns about the universality and comprehensiveness of the model (Green 1975, Poland 1987). Furthermore, scant attention is paid in the HBM and in the wider literature on psychosocial determinants of health-related behaviour to the formation and evolution of health-related attitudes and beliefs over time (Rosenstock 1966, Poland 1987).[8]

This is not to discredit the centrality of individual perceptions to health care service utilization; quite the contrary. It does however attest to the difficulty (and

FIGURE 2.3     THE HEALTH BELIEF MODEL

Individual Perceptions        Modifying Factors            Likelihood of Action

```
                    ┌─────────────────────────────┐      ┌──────────────────────┐
                    │ Demographic variables(age,sex,race,│  │ Perceived benefits of │
                    │   ethnicity, etc.)          │      │   preventive action  │
                    │                             │──────▶│                      │
                    │ Sociopsychological variables (personality,│  │       minus          │
                    │   social class, peer and reference group│  │ Perceived barriers to │
                    │   pressure, etc.)           │      │  preventive action   │
                    └──────────────┬──────────────┘      └──────────┬───────────┘
                                   │                                │
                                   ▼                                ▼
┌────────────────────────┐   ┌──────────────────┐      ┌──────────────────────┐
│ Perceived Susceptibility to│  │ Perceived Threat │      │ Likelihood of Taking │
│   Disease "X"          │──▶│       of         │─────▶│ Recommended Preventive│
│ Perceived Seriousness  │   │   Disease "X"    │      │   Health Action      │
│  (Severity) of Disease"X"│   └──────────────────┘      └──────────────────────┘
└────────────────────────┘            ▲
                            ┌──────────┴──────────────┐
                            │     Cues to Action      │
                            │ Mass media campaigns    │
                            │ Advice from others      │
                            │ Reminder postcard from physician│
                            │   or dentist            │
                            │ Newspaper or Magazine Article│
                            └─────────────────────────┘
```

Source:  Becker and Maiman, 1975.

danger?) of developing standardized definitions and measures of cognitive antecedents to health-related behaviour. Yet such issues must be grappled with if we are to come to a fuller understanding of the ecology of health care service utilization, for individual cognition mediates the perception (and creation?) of (physical) symptoms, their evaluated severity and the perceived need for medical care, as well as perceptions of alternative modes of care.

## 2.5.2 Enabling factors

Conditions permitting or facilitating the use of medical care in the presence of felt need can be defined as enabling factors (Andersen 1968). These conditions encompass attributes of individual users as well as attributes of the health care delivery system. Discussion on the latter is deferred to the relevant section below on health care system parameters of utilization.

The existence of income differentials in utilization and the difficulties in unravelling the chain of causation underlying this association have been discussed above. The relative importance of financial as opposed to attitudinal barriers to utilization is still openly contested (Townsend and Davidson 1982, Crandall and Duncan 1981, Hershey et al 1975, Broyles et al 1983, Horowitz et al 1985, Muller 1986 and many others). Nonetheless, most countries now provide

some sort of state-subsidized health care to the poor in the hope of equalizing access on the basis of need rather than ability to pay.

As we have seen, the persistence of income differentials in utilization under comprehensive health insurance plans can be at least partially attributed to the psycho-social correlates of poverty. However, under parallel systems of care, lower income residents are more likely to make use of curative care and to do so via tertiary care institutions or local health clinics than through a physician. It is widely recognized that regularity and continuity of care frequently imply a greater familiarity with the patient's illness history, sensitivity to his/her needs and communication, and therefore better quality of care. That poverty significantly reduces the likelihood of regularity of source and continuity of care (Litman 1974) provides evidence of an income bias in quality of care that is often compounded by cultural and socio-economic barriers to effective communication between provider and low-income client (Fiedler 1981 and others).

2.5.3 Need

A wide variety of studies have established the predominant salience of either health status or 'need' (or both) in the utilization of health care services (Anderson

and Newman 1973, Bercanovic and Reeder 1974, Hershey et al 1975, Kohn and White 1976, Wolinsky 1978, Kronenfeld 1980, Evashwick et al 1984, Thomas and Penchansky 1984, Foets et al 1985, Habib and Vaughan 1986). As discussed earlier, that need is a major determinant attests to the equitable distribution of health care resources insofar as that is defined as meeting demand on the basis of need, rather than on the basis of socio-economic or psycho-social factors. It is the predisposing and enabling factors mediating the relationship between need and utilization whose influence an equitable system would ostensibly wish to minimize.

An extensive literature has evolved on the measurement of health status (see for example Chambers 1982). More comprehensive indices attempt to incorporate both normative (as professionally determined) and subjective (perceived) aspects of health. Measures of self-reported health status invariably suffer from recall bias (retrospective studies) or contamination bias (prospective diary methods). Unfortunately the measurement of need independent of behaviour (utilization) or subjective perception (self-reported morbidity) remains problematic. Normative measures such as physical exams are expensive, suffer from contamination bias ("Hawthorne effect"), and also must rely heavily (particularly in the case of pediatric health) on (parental) self-reporting of (the

child's) symptoms (Horowitz et al 1985). Furthermore they can never be more than cross-sectional snapshots given the transient nature of most symptoms.

The bulk of the utilization studies and review papers cited above make reference to perceived morbidity (self-reported health status) as the measure of need employed. This is not surprising given the centrality of perception to symptom detection, to assessments of symptom severity and to further stages in the decision-making process that may involve seeking medical attention. The relative salience of perceived morbidity (perceived presence as well as perceived severity: duration, functional disability and illness behaviour / sick role) in utilization appears to vary with the nature and source of care received, being especially crucial to non-referred (patient-initiated) curative health care utilization (Foets et al 1985). In this regard, it is noted that the use of medical care is less discretionary than the purchase of most (other) consumer goods. Furthermore, within the health care system, more discretion is observed in the use of preventive health care (for example dental services) and physician-based care than for hospitalization (Litman 1974, Andersen 1968) or for follow-up care within the medical referral system (Litman 1971).

What remains often obscured is the degree of conceptual and methodological intrigue involved in the

measurement of 'need'. It goes almost without saying that the cognitive dimensions of health care service utilization are not independent of age, gender, socio-economic status, ethnicity, prior illness experience and health care system parameters. It is surprising therefore how many studies predicate health status measures on perceived need and are surprised by the weakness of observed relationships between socio-demographic and socio-economic variables and utilization when controlling for need (Mechanic 1979). Yet despite socio-economic and psychosocial biases in perceived need with respect to objective health status, the salience of the former and problems in assessing the latter, lead one to question the relevance of judging equity of service utilization on the basis of measures of objective health status that are devoid of perceptual factors (were that in fact even feasible). The extent to which a health care system might wish to limit utilization by those deeming themselves needy, and force it upon those lacking in motivation, would seem to reflect the discrepancy between normative and felt need.

While difficulties associated with the (standardized) measurement of health status continue to hamper utilization studies (Beland 1982), it is difficult to conceive of integrated health care research independent of need given (a) it's primary influence on service use, and (b) the

concern of health care policy makers to meet demand on the basis of need rather than less tangible behavioural parameters (Culyer 1978).

## 2.5.4 An added dimension: the home environment

The role of the home environment as a system of influences affecting the health service use of its members has been insufficiently explored. It is expected that the home environment would encompass a variety of elements discussed (individually) above, and that these influences would be subsumed within a more holistic physical and social ecology at the household level. The distinction between individual and household is thus blurred at times.

Support for the family as a unit of health has and continues to be widespread (Mann et al 1970, Litman 1974, Sprague and May 1978, Shapiro 1983, Angulo 1987, Schor et al 1987 and many others). From the perspective of disease etiology alone, it is clear that the spatial clustering of individuals predisposes (through heightened exposure) to increased risk of infectious disease transmission. In addition, the family unit may often act as a frame of reference for health-related decision-making (Litman 1974). As small social systems, families also hold shared beliefs and learned responses to illness (Mechanic 1964, Litman 1971). The need for parental involvement in the pediatric

utilization of medical care further reinforces the need for a family-centred approach in health care research.

It has long been evident that a small proportion of individuals are typically responsible for a disproportionate share of utilization (Schor et al 1987, Starfield et al 1984), and that individual utilization patterns are relatively stable over time. Clear evidence now also points to the clustering of illness episodes among families and the persistence of family utilization patterns over time (Dingle 1959, Schor et al 1987, Osterweis et al 1979), particularly in the influence of parental use patterns on their children's utilization behaviour (Starfield et al 1985).

It would seem fair to assert that, as is the case with all systems, the whole is more than the sum of its parts: there is indeed more to the family than a collection of individuals. While studies in family health establishing the interconnected-ness of the health status of family members date back to the sixties (for example Hare and Shaw 1965), an explicit focus on the influence of the family unit on individual utilization remains scarcely explored (Hershey et al 1975, Schor et al 1987).

A number of family characteristics that have been linked to variations in the health status and health service utilization, although at times the underlying causal structure remains to be clearly elucidated. Family size,

for example, has been linked to both family utilization and that of the individual family member. It appears that while family size may have a positive influence on household utilization (Hershey et al 1975), it exerts the opposite influence on individual service use (Anderson and Kasper 1973, Wolfe 1980, Horowitz et al 1985, Schor et al 1987).

In controlling for family size however, Tessler (1980) has noted that most of the influence of family size on pediatric utilization was due to the clustering of first-borns in small families and that it is birth order that warrants closer attention. This has been corroborated by Wolfe (1980) and others, although Mann (1970) has suggested that age-related differentials in health status confound the relationship between on the one hand birth order and number of children in the family and on the other utilization. He further demonstrates this relationship to be inconsistent with respect to morbidity type. Indeed, family age composition (the proportion of household members in each of several age groups, especially those over 45 years) has been shown to have a strong bearing on family health status (Sprague and May 1978).

In part these observations reflect changes in the family life cycle, where childless couples have been observed to have low utilization rates, and young families high rates that taper off with time before re-emerging as

the parents become elderly (Litman 1974). Family life cycle
will also exert an influence on the nature and extent of
reliance upon the 'lay referral system' by family members
for advice about home remedies and advice as to whether to
seek medical attention (op.cit.)

Unfortunately, various cognitive and psychosocial
dimensions of the family remain to be adequately
investigated in their relationship to the utilization of
health care services, particularly as concerns the dynamics
of childhood or family coping with illness in the home
(Shapiro 1983). The predominance of parents as a primary
source of health attitudes among adults sampled in a large
midwestern American city suggests that a great deal more
attention could gainfully be focussed on the inter-
generational evolution and transference of health-related
attitudes and beliefs (Litman 1971).[9]

Where child health is concerned, the influence of the
mother has been particularly emphasized (Ramalingswami 1986,
Pelto 1987 and many others). The relationship of maternal
use of health services to that of the child has been noted,
although authors disagree as to whether it is the volume
(Wolfe 1980) or the presence as opposed to absence of
utilization (Newacheck and Halfon 1986) that is most
affected. There can be little doubt of the central role of
the mother as provider of care in the health of her

children, for it is she who must feed them, watch over them,
and minister to them in sickness and in health. While there
exists a small literature on maternal knowledge and use of
oral rehydration therapy, such an approach remains to be
extended to respiratory infection (representing a major
burden of illness among children) and other childhood
morbidities (Pelto 1987). Again, the tendency has been to
work with easily quantifiable factors such as maternal
education and maternal employment in addressing these
issues, with predictably mixed results.


## 2.6 Supply-side factors influencing the utilization of health services: health care system parameters

### 2.6.1 Macro-scale issues and concepts of access to health care

The primary influence of the health care delivery
system on utilization rates is due to differential access,
be that on the basis of facility location, referral
networks, insurance policies, entry eligibility criteria or
other system-related parameters.[10] Unfortunately access to
health care remains a nebulous and often misunderstood
concept (Thouez et al 1981, Feidler 1981, Thomas and
Penchansky 1984). It clearly must include both quantitative
and qualitative aspects of the health care system, set in
the context of changing medical technology (that in the West
has often favoured specialization and centralization),

organizational developments (such as professionalization), prevailing political realities and societal norms with respect to concepts of equity and social justice (Kohn and White 1976, Joseph and Phillips 1984).

Access has been compartmentalized into a number of conceptual dimensions. Kohn and White (1976) differentiate between resource factors (quantifiable measures of manpower and facilities) and organizational factors (resource allocation, health care expenditures, degree of state responsibility for public and individual health). Thomas and Penchansky (1984) have specified five "A"s of access to health care: availability, accessibility, accommodation, affordability and acceptability. The last named is addressed below with respect to patient satisfaction and consumer perceptions of the health care system. Issues of affordability were covered in our earlier discussion on the impacts of income and insurance coverage on service utilization. It is to the other dimensions of access that the discussion now turns.

## 2.6.2 Availability

Naturally the availability of health services for specific types of medical complaint will exert an influence on their degree of uptake among the population at risk, for where services are lacking many will choose to do without in

weighing the opportunity cost of more distant or different care against perceived need for and efficacy of care. However, regional availability measures, be they distributional indices (location quotient) or measures of regional concentration (coefficients of geographical association or localization), suffer in their substantive interpretation to the degree of aggregation they imply and by virtue of the (arbitrary?) boundaries they assume (Joseph and Phillips 1984). Perhaps the homogeneity of both provider and consumer characteristics implicit in such measures explains the conflicting and inconclusive findings regarding the influence of availability on utilization (Thomas and Penchansky 1984). Surely, true access is not the presence of a facility, but utilization with respect to need (Donabedian 1972).

## 2.6.3 Accessibility

As a locational variable, accessibility can be described as the 'effective proximity' of health care facility to potential consumer. This "friction of space" can be conceived to include linear (map) distance, travel time, mode of transportation and the opportunity cost associated with the trip for medical care (Shannon et al 1973). These factors are discussed in turn below.

The negative influence of distance on utilization (also coined "Jarvis' Law") has been widely documented (Shannon et al 1969, Morrill et al 1970, Shannon et al 1973, Shannon and Dever 1974, Shannon et al 1975, Feidler 1981, Annis 1981, Hunter and Shannon 1984, Joseph and Phillips 1984, McGuirck and Porell 1984, Hunter and Shannon 1985, Foets et al 1985, Habib and Vaughan 1986, Kloos et al 1987 and others). A variety of distance decay functions have been formulated to operationalize the measurement of Jarvis' Law (Joseph and Phillips 1984, Hodgson 1984, McGuirk and Porell 1985). The relationship does not appear to be uniform, for sometimes abrupt thresholds exist beyond which "zones of indifference" with respect to distance exist (Hunter and Shannon 1985). The impact of distance on the presence or absence of utilization has been shown to be stronger than on the frequency (volume) of use (Joseph and Phillips 1984), indicating the presence of a psycho-social attachment bias or the influence of the medical referral system on utilization following initial patient-initiated contact. That sensitivity to distance varies among population subgroups and by type of admission (nature of contact and of illness, type of service, source of care) may account for the inconclusive results obtained in numerous studies of the relationship of distance to utilization (Shannon et al 1969, Stock 1983, McGuirk and Porell 1984,

Joseph and Phillips 1984).

Despite the hope that distance would act as a simple proxy for the effort associated with travel for care, it is clear that mileage measures alone ignore the human dimensions of travel. Joseph and Poyner (1982) provide a poignant example of this in their analysis of the influence of activity space on choice of facility for health and non-health care services.[11] Nor is distance to care independent of the existing location of services, the social and spatial bias of which has a direct bearing on accessibility across socio-economic groups (Shannon et al 1975, Joseph and Phillips 1984).[12] On a similar note, it must be acknowledged that relatively little is known about the influence of (perceived) distance on the choice between alternate sources of care (individual facilities often not being in spatial or functional isolation from one another)(Shannon et al 1969). Nor has the relative importance of locational to non-locational factors in consumer decision-making been adequately explored (op.cit.). Other confounders of the distance effect include the nature of the health care referral system, as previously noted (Joseph 1979). Notwithstanding, it has been argued that distance to care is particularly cogent to the utilization of western-style care in developing countries where such facilities are widely dispersed, where most people walk for

care, and where many alternatives to western-style care are locally available (Stock 1983). Distance nonetheless remains only one of several measures of access to care.

The use of travel time in lieu of distance measures may overcome some of these difficulties (Feidler 1981), although not as relevant to pediatric as to adult utilization (Cohen and Lee 1985). The use of perceived travel time may represent an advantage over objective measures in capturing components of effort associated with familiarity of route and the possible multipurpose nature of journeys for care (Shannon et al 1969).

Unfortunately then, questions of allocative efficiency in health care planning are not easily resolved on the basis of raw distance measures: one must also account for situational and psychosocial parameters of accessibility.

## 2.6.4 Accommodation

The nature in which clients are accepted into the health care system may impact the utilization of such services. The relative convenience of office hours and appointment systems and the importance of differential waiting time often varies among socio-economic groups (Thomas and Penchansky 1984). Continuity of care through the referral system has also been shown to influence the

perceived accessibility of care (Feidler 1981).

## 2.7 On the interface between demand and supply: consumer perceptions of the health care system

While perception is intrinsic to both demand- and supply-side influences on utilization, consumer perceptions of the health care system have often been separately considered by virtue of being an input to the decision for care as well as an output of such use. Perceptions of the health care system prior to use evolve through acculturation, the influence of information flows (media, friends, rumors and myths) and reflect prior expectations regarding the nature and quality of care (Feidler 1981). Satisfaction with care received will often depend on the degree and nature of communication between provider and client, perceived attitude of the provider and of the efficacy of intervention, continuity of care, cost, and physical surroundings (Ware 1978, Feidler 1981). In this regard socio-economic distance between provider and consumer cannot be ignored (Benyouseff and Wessen 1974, Bercanovic and Reeder 1974). The inherent subjectivity of patient satisfaction has hampered the development of standardized measures of satisfaction which often vary within and between individuals independent of the object of concern, through time, with general mood, with age, sex, education, income, family size, occupation, social class, race, marital status

and specific measurement tool employed (Fiedler 1981, Linder-Pelz 1982a, b). Despite a rich literature on the nature of attitudes and attitude formation (Ajzen and Fishbein 1980) much of the health care literature has been concerned with testing the relationship of patient satisfaction to health behaviour, with little explanatory work designed to get at the substance and nature of these relationships (Linder-Pelz 1982a).

Of particular relevance to utilization in the developing world is how consumer perceptions translate into the use of alternative sources of care within both western and traditional medical systems. Comprehensive studies of medical pluralism indicate that the proportion of morbidity presented for western-style as opposed to other forms of care is typically low (Chen 1975, Agarwal et al 1980, Ojanuga and Lefcowitz 1982).[13] While a variety of explanations have been advanced to account for the differential use of alternative systems of care (on the basis of perceived etiology, perceived severity, perceived efficacy or "shotgun trials" of several alternatives at once) the underlying nature of the decision-making process remains obscure (Colson 1971).

## 2.8 Assessing the literature

A cross-section of recent studies on the utilization of health care services in both developed and developing country settings has been summarized and appraised in Tables 2.1 and 2.2. These studies were identified on the basis of (a) medline searches retroactive to 1980, (b) hand searches of Social Science and Medicine, Health Services Research, Medical Care, International Journal of Health Services, Journal of Health and Social Behaviour, and Bulletin of the World Health Association, and (c) references from key articles. They have been summarized with respect to key issues of location, sample, the definition of dependent and independent measures, and the parameters emerging as significant. Attempts at critical appraisal of the thoroughness of the studies were thwarted by an almost universal lack of specific information regarding sampling criteria, the nature as well as extent of attrition among the sample, representativeness of the sample population, and discussion concerning alternative possible confounders to observed trends and processes.

It is evident from the tables that the literature is uniformly inconsistent in its definitions, range and character of various dependent and independent variables employed, and in the nature of the target population selected for study. These issues are discussed below in the

**TABLE 2.1     SUMMARY CHART OF RECENT UTILIZATION STUDIES:**
**DEVELOPED NATION FOCUS**

| STUDY | LOCATION | SERVICE/ FACILITY TYPE | UTILIZATION MEASURE | SAMPLE SIZE | FACTORS EMERGING AS SIGNIFICANT |
|---|---|---|---|---|---|
| Wolfe (1980) | Rochester, N Y | any medical care | self-reported utilization | 830 | age, need, income, family size, parental utilization, mother's employment status, marital status |
| Thouez et al (1981) | Eastern Townships, Quebec | any medical care | self-reported morbidity & utilization | | age, level of illness |
| Wilcox-Gok | St Louis U S A. | ambulatory | service use in prepaid med plan | 1900 | income, mother's educa-marital status, fathers education, health of mother |
| Orr et al (1984) | Baltimore, MD | hospital outreach | recorded use (pediatric) | | health system barriers |
| Thomas & Penchansky (1984) | Rochester, NY | hospital & GP | self reported morbidity & utilization | 287 | need, patient satisfac-5 dimensions of access |
| Campion & Gabriel (1985) | UK | GP | pediatric utilization (recorded) | 113 fam-ilies | health status, family size, age, SES, mothers anxiety |
| Cohen & Lee (1985) | Rhode Is, U S A. | 14 general hospitals | short-term care | ? | travel time, hospital size |
| Dutton (1985) | Washington D.C | - | health status at interview | 1063 | age, family income, crowding, previous health status |
| Foets et al (1985) | Belgium | GP, pharma-ceuticals | self-reported medication & utilization | 1745 | age, SES, perceived severity, health know-ledge, accessibility, "socialization" |
| Diaz et al (1986) | Columbia, U.S.A. | ambulatory care | visits under prepaid med plan | 120 kids | child health status, family size, maternal education |
| Newacheck & Halfon (1986) | U S A. | physician services | self-reported utilization | 28340 | age, race, child health status, # kids, income, education, insurance, maternal utilization, " employment status |
| Andersen & Laake (1987) | Norway | physician services | self-reported utilization | 8146 | need, sex, access |
| Schor et al (1987) | Columbia U.S A. | ambulatory care | visits under prepaid med plan | 693 fam-ilies | family size & utiliza-tion, parental utiliza-tion |

Notes: (1)  The author acknowledges that the indicated  factors were occaision-
ally related  to one  of the outcome measures and not to the other
Operational definitions varied
(2)  SES refers to socio-economic status, GP to general practitioner.

TABLE 2.2  SUMMARY CHART OF RECENT UTILIZATION STUDIES:
LESS-DEVELOPED NATION FOCUS

| STUDY | LOCATION | SERVICE/ FACILITY TYPE | UTILIZATION MEASURE | SAMPLE SIZE | FACTORS EMERGING AS SIGNIFICANCE |
|---|---|---|---|---|---|
| Ogionwo (1973) | Nigeria | immunization | uptake of 3 successive doses | 150 | age, education, marital status, knowledge, attitudes, social interaction |
| Benyouseff & Wessen (1974) | Tunesia | Government health care system | # visits & # visits/ illness | 1467 | age, sex, health attitudes, patient satisfaction, occupation, health care system |
| Mburu, Smith & Sharpe (1978) | Kenya | government-provided immunization | presence of BCG & small-pox vaccination scars | 150 homes | age of mother, social ref. group, health knowledge, "cosmopoliteness" |
| Gesler (1979a) | Nigeria | all western & non- | self-reported morbidity & utilization | 444 kids | age, mobility, SES, illness type, toilet type |
| Akesode (1982) | Nigeria | 2 PHC clinics | level of immunization | 120 moms & their kids | family size, mom's age & education, perceived severity |
| Bamisaiye (1984) | Nigeria | university-based MCH | service coverage | 950 kids | age & sex of child, duration of residence, child care arrangements, patient satisfaction |
| Chojnacka & Adegbola (1984) | Nigeria | teaching hospital | admissions | 602 families | age, sex, crowding, education, marriage type, occupation, water supply |
| Habib & Vaughan (1986) | Iraq | modern health services | self-reported utilization | 2933 | income, distance, health status, type of household, SES, adult females home |
| Kloos et al (1987) | Ethiopia | all services | self-reported morbidity & utilization | 2829 | age, sex, distance, SES, crowding, building material, rural-urban |

Notes: (1)  The author acknowledges that the indicated factors were occaision-
ally related to one of the outcome measures and not the other.
Operational definitions varied.

wider context of an assessment of the philosophical underpinnings of utilization studies.

The diversity of definitions and operational measures suggests that the phenomenon of utilization is relatively poorly understood in the literature (Hershey et al 1975, Crandall and Duncan 1981). This is unfortunate since the factors influencing utilization and the relative importance of these has been shown to vary with respect to type of visit (patient-initiated or system-initiated), type of contact (preventive or curative), type of provider or service (physician, hospital, local clinic), degree of contact (phone consultation versus visit), initial versus repeat visits and underlying health condition (perceived severity, chronicity)(Donabedian 1972, Hershey et al 1975, McKinlay 1972, Horowitz 1985, Newacheck and Halfon 1986, Andersen and Laake 1987). It is unfortunate that despite a recognized need for a taxonomy of utilization, few such models have been developed (see for example Figure 2.4), and little attempt has been made to the author's knowledge to coordinate and classify study results on the basis of outcome measures employed. All too often the influence of outcome measure on model-building has been ignored or only paid 'lip service'.

The emphasis on utilization as a standardized countable outcome measure has traditionally negated the

**FIGURE 2.4    A PROPOSED TAXONOMY OF UTILIZATION**

UTILIZATION OF HEALTH SERVICES

TYPE

| Hospital |
| Physician |
| Medications |
| Dentist |
| Nursing home |
| Other |

PURPOSE

| Prevention |
| Curative services |
| Health maintenance (chronic conditions) |
| "Custodial care" (terminal illness) |

UNIT OF ANALYSIS

| (Initial) contact |
| Volume (including follow-up) |
| "Episodic care" (illness-specific utilization process) |
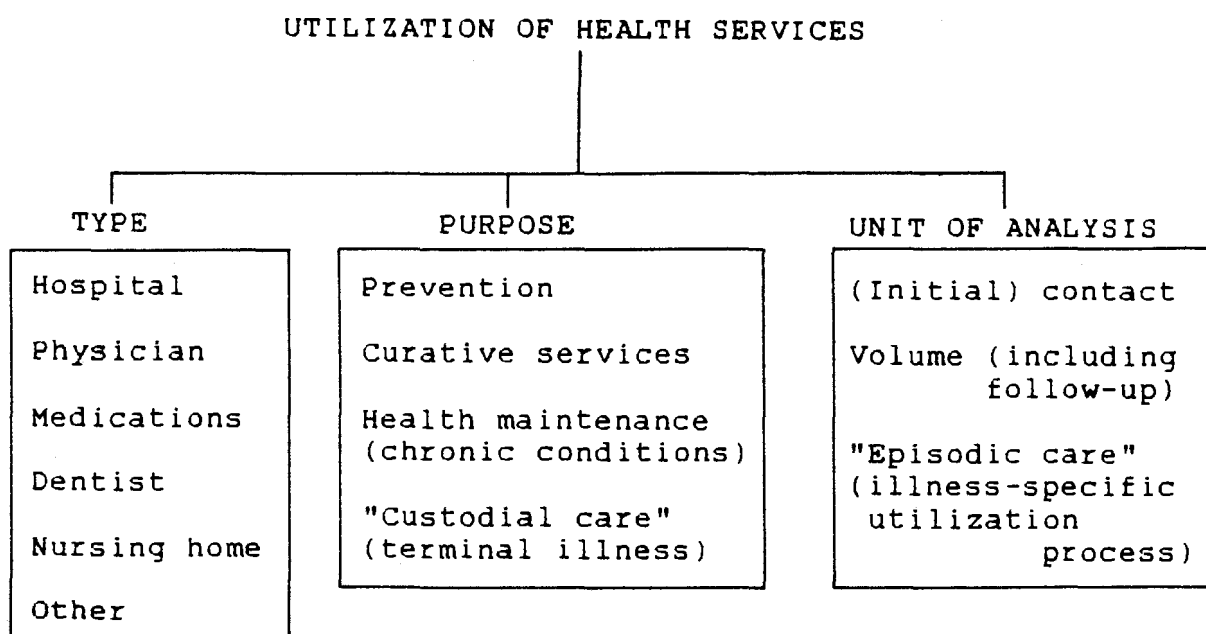
Source:   inspired by Andersen and Newman (1973)

inherently dynamic process of decision-making that underlies
and culminates in a series of actions designed to alleviate
a perceived health threat, of which the utilization of the
formal health care system is but one (Mechanic 1979, Gesler
1984, Foets et al 1985). Stages in the decision-making
process are commonly thought to include the perception of
symptoms and evaluation of their severity, the interaction
with family and peers (opinion seeking), and the evaluation
of health care alternatives as a function of one's
socialization, prior health history, previous utilization
experience, current functional disability and so-forth
(Anderson 1973). It is entirely conceivable - indeed it is
likely - that the determinants of each stage in the process
may be quite different (Safer et al 1979), demonstrating the
need for a dynamic approach to utilization that focusses on
the propensity for use expressed as sequential actions over
time, and as manifestations of an underlying stochastic
process of evolving health behaviour (Beland 1982).[14] Where
this has been attempted, the importance of accounting for
interactions between the use of different facilities has
been highlighted (Swinkels and Schulpen 1980).

Variations in the sampling of study populations have
also limited the comparability of results across studies.
The proliferation of service-based research has left issues
of representativeness and the heterogeneity of non-users (as

distinct from non-actors) relatively unexplored (Muller 1986). The paucity of detailed quality research into the utilization of health services in less-developed countries (particularly as concerns utilization by specific population subgroups such as children and the elderly) is regrettable in the face of a considerable literature relating to service use in developed countries (Benyouseff and Wessen 1974).

The amount of variance 'explained' in most utilization studies is small.[15] This is not atypical in the modelling of human behaviour where an element of inherent unpredictability is inescapable. It also represents an excessive reliance on easily measured socio-economic and demographic variables which themselves act only as (inconsistent?) proxies for underlying situational or psychosocial influences. As we have seen in our earlier discussion, the meaning behind these descriptive associations is often difficult to unravel. This ambiguity of cause and effect is compounded by the crossectional and retrospective nature of much of the research in this field (Horowitz et al 1985). Indeed the usual criteria for the establishment of causation are not satisfied (in fact are rarely tackled) in the literature.

As noted earlier, collinearity between self-reported (perceived) health status and a variety of psychosocial and socio-economic influences on utilization is likely. This

may account for the contradictory findings of many studies concerning the influence of the latter on utilization, and the conclusion by some that the influence is minimal. It is noteworthy that multicollinearity is likely amongst the individual factor set and will lead to biased parameter estimates in both bivariate and multivariate analysis and the misspecification of resultant utilization models. The failure to include relevant dimensions of use will produce similarly biased results in proportion to their own influence and to the degree that they confound (correlate with) the influence of variables retained in the model (Hershey et al 1975). Finally, within the choice of dimensions of utilization examined lie a veritable potpourri of operational definitions with respect to the choice of representative variables and their measurement (Figure 2.5) that further complicate the comparison of results between studies.

It would appear that a coordinated agenda for further research is sorely lacking. Rather than continuing to replicate earlier findings it seems appropriate to build on existing work, to increase the sophistication of model building and analysis, and to refine and standardize operational measures (including qualitative psychosocial indicators) in a more coordinated research environment.

FIGURE 2.5     LEVELS OF CHOICE IN THE MEASUREMENT OF
               PRESUMED DETERMINANTS OF UTILIZATION

```
        ┌─────────────────────────────┐
        │  Utilization phenomenon     │
        │  (dependent variable)       │
        └─────────────────────────────┘
                     │
                     ▼
        ┌─────────────────────────────┐
        │  Study population           │
        └─────────────────────────────┘
                     │
                     ▼
        ┌──────────────────────┐   (psychosocial,
        │  Dimensions of use   │    health status,
        └──────────────────────┘    health care system,
                     │               socio-demographic)
                     │
                     ▼
        ┌─────────────────────────────┐
        │ Variables employed to represent │
        │      a given dimension      │
        └─────────────────────────────┘
                     │
                     ▼
    ┌──────────────────────────────────────────┐
    │     Particular operational measures      │
    │ designed to capture the variable(s) in question │
    └──────────────────────────────────────────┘
```
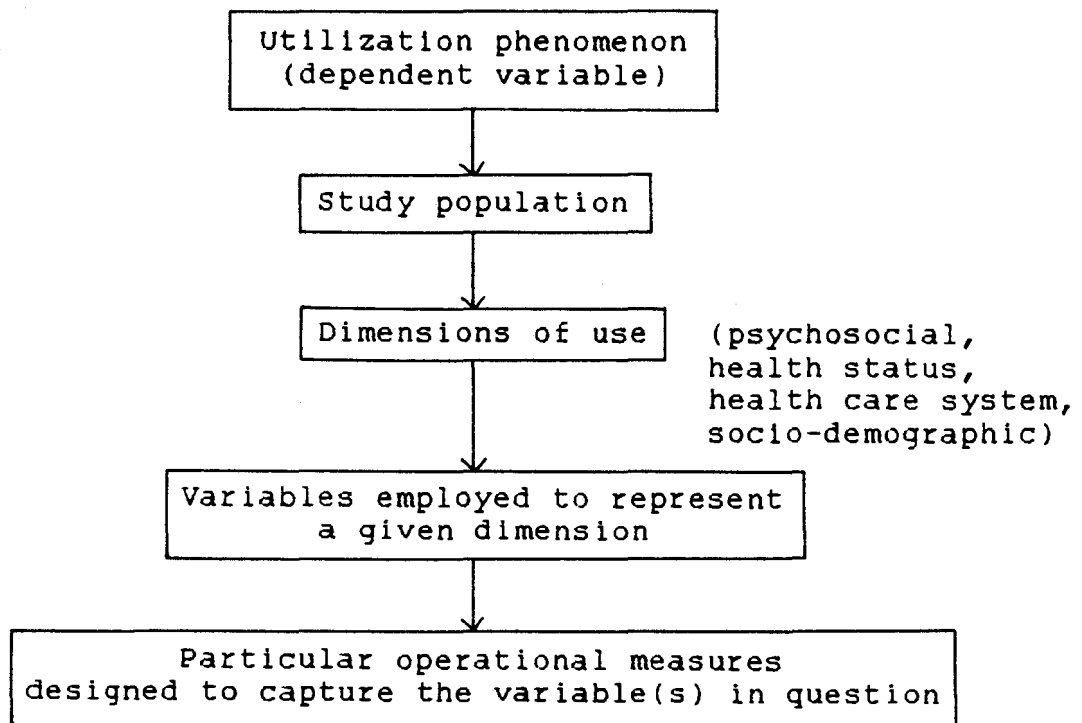
## 2.9 Conceptual models of health: the need for a socio-ecological perspective

In discussing the philosophical and conceptual underpinnings of utilization research, it is essential that attention be focussed on conceptions of health and disease causation. A biomedical cause and effect model of disease has dominated the bulk of health-related research in the twentieth century. The conceptual backbone of a curatively oriented health care system, the biomedical model is characterized by a positivist and mechanistic approach that emphasizes the identification of disease etiology (from causal agent through to associated lesion) and leaves social, cultural and behavioural factors largely ignored (White 1981, Myers 1982).

Subsequent attention within medical geography to the ecology of disease allowed for a multiplicity of causal factors and the recognition of other dimensions of influence (social, behavioural, cultural) previously ignored. However, documenting the who, what and where of associations between disease and its total environment still focussed largely on natural scientific explanations (Pyle 1977). The assimilation of an expanded factor set into a still linear additive process of disease causation is reminiscent nonetheless of environmental determinism (Myers 1982). Jakobsen's (1978) model of the ecology of underweight in children (Figure 2.6) provides an example of this approach

FIGURE 2.6    AN ECOLOGICAL MODEL OF UNDERWEIGHT IN CHILDREN



FAMILY ECONOMY provides food, together with other goods and services, directly, and/ or via cash, see fig. 4.2

Monetarization

Education

Vaccinations and immunizations

Woman's control over resources

Family planning, e.g. spacing of children

Hygienic level

Food available for the family

Distribution of food within the family

Number of children to be fed

Amount and quality of children's food intake

Mother's food intake

Former generations' food intake

Malnutrition in children

Infections & parasites

Low birth weight

Genetic factors

Underweight in children

Policy factors
Input variables
Action variables
Factors open to government manipulations

Factors defining children's food intake

Food intake

Factors causing underweight in children

Boxes indicate variables
Arrows indicate causal relations

that is also characteristic of research into the determinants of health service utilization. Traditional models of utilization do not illustrate this inter-connectedness but organize systems of cognitive and situational factors so as to suggest a linear additive influence.

Dissatisfaction with this approach stems from its failure to address why such links between factors have been observed in any more than a generalized descriptive or speculative manner. As indicated earlier, the dynamics of man's interaction with the environment and its relationship to health and to the utilization of health care requires more focussed and dedicated attention.

A socio-ecological model of health provides an attractive context in which to address these issues (Figure 2.7). A socio-ecological perspective on utilization allows for the sorts of complex interactions within and between dimensions of factors that have been observed to be relevant to utilization behaviour as one of their many outcomes (Figure 2.8). It is also an interactional model which allows for a variety of internal feedback mechanisms and should, in the context of utilization behaviour, be seen as an open rather than closed system.[16] White (1982) outlines three ecological principles guiding the operation of the system: "The system as a whole has properties which are not

**FIGURE 2.7     A SOCIO-ECOLOGICAL MODEL OF HEALTH: GENERIC FORM**
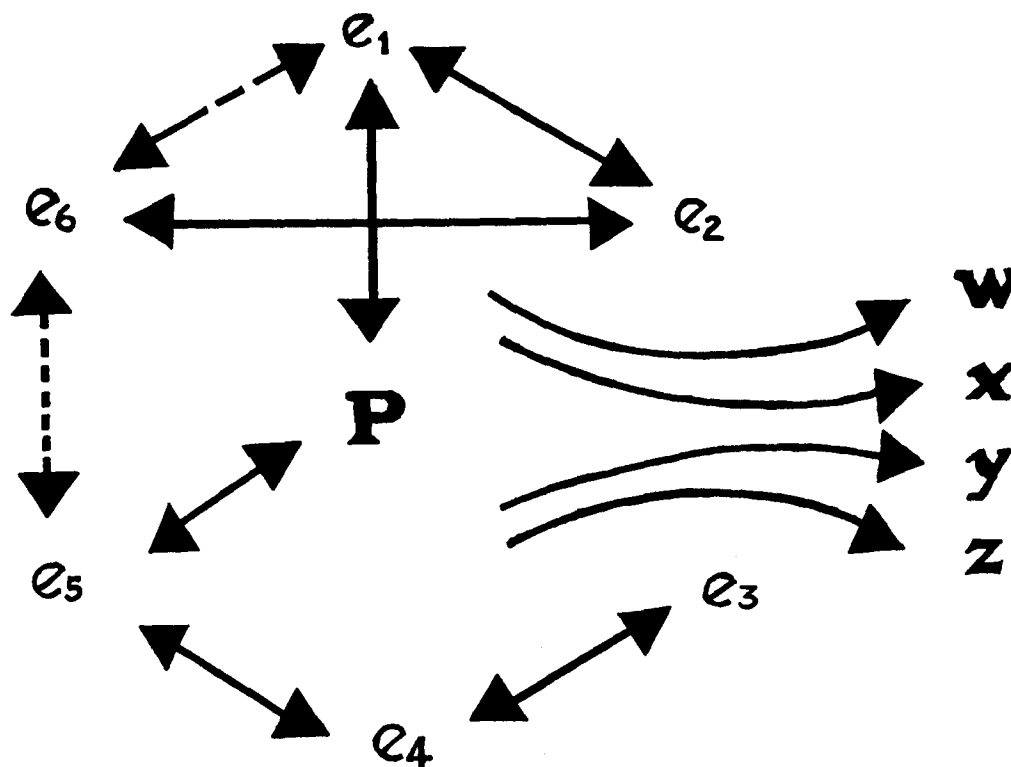


Source:   White (1981)

Notes: (1)   'P' refers to an individual person

(2)   'e1' to 'e6' represent dimensions of the environment

(3)   'w' to 'z' indicate alternate health or non-health outcomes

**FIGURE 2.8     A SOCIO-ECOLOGICAL MODEL OF UTILIZATION**



```
                        societal norms


    health care                              beliefs
      system

                                                        self-
                                                        medication

                                                        health
                                                        service
                         individual                     utilization

                                                        sick role

    household
    environment                                         perception

                                       demographics

                    health
                    behaviour
```
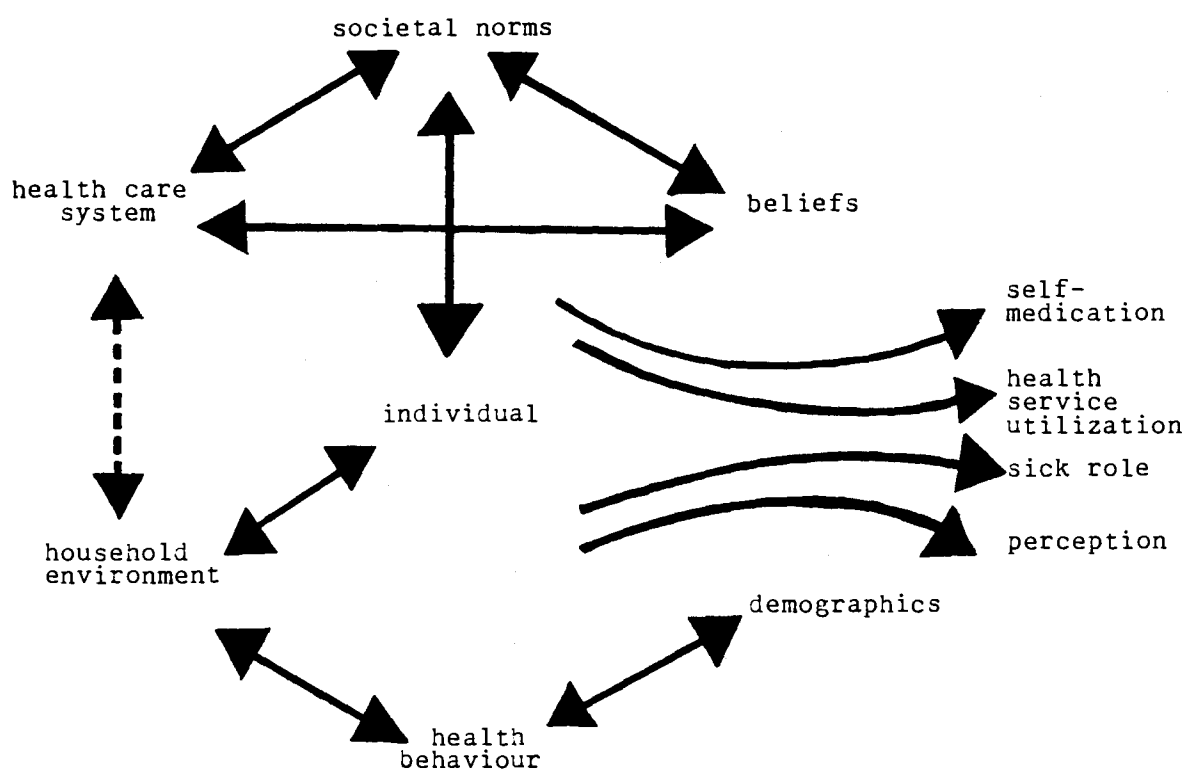
Notes:  (1)  The links illustrated above are purely hypothetical,
             and are in fact considerable more complex than sug-
             gested here.

reducible to the properties of any single constituent, [that] the function of any single element is affected by the operation of the system as a whole; and , [that] change in any point of the system can be predicted to have remote effects". The implied non-linear nature of causal relationships led him to distinguish between "proximal" and "distal" causes, and to sanction the isolation of specific interactions to render manageable their study. This is a point to which I will return, since many (societal, health care system and other) dimensions of utilization behaviour have a semi-autonomous sub-ecology of their own that require attention, albeit in the context of their wider ecology.

## 2.10 The McMaster-Grenada Child Health Project and the home environment

The research on the utilization of health services in selected communities in Grenada described in this dissertation was part of the McMaster-Grenada Child Health Project. Funded by the Pan American Health Organization (PAHO), its mandate centred on the analysis and reduction of childhood morbidity in Grenada, particularly that related to infant diarrhoea. Two parallel streams were developed within the project. One of these focussed on the dissemination of oral rehydration therapy and health behaviour education through the empowerment of local community organizations.

The other facet of the project concentrated on the development of a risk assessment tool by which to target scarce health care resources. The successful identification of populations at risk from diarrhoeal morbidity on the basis of readily accessible/observable characteristics of the home environment was seen as a powerful management tool in the allocation and implementation of community-based interventions designed to reduce the burden of illness associated with childhood diarrhoea. Early work undertaken by project team members in the fall of 1983 and beginning of 1984 (subsequently published in Social Science and Medicine, see Taylor et al 1986) indicated risk assessment to be a very promising tool. On the basis of a household survey of 169 homes in three communities on the island, Taylor and colleagues (op.cit.) were able to develop highly sensitive and specific models in the prediction of childhood diarrhoea on the basis of a limited set of household risk factors.

In order to further validate the efficacy of the risk assessment tool, a second set of study communities was selected for analysis. When the author joined the project a detailed census of the new study communities was nearing completion and the first eighteen months of utilization data had been extracted from area health service records. Field work in the summer of 1987 permitted myself, Michael Hayes (PhD candidate) and two field assistants to capture a

subsequent twelve months of utilization data from health care records and complete a household survey of the five communities for self-reported morbidity and data on the home environment (suspected risk factors).

The utilization study represents a distinct but related module within the larger McMaster-Grenada Child Health Project. It is intended that key information on health care utilization, both in descriptive form and that arising from the analyses presented in chapters 4 and 5, will be made available to the Grenada Ministry of Health so as to inform decision-making in the provision of health care. Although fairly comprehensive record-keeping pervades the Grenadian health care system, only aggregate statistics reach the ministry offices in St.Georges. Since detailed cross-tabulation at the local level is beyond the manpower capabilities of the system and such linkages are lost in aggregated monthly summaries, it appears that the current study represents one of the first comprehensive analyses of health service utilization in Grenada.

In apparent contradiction to my comments on the need for a more holistic approach to health care utilization research, the explicit focus of this study has been on the influence of the home environment on health and health service use. I have previously argued that focussing on a subsystem within the larger socio-ecology of health care

utilization is warranted so long as (a) it helps clarify the nature of that subsystem and the interelationships of its constituent parts, and (b) one remains sensitive to its open-ended nature with respect to the larger environmental context (in the loosest sense of the term).

In this context, a word or two concerning the problems associated with a family-oriented approach to health and health care seem appropriate. To begin with, and particularly in Grenada, where family structures are loosly defined and rarely formalized, arriving at a workable definition of 'family' remains a problematic task. Furthermore, in Grenada, household membership extends beyond the nuclear family and often beyond the extended family with sometimes remarkable fluidity. The use of key informants in household surveys also raises concerns about under-reporting and bias as well as the ability to measure attitudes and other psychosocial factors in a valid, reliable and consistent manner. Indeed as an individual act, utilization must necessarily encompass individual as well as familial, societal and structural/contextual 'determinants'. To return to an earlier point then, it would seem advisable to remain cognizant of the family system of influences on personal health behaviour in the context of other internal and external factors.

## 2.11  Conclusion

At the outset of this chapter it was suggested that utilization studies inform planning for the equitable provision of health care. Subsequent sections reviewed the nature of utilization studies, their assumptions and their findings. I have proposed that utilization be conceptualized in a socio-ecological framework, a context that allows for a system of systems. I have further proposed that one subsystem - that of the home environment - can be gainfully explored to illuminate the ecology of health service utilization. It is anticipated that a range of both demand and supply-side factors, operating at a variety of scales, converge upon and are reflected in the household 'environment'. This dissertation reports on the findings of such an approach applied to five communities on the island of Grenada in the West Indies. Chapters 3 through 5 focus on methods of data collection and analysis as well as their substantive interpretation. It is to these issues that we now turn.

# FOOTNOTES TO CHAPTER TWO

1. WHO defines health as "a state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity" (Callahan 1973).

2. Unfortunately, the overlap between health beliefs as social factors and psychosocial dimensions of perceived need is not acknowledged by Andersen. In the context of the discussion to follow (in this chapter), this can be considered a serious omission.

3. This has prompted some authors to speculate that the conceptualization of the subject has lagged behind its empirical development (Phillips 1985).

4. For reviews of the literature see McKinlay 1972, Fiedler 1981, Gesler 1984, and Joseph and Phillips 1984.

5. One notes here the lack of studies examining perceived need as distinct from perceived health status.

6. Bercanovic and Reeder (1974), although citing a number of studies linking poverty to utilization as a function of access rather than social psychology, assert that questions of access bely the latter.

7. The author's impressions in Grenada and in Kenya corroborate this. Income differences in source of care partly reflect the likelihood of having a regular source of care, a likelihood that varies inversely with income (Horowitz et al 1985).

8. All too often data on beliefs, attitudes and behaviour has been cross-sectional in nature, causality, and indeed the direction of the presumed relationship, being largely assumed (Zanna et al 1980).

9.  Respondents from all generations cited parents as (primary) source of health attitudes in 41.7 percent of cases, spouses in 15 percent, health personnel in 15 percent, and mass media in a mere 8.3 percent of cases (Litman 1971).

10. Authors such as Joseph and Phillips (1984) have portrayed utilization as "revealed accessibility".

11. See also Shannon's (1977) work on the subjective reality of space.

12. For further discussion on the "inverse care law" the reader is referred to Eyles and Woods (1985).

13. For example, of the 77 percent of clinically identifiable morbidity among under-fives in rural India (on the basis of fortnightly assessments over several months) presented for treatment, 37.5 percent sought 'modern' care, 25.5 percent used home remedies or self-medication, 11.1 percent tried folk practices, and 26.3 percent relied on "mixopathy" (a mixture of modern medicine, homeopathy and other treatments)(Agarwal 1980). In a longitudinal study of utilization in rural Kenya, Schulpen and Swinkels (1980) reported that 37 percent of those unwell (self-reported health status) took no action, 35 percent tried self-medication, and only 21 percent sought external medical attention (both traditional and modern).

14. Swinkels and Schulpen's (1980) longitudinal study of health care utilization in Kenya represent one of the few examples of work taking this into account.

15. Among the larger multivariate studies for example, Andersen et al (1975) were able to account for 16 to 25 percent of the observed variance in utilization, Andersen and Aday (1978) 22 percent, Kohn and White (1976) 4 to 10 percent, Wolinsky (1978) 9 to 12 percent, most of which was subsumed by need/health status variables.

16. The open-system models, as pioneered in physics and biology by von Bertalanffy, are more appropriate to the analysis of complex phenomena such as health and human behaviour, in which a given stimulus may ellicit a range of reactions under different circumstances (outcomes X through Z in Figure 2.6; Cassell et al 1960).

# CHAPTER 3

## DATA COLLECTION

To assess the role of household environment on health services utilization three information sets were necessary. A census was conducted to establish the population at risk, medical records were scanned for utilization data, and a house to house survey provided the household parameters of interest (Figure 3.1). This chapter reviews the means by which these information sets were acquired and coded for analysis and explores the more salient issues raised thereby.

## 3.1 The census

Five communities in two parishes in the western portion of the island were selected for inclusion in the study (Figure 3.2a,b). The western district was originally chosen on the basis of the organization and enthusiasm of the area's primary health care team, the completeness of their records, and their interest in our work. The study communities were chosen in consultation with the team, partly to ensure their involvement and ongoing interest in the study, but mostly since they were more familiar with the

**FIGURE 3.1     DATA COLLECTION:   STUDY INFORMATION SETS**



STUDY ON THE ECOLOGY OF UTILIZATION
IN GRENADA

CENSUS                    SURVEY                    UTILIZATION

1986: name, age
sex, location

1987                 Household              Self-reported
                     environment

residential                               morbidity      utilization
instability          accessibility
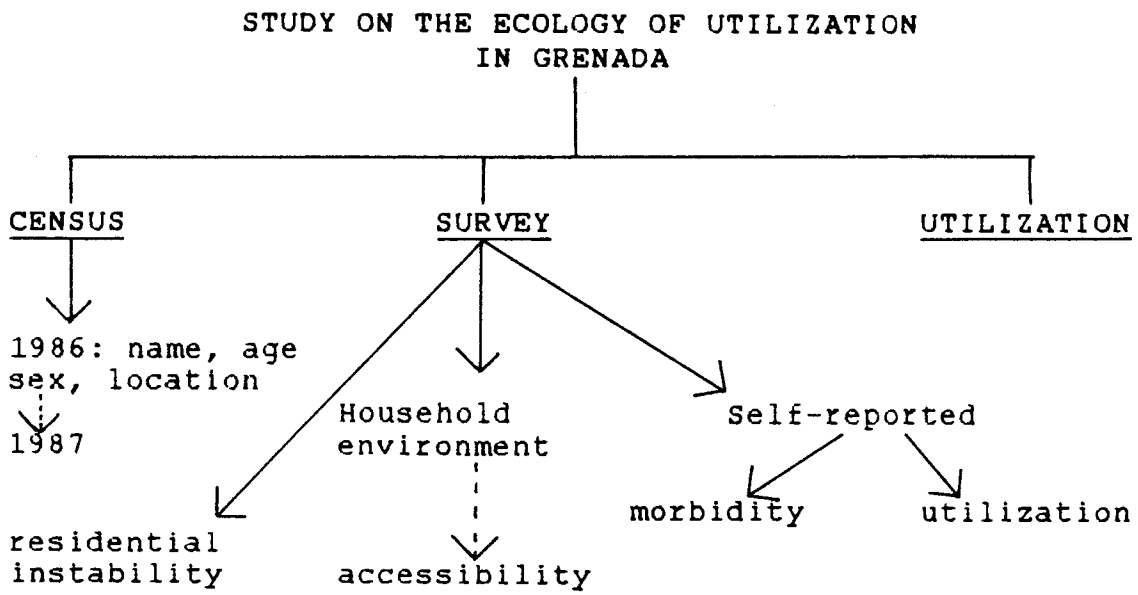
**FIGURE 3.2a      GRENADA IN THE CARIBBEAN**

FIGURE 3.2b    GRENADA:  THE WESTERN DISTRICT
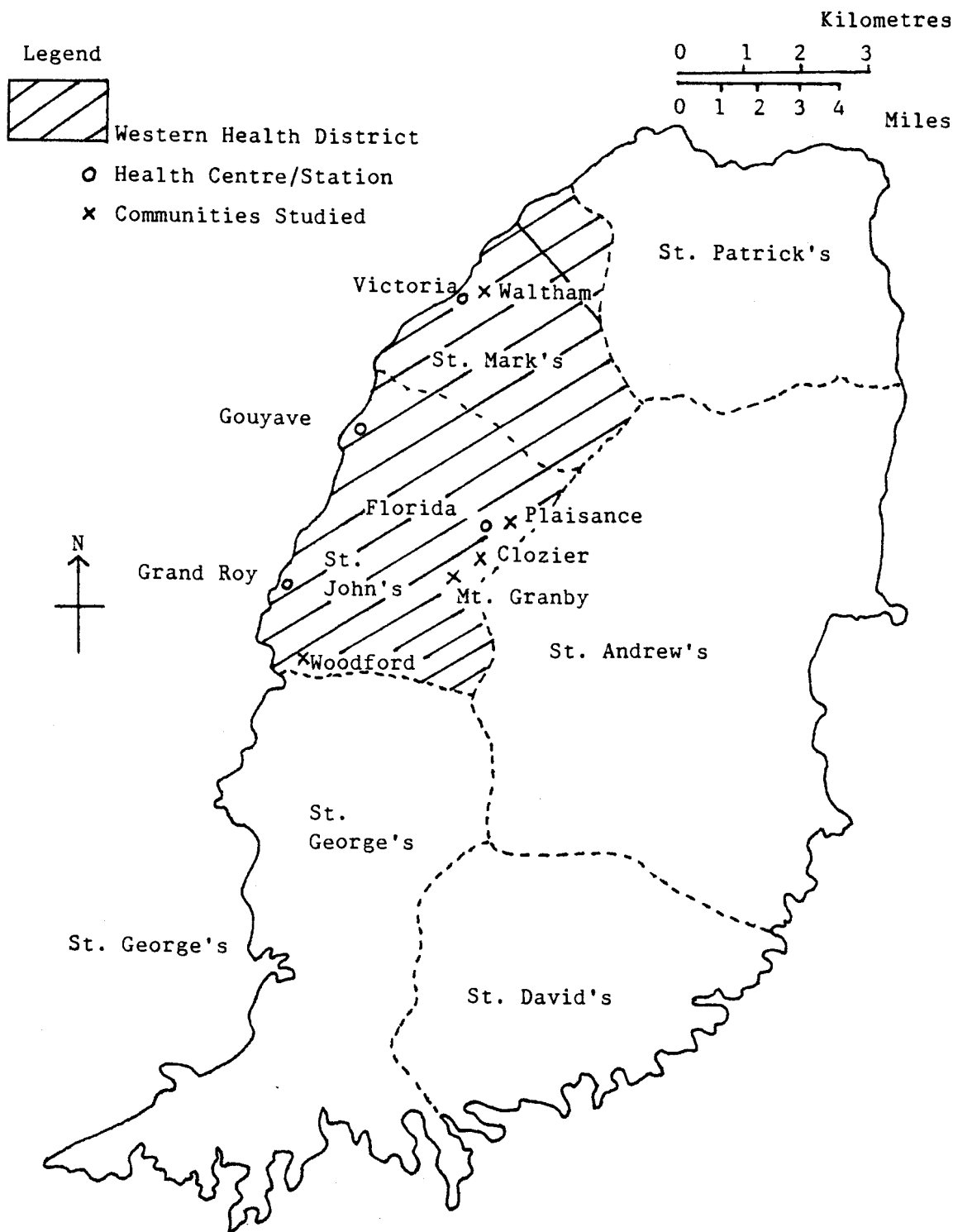
area and its needs.   To no-ones great surprise, they

suggested communities   in   which   the   team   was conducting

outreach work   as well   as one   in which a health survey was

planned (Plaisance).   Nonetheless, we feel these communities

to be representative of those in the area.   Few would likely

be much   poorer   overall   in   health   and   in socio-economic

status than Waltham, nor better off than Woodford.

Three attempts were made to establish the denominator

population in these   five   communities.   In   each   case an

attempt was   made to establish the name, age, sex, and place

of residence of everyone in the communities of interest.   To

a lesser   extent we   were also   able to identify "ownership"

(kinship) of children by resident adults.

Our task was complicated by the   context in   which it

was   carried   out.   Typical   of   many   developing nations,

Grenada's villages   and   land   tenure   patterns   lacked the

familiar grid  patterning or clear property boundary symbols

(fences, paths...) common in North America.   Instead, plots

appeared indistinguishable   from   one   another   and   houses

seemed   dotted   at   random   along   or   away   from   the road,

connected by   a web of footpaths.   Street names were for the

most part non-existent, the exceptions being   not posted but

common knowledge  among locals.   In   the few cases in which

house   numbers   were   assigned,   they   appear   to   have been

distributed at random or on the basis of personal preference

("favorite" numbers). This made it difficult to locate and map households in the community.

In addition, family structure in Grenada is very loose-knit. Typically, women do not live with their mates but instead alone, or more frequently with their sisters and mothers, and usually each accompanied by children from several fathers, each carrying different last names. It is also common for children of other women to reside with their aunts, grandmothers or sisters during part of the year or perhaps only during the day while the mother is at work. As such, the North American logic of ascribing a Smith child in the utilization records to the Smith household would not hold, particularly as often only a handful of last names are to be found distributed amongst the households of each community.[1]

Furthermore, nicknames are more often the rule than the exception, unless the formality of the situation seems to dictate otherwise. To cite one example, a Woodford resident was known as Cadore by most, Burroughs by some, and Lennox, Zio or St. Bernard by still others. As a result, we were frequently mistaken in assuming that two different names on a medical log referred to any other than the same person. Furthermore, parents seemed to delight in naming children of similar age and gender virtually like-sounding names. The likelihood of confusing Kellon with Kevon or

Keron (or Cathyann with Karlianne and so-on) is frustratingly high in a barely legible medical log where the recorded age falls between those provided in the survey for the children in question. Finally, cultural and socio-economic barriers led to misunderstandings in which "yes" might will have been the answer to two or more contradictory questions.

### 3.1.1 First census

As of the first census conducted in our communities in August of 1986, we were fortunate to secure the use of cadastral survey maps prepared by the Ministry of Finance (Appendix D). These had only recently been commissioned and greatly facilitated our attempts at locating and assigning code numbers to households in the communities. In all three field visits, key informants were also used wherever possible. Whether residents of the community, locally-resident community health aids or area health station nursing staff, they greatly assisted us in obtaining a reliable census. Additionally some house to house work in the presence of local health care staff was undertaken as part of the first census to update and verify information provided by key informants. Four hundred and twenty three households comprising 2079 residents were thus included in our census of the five communities (Figure 3.3).

FIGURE 3.3    CENSUS GRAND SUMMARY:   POPULATION AND HOUSEHOLDS BY LOCALE
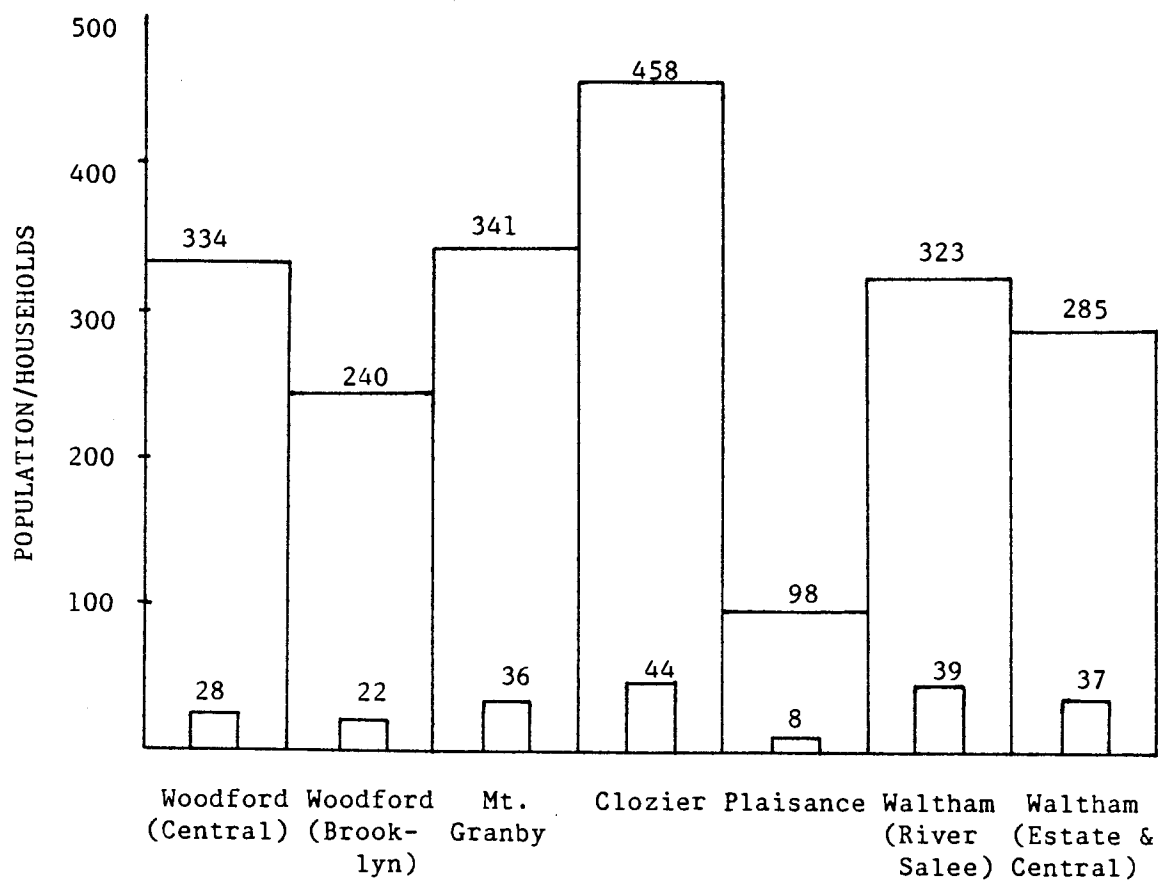
As a result, we were able to assign to each person a unique identifier number comprising three segments: community, household, and person identification. The last of these represented a within-household resident number usually assigned 1 through n beginning with the oldest resident or the person interviewed. A computerized version of the census established on this basis allowed for assigning ownership of health care service utilization visits and facilitated aggregation to the household and community levels. Using our census information, it was also possible to create a series of variables describing household residential composition in terms of ratios of various age/sex groups or totals thereof (see Chapter 4).

### 3.1.2 Survey, census portion

A subsequent survey of 224 households with children in July of 1987 provided the opportunity to recheck and upgrade our earlier census information for a subset of the community populations. Each household interview began by clarifying the residential status, age and sex of members. The following types of discrepancies from the earlier census were noted: (a) same person but new name or age; (b) person listed in census but no longer present; and (c) new resident not on previous census. Changes in name (for reasons discussed above) and in age were relatively common.

Generally less care was taken to be precise on the age of older residents (whose variance was typically greater than among children), partly because of the study's focus on childhood morbidity, but also reflecting the lack of certainty among local residents as to the exact age of older members. The ages calculated for subsequent analysis consisted of survey age where available or census ages plus one.[2]

### 3.1.3  Residential stability

For those no longer present at the time of survey, we attempted to distinguish between those who had relocated within the study area in the twelve months following the first census and those who had moved outside the area or to an unknown location. In the few cases in which it was clearly stated that the person in our census had never resided at the address indicated, and an alternate location could not be established, they were removed from the census altogether.

Residents not previously accounted for in our census comprised babies born since the first census on the one hand, and, on the other, those who had moved in either from a previously identified location within the study area or from an unknown location or one outside our communities of interest. The relative frequencies associated with each

form of residential change at the individual scale and that of the household are provided in Table 3.1.

In an analysis of the ecology of disease (viz the effect of environment on health), it is crucial that the population exposed and the duration of exposure be specified before a discussion of the nature of exposure and its effects can meaningfully take place. The results of the census portion of our survey indicate that amongst those followed up (n=1435), fully 16.3 percent experienced some residential change of the sort described above in the twelve months between first census and survey. The dependent variables in our study, as discussed below, relate to total numbers of visits to area health services for all or specific complaints over the entire study period. Given that the denominator population varies through time, we were faced with how to build this dynamic in its various forms into an essentially cross-sectional study. The question is complicated by the fact that we have not been able to capture many of the changes that have occurred, either because the residents of households without children were not surveyed (so we have no post-census check on those 371 households) or because moves took place in periods preceding the census or only temporarily between census and survey (Figure 3.4). Furthermore, apart from the census and survey time checks, we have no indication of when the changes took

**TABLE 3.1     RESIDENTIAL MOBILITY BY LOCALE**

| LOCALE | TOTAL HOMES | TOTAL PEOPLE | # NOT SURVEYED | NO CHANGE | NEW PERSON | NO LONGER PRESENT | PEOPLE UNSTABLE # | PEOPLE UNSTABLE % | HOMES UNSTABLE # |
|---|---|---|---|---|---|---|---|---|---|
| Woodford (main) | 28 | 334 | 144 | 182 | 8 | 0 | 8 | 4 2 | 2 |
| Brooklyn | 22 | 240 | 65 | 137 | 23 | 15 | 38 | 21 7 | 7 |
| Mt Granby | 92 | 341 | 92 | 199 | 23 | 27 | 50 | 20 0 | 10 |
| Clozier | 44 | 458 | 158 | 251 | 27 | 22 | 49 | 16 3 | 10 |
| Plaisance | 8 | 98 | 27 | 57 | 7 | 7 | 14 | 19 7 | 3 |
| River Salee | 39 | 323 | 96 | 203 | 19 | 5 | 24 | 10 6 | 11 |
| Waltham (Central & Estate) | 37 | 285 | 62 | 172 | 24 | 27 | 51 | 22 9 | 15 |
| TOTAL in study area | 214 | 2079 | 644 | 1201 | 131 | 103 | 234 | 100 0 | 58 |
| % of total in study area | 100 | 100 | 31 | 58 | 6 | 5 | 11 | - | 27 |

**FIGURE 3.4      LEFT AND RIGHT CENSORING IN RESIDENTIAL INSTABILITY***
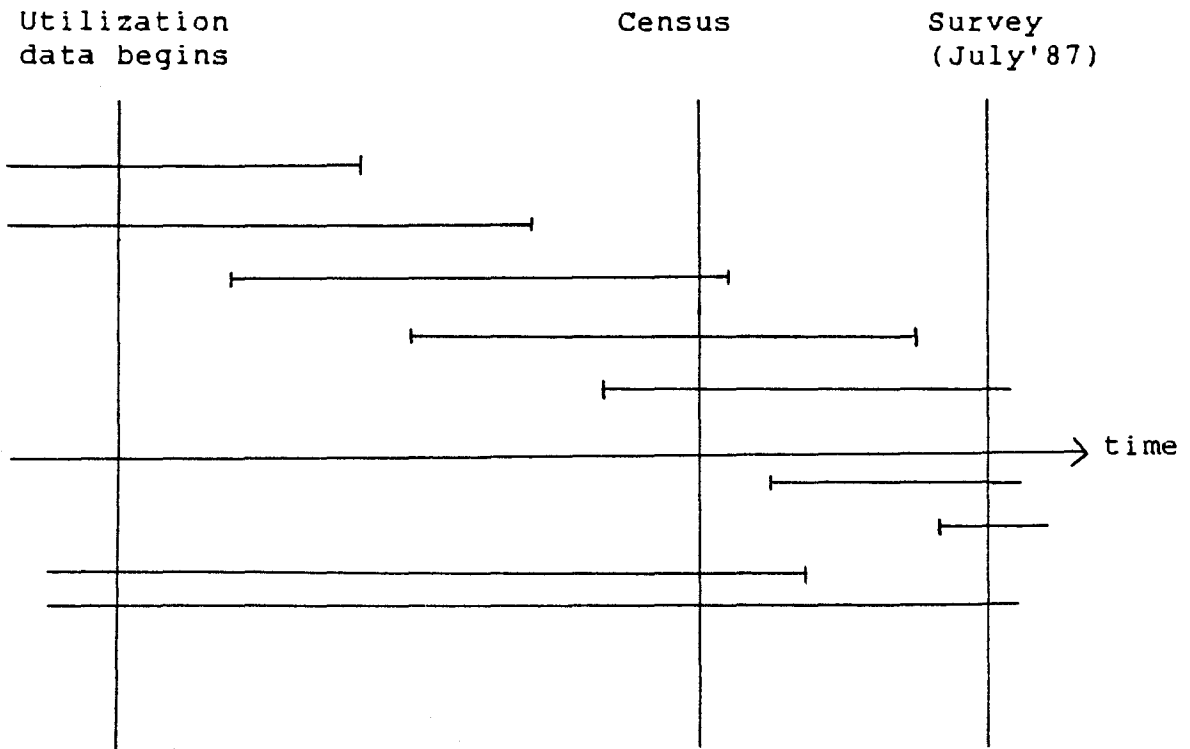


* Each line represents the theoretical residential history of a different study subject

place (except for newborns according to date of birth). This would hamper our ability to weight movers on risk according to length of stay, had this been our desire. That any attempt at compensating for residential instability would affect only a fraction of the study population, and then only on the basis of changes observed in the last twelve months of a two and a quarter year study, begs the question as to whether such manipulation would introduce more bias into the study than would otherwise exist. On the other hand, to treat the population as static is to assume the distribution of residential change to be essentially random.

Despite a laudable concern for using stable populations at risk, it would be unfortunate to ignore unstable households completely, as one might expect them to exhibit rather different characteristics and relationships than stable ones, to say nothing of the loss of information incurred. The more specifically we define our population the smaller are our numbers and the less generalizable the results.

Having considered these issues in the context of a Master's thesis, I have chosen not to define eligibility of cases on this basis, but to include residential instability as an independent variable in a variety of forms and at both the individual and household level. This is covered in

greater detail in the next chapter.

### 3.1.4  Follow-up on difficult cases

A final follow-up check to resolve "outstanding difficult cases" on the census was made late in August of 1987. This concerned members of the user population whom we had every indication (from service use, name and age, word of mouth) were in the community but for whom we still had no fixed address. Again key informants were used, including the staff of a local watering hole, but the marginal returns on our efforts to pinpoint folks who had escaped two previous attempts at circumcision were not encouraging!

### 3.2  The survey

### 3.2.1  Sampling and administration

In July and August of 1987, a team of four researchers (myself included) from Waterloo and McMaster universities conducted a detailed household survey in our five communities with a three-fold purpose in mind: (a) to verify earlier census information and establish the nature and extent of residential instability (as indicated above); (b) to gather information on the nature of the household environment; and (c) to elicit self-reported morbidity for children in the two weeks and three months previous. This was to provide us with the information with which to guage

the influence of household environment on childhood morbidity and on patterns of health service utilization in the communities.

All households that our first census indicated contained children eight years of age or younger (224 in all) were included in the survey in addition to a few (17) subsequently added in the field when it was discovered that children were present. However, 22 of the originally targeted households were shown to no longer contain the residents indicated, or contained children of older ages than anticipated, and were therefore dropped from the survey, leaving a total of 219 surveyed households. Five more were subsequently removed for the purposes of this study since household environment has been matched to residents at the time of the first census and these homes were unoccupied (or nonexistent) at the time. A more 'sophisticated' sampling procedure was not pursued as the number of eligible households was not excessive and it was felt that not going to all households with children would raise questions among residents as to why they had been singled out.

Two teams of two administered the survey with the help of one or two local resident to legitimize our presence and provide guidance in locating the homes we had targeted. We began with the community closest to our place of

residence (Woodford), as our presence was known to many there. It was deemed appropriate to make this community our trial run where our acceptance was the greatest, and, in general, socio-economic and health status were higher than in the other communities. Our impression was that living locally, interacting informally with area residents, and displaying a knowledge of and sensitivity to the local culture as well as arriving with residents' names in hand all greatly improved our acceptance in the communities.

The survey comprised verbal questionnaire and visual observation components. Steps were taken to ensure, as far as reasonably possible, standardization between the two interview teams. The team member with the most local field experience conducted the verbal questionnaire in all but three cases, and daily summary review sessions were held to discuss and iron out discrepancies between the two teams in interview techniques and terminology. Inter-rater reliability tests were conducted before and after the survey period to measure and to educate against marked discrepancies between observers on subjective observation ratings. These tests indicated that, while some discrepancies between observers existed, it remained within marginally acceptable bounds, but (curiously) increased substantially from beginning to end of the survey period.[3] This would be more alarming were it not for the context in

which the tests were conducted: a sense of awkward
artificiality surrounded our attempts to test ratings in new
unfamiliar communities while trying to remain as
inconspicuous as possible.[4] As indicated in the chapter to
follow, no consistently significant relationship existed in
most cases within the body of the survey between rater and
rated environmental variables.

## 3.2.2 Household characteristics

In keeping with the goals of the larger Grenada-
McMaster Child Health Project our choice of variables at the
household level was governed by the results of the earlier
Taylor et al (1986) study and the desire to develop an
efficient and straightforward risk assessment tool for local
use in targeting scarce health resources, as indicated in
chapter two. As such we chose to look at aspects of the
household's behavioral as well as physical environment.

By and large, the household physical environment was
assessed through visual observation by one of the survey
team members. Such factors as household construction
material, condition of dwelling, cleanliness of house and
yard were rated (Appendix B). Information regarding number
of rooms, water supply and kitchen location was solicited
verbally (Appendix A). It was anticipated that these
measures would act as markers of illness and service use,

some being etiologically related to the morbidity in question (water supply) and others acting as proxy measures for health behaviour (cleanliness measures) and socioeconomic status (building material). The nature of their relationships with health services utilization is explored in chapters 4 and 5.

Assessment of the behavioral environment comprised only two relatively easily ascertainable health related practices: those related to the boiling of water and to the breast feeding of young infants. These were solicited directly in the verbal questionnaire. As indicated earlier (Chapter 2), it was felt that a rapid and simple risk assessment tool could not delve into the larger issues of health attitudes and personal hygiene despite their probable relevance to service utilization. The frequencies associated with each variable group are illustrated in Tables 4.5 and 4.6.

### 3.2.3 Self-reported morbidity

Of considerable interest to us was the degree to which the relationships discovered between environment and self reported morbidity in the Taylor et al study would be replicated in our setting, and the extent to which the results would be mirrored when substituting health service utilization over the medium term for short-run self reported

morbidity. Indeed, the relationship between self reported morbidity and service utilization is itself of interest and is explored in greater detail in Chapter 4.

Questions eliciting self reported morbidity directly followed census-related inquiries in the survey questionnaire. Respondents were first asked to comment on the general health of the resident children and to specify any illnesses that had occurred in the past three months. It was necessary to employ Mayday (a national holiday) as a familiar recall cut-point, although surveying spanned several weeks. Respondents were also asked to specify any ailments that had occurred in the previous two weeks. In all cases, reported morbidity was followed up with queries as to whether the child was seen by a doctor or nurse and, if so, the name, place and date was recorded. These questions were repeated to elicit episodes of childhood diarrhoea.

### 3.2.4 Weight for age

In Grenada, every child is issued a health card at birth that is designed (in theory) to record the child's history of service utilization and which includes information on date of birth, weight at birth and so-on. A portion of each child's health card is devoted to tracking weight for age over the first few years of life. As part of

our household survey, the team member compiling observation measures would ask for such cards and record weight for age at several month intervals. These were later converted to percentile scores using C.A.S.P. (CDC Anthropometric Software Package) software. It was anticipated that severe bouts of illness (particularly diarrhoea causing dehydration and weight loss) would be reflected in these scores and that as such they could be used as markers of severity. In practice, however, cards were frequently lost, stored elsewhere (at school for school-aged children) or, when present, had weight for age measures only infrequently recorded. There was also a great deal of confusion in the conversion to metric equivalents, giving rise to some rather unlikely results. Exploratory descriptive work failed to reveal any meaningful patterns with respect to reported morbidities. Therefore, their relationship to service utilization being all the more tenuous, no further use of these measures was made.

## 3.3 Utilization data

### 3.3.1 Data collection

Utilization data were gathered from area medical service records for residents of the five communities spanning a thirty month period from January of 1985 to the end of June 1987. For every visit originating from our

study communities, the location (facility or service code) and date of contact as well as up to two illnesses, symptoms or complaints associated with the visit were transcribed from the medical log books in addition to the name and place of residence (community) of the user. Morbidity was transcribed as recorded and subsequently coded using a customized WONCA (1983) form, to be later aggregated into major disease categories (Appendix C). Matching name and community to computerized census sheets provided the unique personal identifier number to attach to the utilization code numbers before computer entry. In all, 4710 utilization records were entered, one for each individual visit. These were generated by 1435 of the 2079 residents in our study area.

The results of a five percent random sample for coding errors indicate a 2.4 percent error rate in the utilization data. However, this belies complications encountered in the documentation of medical histories in the service logs. While health care staff were generally expected to record both symptom (or complaint) and diagnosis, all too often one or the other was absent (usually the latter was missing and frequently both). Where a visit was made, but no illness specified, or the record was illegible, no coding of complaints was possible, although record was still made of the visit. Therefore,

while overall utilization is relatively accurate, care must be taken in interpreting patterns of morbidity-specific service use. It is unclear to what degree the incompleteness might be morbidity-specific (and therefore biased), however illegibility was more common among Dr. Otway's private practice records.

### 3.3.2  The Grenada health care system

To understand health service use by members of the study communities requires an appreciation of the context in which it is generated. As previously stated, the mandate of the Grenada Ministry of Health, in keeping with earlier PRG (Bishop's People's Revolutionary Government) initiatives, is to provide quality health care to all those in need, free of charge. The organization of state-run medical care has inevitably fostered the growth of a bureaucratic hierarchy subsuming planning, financing and supervisory roles in service delivery. As indicated in Figure 3.5, primary health care is organized at the district level. The western health district, subsuming the parishes of St. Johns and St. Marks, for the duration of the study fell under the supervision of Lydia Joseph (family nurse practitioner) and her primary health care team based in Gouyave (Figure 3.6). The team maintained health stations in Grand Roy, Gouyave, and Victoria. The Florida health centre was declared

FIGURE 3.5     ORGANIGRAMME OF GOVERNMENT OF GRENADA HEALTH CARE DELIVERY SYSTEM



Line of authority
and responsibility

Direct consultation
and advice
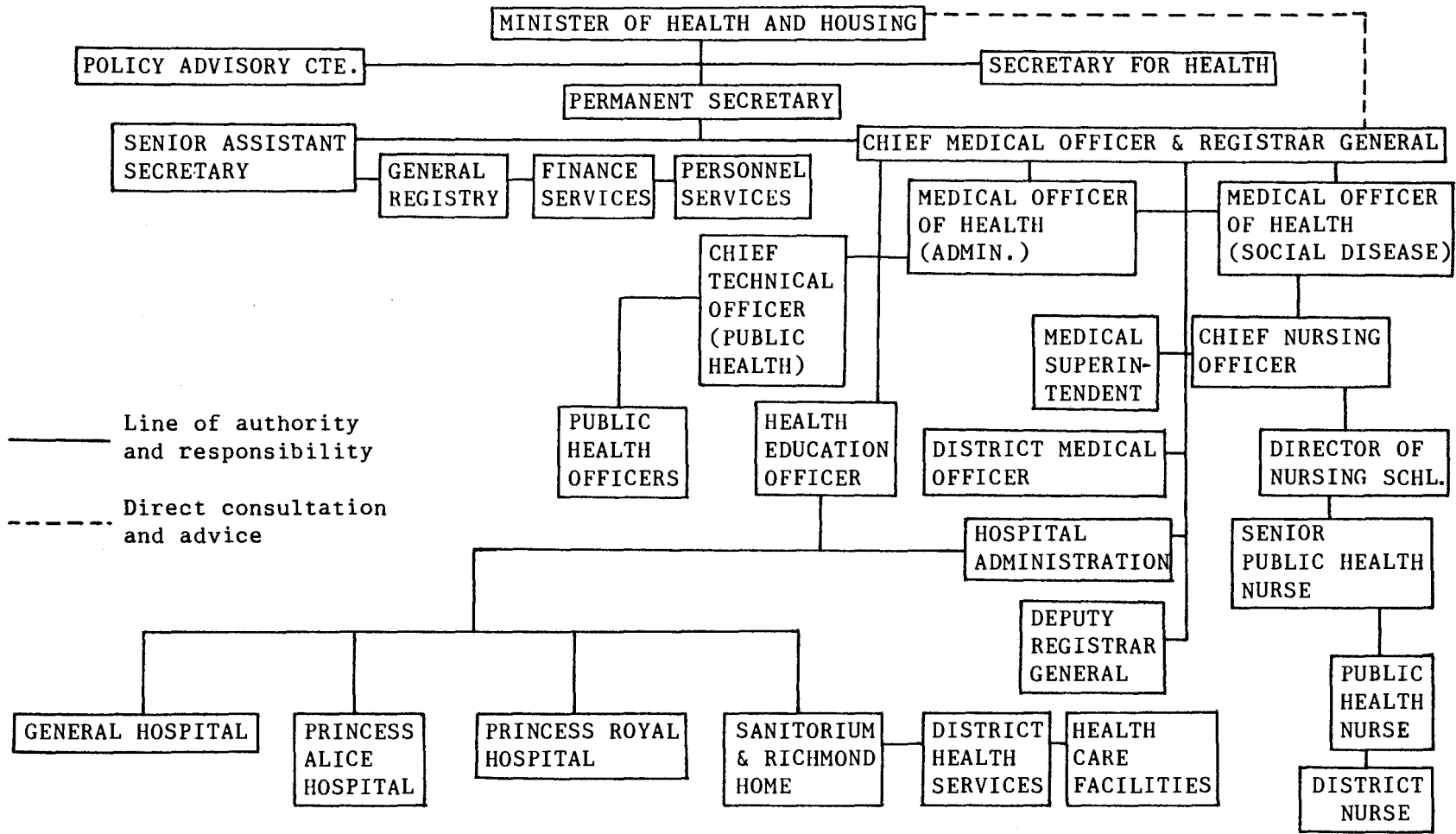
CREDITS TO LILIAN BAYNE

**FIGURE 3.6**     **THE FUNCTIONAL ORGANIZATION OF PRIMARY HEALTH CARE SERVICES IN THE WESTERN DISTRICT, GRENADA**

```
                    ┌─────────────────────────────┐
                    │  DISTRICT HEALTH STATION     │
                    │        (Gouyave)             │
                    └─────────────────────────────┘
                                  │
┌──────────┐                                          ┌──────────┐
│ Victoria │       ┌─────────────────────────┐        │ Florida  │
└──────────┘───────│  AREA HEALTH STATIONS    │────────└──────────┘
┌──────────┐       └─────────────────────────┘        ┌───────────┐
│ Gouyave  │───────           │                    ────│ Grand Roy │
└──────────┘                                           └───────────┘
```

| Dressings/ Nursing records | Weekly DMO clinics | Pediatric clinics | Outreach program |
|---|---|---|---|

```
                         ┌──────────────┐      ┌────────────┐
                         │ general      │      │ well baby  │
                         │ health       │      │ clinics    │
                         │ maintenance  │      └────────────┘
                         └──────────────┘

                         ┌──────────┐          ┌─────────────┐
                         │ weight   │          │ immuniza-   │
                         │ for age  │          │ tions       │
                         └──────────┘          └─────────────┘
```
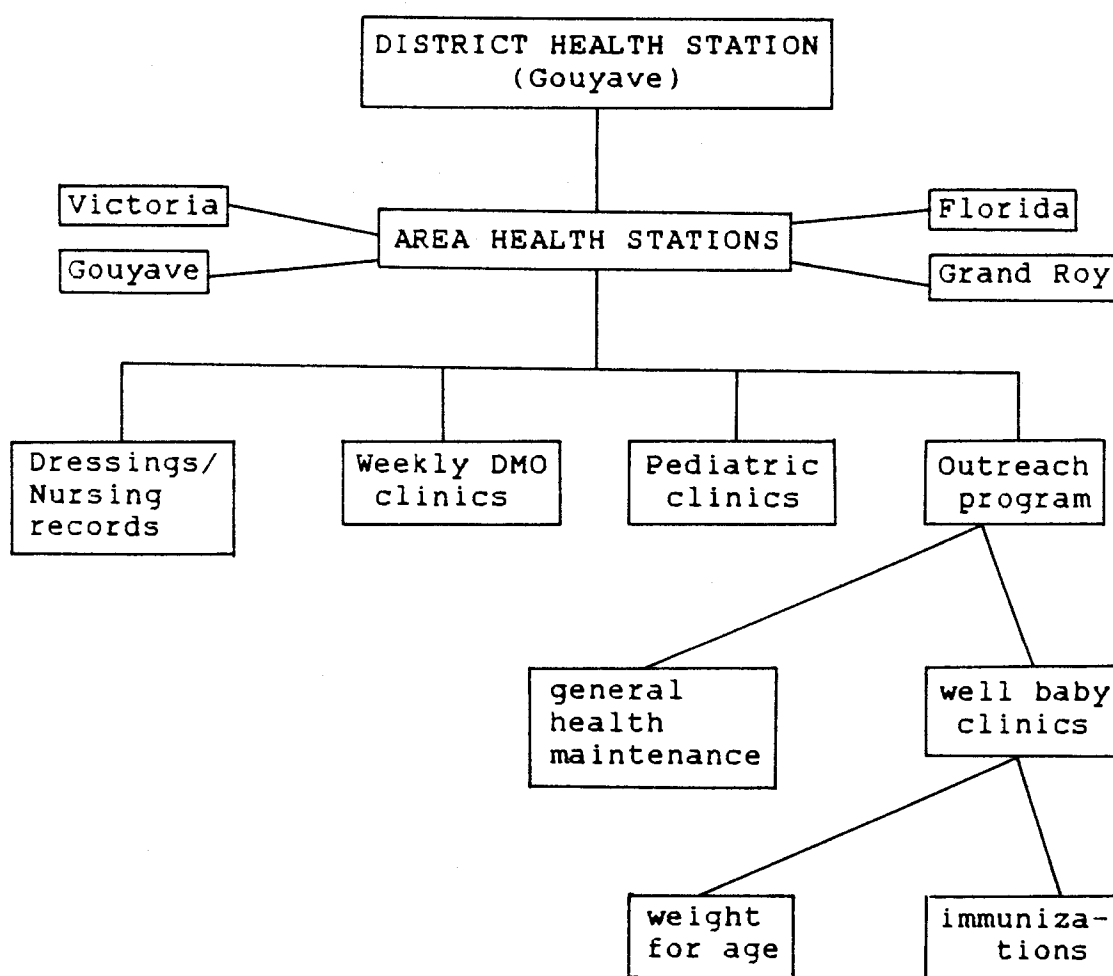
structurally unsound in November of 1986 and was subsequently closed pending construction of a new facility. The centre's staff relocated to Gouyave, which meanwhile assumed responsibility for activities previously based in Florida.

The activities of the primary health care team comprise four types (Figure 3.6), each with different administrative, temporal and spatial boundaries: dressings, regular clinics given by the District Medical Officer, pediatric clinics, and outreach activities. Area health stations are continually staffed and provide dressings for minor wounds on an ongoing basis. These daily nursing records were not included in our analysis of service utilization, so that trauma events are under-represented in our study.

The District Medical Officer (Dr. Otway) provides regular weekly clinics at each of the area health stations. Subjects from our communities generally attended those clinics in closest proximity to their place of residence unless the ailment was deemed sufficiently urgent to travel to an earlier clinic at another centre, to hospital in St. Georges (or Mirabeau St. Andrews for Clozier residents), or to be seen by a private doctor in the area. Records for these contacts remain in the health station in question. DMO clinics accounted for just over 47 percent of the visits

FIGURE 3.7   UTILIZATION BY SERVICE TYPE AS A PROPORTION
OF TOTAL VISITS GENERATED BY STUDY
COMMUNITIES OVER THIRTY MONTHS (N = 4710)



PEDIATRICIAN 1%

DMO CLINICS          47%

35%   PRIVATE DOCTOR

HOSPITAL   OUTREACH

8.15%          8.6%
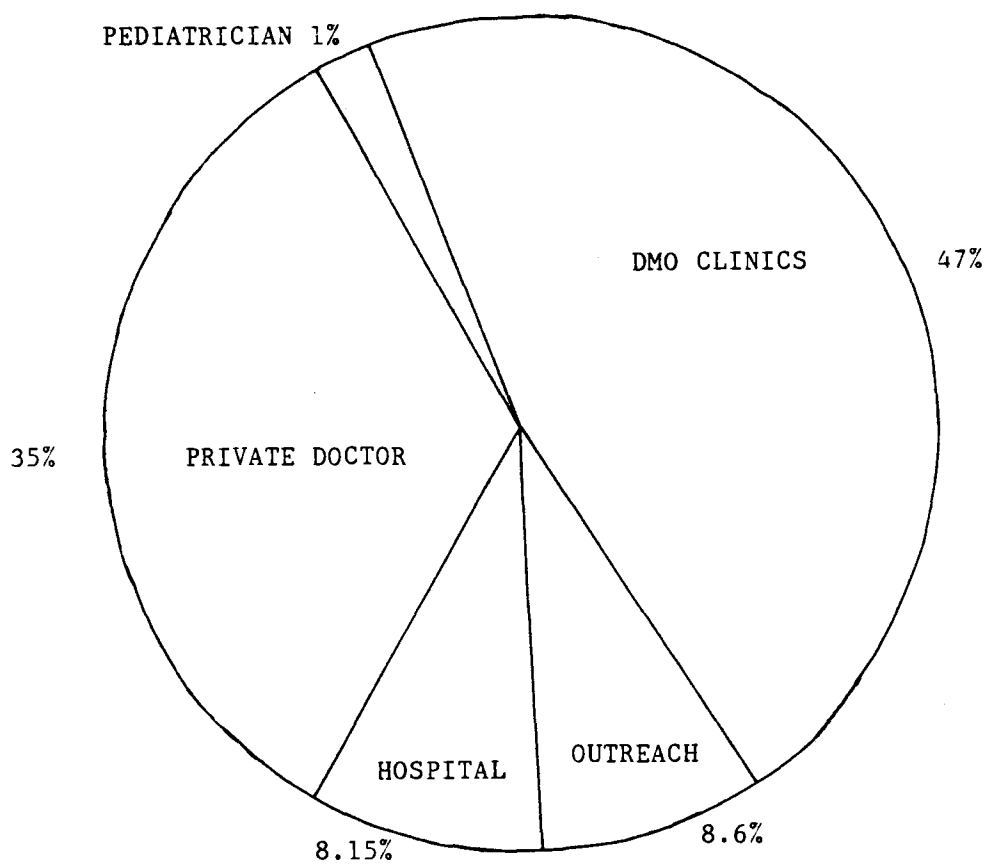
generated by the study population (Figure 3.7).

Pediatric clinics, staffed by a Project Hope (U.S.A.I.D.) doctor based in St. Georges, occur weekly at the district health station in Gouyave. Three percent of all utilization generated by children under eight years of age was seen in these clinics.

Area health stations also conducted outreach programs to surrounding communities (Figure 3.2b), typically on the same last or first day of the week of each month. The contacts generated by these programmes centred on well baby clinics (immunizations and weight for age) and general health maintenance (particularly for chronic morbidities such as hypertension and anemia). Contact information for the former is contained in immunization records and on the health cards of individual children and was not used in this study. Utilization for general health maintenance is recorded on outreach program log books. This information was included in our study and accounted for 8.6 percent of the overall utilization generated by our communities (Figure 3.7). This figure is lower than might be expected largely because of the appropriation for a rabies campaign of the vehicle used for outreach activities in August of 1986 and its subsequent demise in a fatal accident in November of the same year. Outreach programs are no longer regularly scheduled but continue on an ad hoc basis contingent upon

availability of health care staff and transportation. Typically, only management of specific high risk cases has been continued.

In addition, serious cases were referred to the general hospital in St. Georges for more expert and long-term care. Motor vehicle and other accidents and severe infections represented the bulk of hospital cases seen from our area. As a proportion of all visits for health care generated by the study population, 8.15 percent were treated at the hospital in St. Georges (Figure 3.7). Our decision not to include dressing records from area health stations has inflated the relative importance of the general hospital in treating trauma victims (Figure 3.8). A limited number of cases from Clozier surfaced in the Princess Alice hospital in Mirabeau (Figure 3.2b), which as a result of local topography, transportation networks, and traffic patterns is frequently more accessible than the nearest health station in the western district. An increase in such visits in the latter portion of the study period (Figure 3.9) reflects both improved record keeping at the Princess Alice and the aforementioned closure of the medical station in Florida in November of 1986.

Opportunities for medical care outside the state-run system exist through the private offices of doctors in the region. Indeed, district medical officers typically fulfill

**FIGURE 3.8     UTILIZATION BY DISEASE CATEGORY AS A
PROPORTION OF ALL SPECIFIED COMPLAINTS**
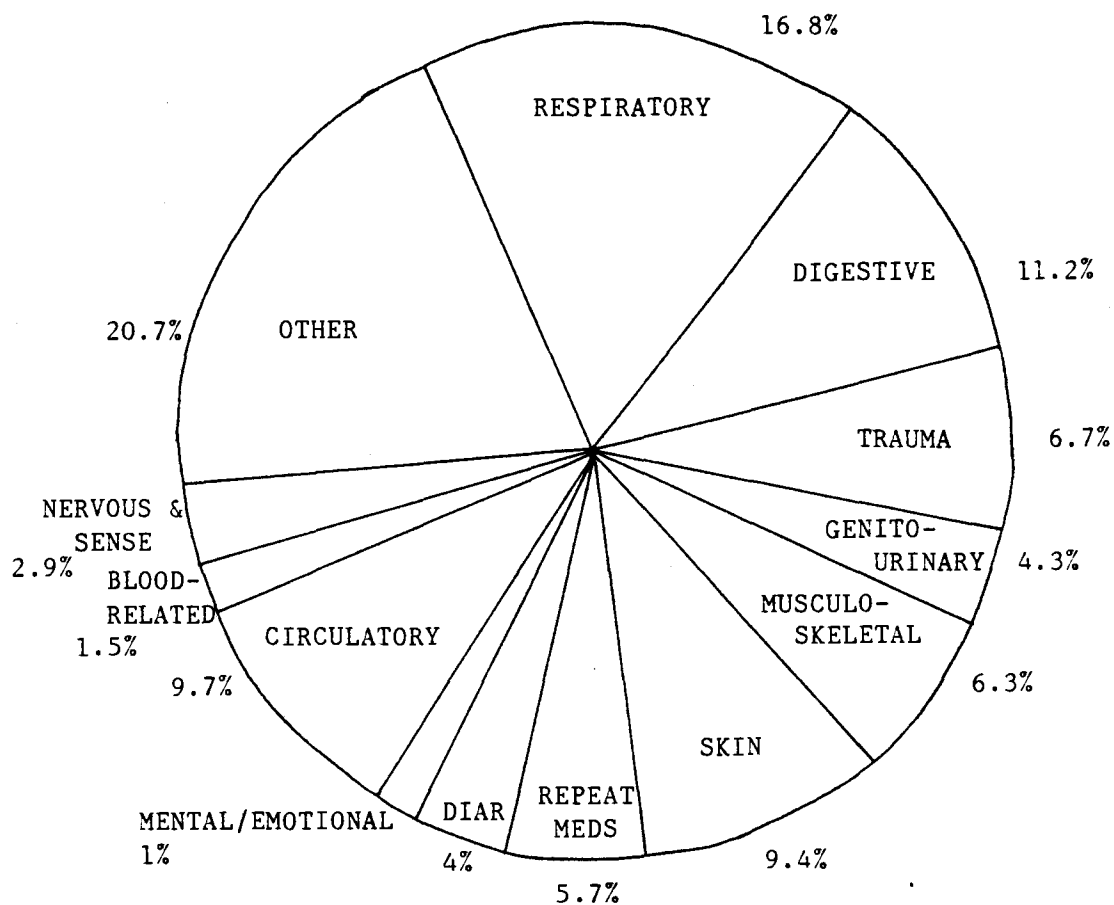


Notes:  (1)  The number of complaints (6000) exceeds the
             number of visits (4710), given that two
             symptoms were recorded in the majority of
             visits. The figure above provides morbidity-
             specific ratios to the total number of
             complaints. Note that 3418 fields (first,
             second or both symptoms) were unlisted.

        (2)  Figures rounded to the nearest tenth.

FIGURE 3.9     SEASONALITY OF UTILIZATION
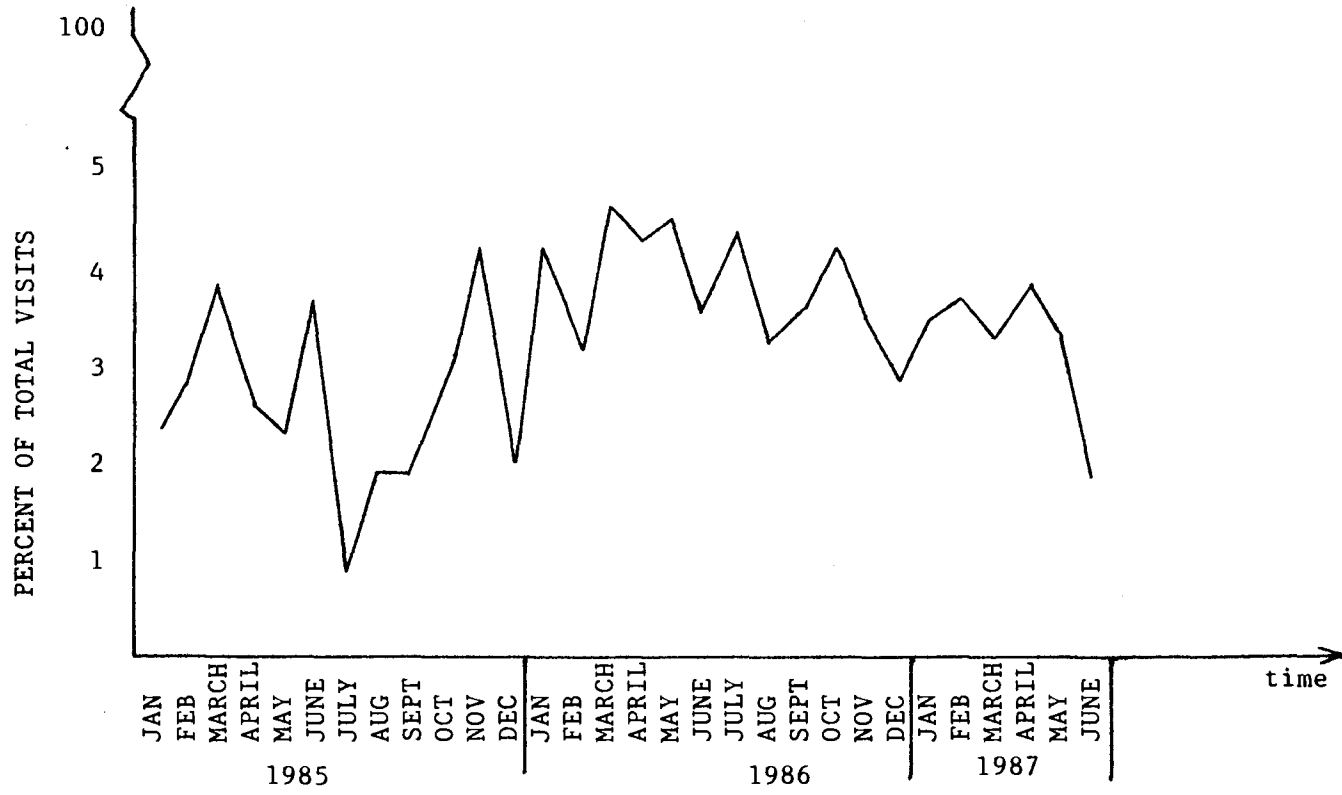
both roles, tending to patients in a public and private capacity. Dr. Otway receives patients at the DMO clinic, in his home, and at his Gouyave office. In addition to an office in Sauteurs, Dr. Varma (the District Medical Officer for a neighboring health district) has recently opened a second office in Gouyave as well as seeing patients in his home near Sauteurs. The general sentiment appears to be that private doctors can provide better and more immediate attention than available through the public system even though the same doctor may be in attendance in both cases. Undoubtedly, the physician is more obliging with his time in a fee-for-service environment.

There also appears to be a small number of residents who use private doctors based in St. Georges. We were not able to obtain medical records from this latter group of physicians, but indications are that these users represent a small minority who are able to afford both the fees and the transportation costs implied.

Apart from limited out of area service use then, our data-base is a reasonably accurate representation of health service utilization by the residents of our communities for non-trauma-related complaints over the thirty month study period.

## 3.4 Locale-specific variables

Both distance to health care facilities and accessibility ratings were assessed at the smallest geographically meaningful scale: that of the locale. Fifteen locales were assigned on the basis of topography, distance, clustering of households, and our intuitive understanding of qualitatively different districts in terms of health status and socio-economic status. These were subsequently collapsed into seven locales to reduce the number of cells created during statistical analysis. Thus upper Brooklyn was separated from the rest of Woodford, and River Sallee from the rest of Waltham. Distance and access measures were still assigned to the smaller geographical units however.

Distance was calculated in kilometers from the centroid of the locale to the nearest permanent health care facility and was measured as road distance as per the odometer readings on a small motorcycle rented for this purpose. Two distance measures were recorded. DIST1 assumes the Florida health station to be closed and thus Clozier and Plaisance residents to be making use of the Gouyave health station. DIST2 on the other hand uses distance to the Florida health station for these residents. [The distinction proved largely unimportant in subsequent analysis although distance itself was shown to be a key

factor in service use]. No attempt was made to compensate for contacts generated by outreach programs in the communities. This reflected the low overall numbers involved, the relatively uniform impact or low suspected bias introduced, and the complexity that we felt would have been involved for low suspected marginal gains.

Accessibility at the level of the locale was rated "average" or "poor" on the basis of (a) topography, particularly slope (crucial for walked stretches); and (b) vehicle traffic volumes (ease of hitching a ride), in other words whether the locale straddled a main road or not. In practice, the two were synonymous in the field (in other words a poor rating in one usually coincided with a poor rating in the other) and thus one ACCESS rating was used. Upper Brooklyn, Plaisance and Mt. Granby were rated "poor" relative to the others. Clozier's proximity to a main road gave it a higher rating, for, despite the incline of the road from Gouyave, the distances involved demanded motorized transportation.

## 3.5 Conclusion

In summary three major sources of information were consulted in this study. A census early in August of 1986 provided locational information for the study population as well as data on individual attributes (age, sex) and

household residential composition.  Follow-up information on those households with children gathered during a household survey in July of 1987 allowed for an assessment of residential mobility among a subgroup of the study population.  The survey also provided information on self-reported morbidity among children up to three months previous and self-reported utilization.  Aspects of the behavioral and physical environment at the household level were assessed during the survey as well.  For the purposes of the current study, these characteristics were imputed to the residents of these homes at the time of the first census rather than to residents at the time of our later survey. This more conservative approach, in the context of mobility within the communities, ensures a reasonable period of exposure to the influence of household environment.

Access to the medical records of area health services provided detailed information on utilization for medical care by the study population during a thirty month period. The coding of these information sets made them compatible at a variety of geographic scales and allowed for an analysis of the role of personal, household and locale-specific characteristics in the use of medical services in our study area.  Related questions as to the relationship between self reported morbidity, self reported utilization and actual utilization could thus also be examined.  It is to these

questions that we now turn our attention in the chapters that follow, first at the bivariate level (Chapter 4) and then in modelling service use on the basis of these results (Chapter 5).

# FOOTNOTES TO CHAPTER THREE

1.  In Plaisance for example 60 percent of the residents (totalling 59, distributed in all 8 households) shared the same three last names (Williams, Charles and Harriman).

2.  Where the absolute differences in age between census (+1) and survey exceeded three years cases were printed out and verified to ensure against mistakes in coding or data entry having taken place. The appropriate changes were made where necessary.

3.  Discrepancies in rating were noted in two of 16 cases in the pretest but seven of the fourteen included in the post-survey test, but without any clearly consistent bias in either case.

4.  In fact three whites wandering down the road, clipboards in hand, gauking at homes and jotting notes would raise an eyebrow or two among any local who could not fail to notice us. Our activities then were not as easily explained as pacifying assertions about surveying for childhood illness.

# CHAPTER 4

## THE ECOLOGY OF UTILIZATION:   A BIVARIATE ANALYSIS

This    chapter    explores    the    relationships    among
personal       characteristics,       household       environment,
accessibility,    and    the    use    of    health    care    services by
individuals and by household units.   In examining the nature
of associations within and among these domains, we also come
to an understanding of the ecology  of the  home environment
as a partially closed system and its influence on the health
and personal decision making of its individual members.   The
hypothesis informing  this research  is that an  individual's
health  arises  in  an    environmental    context    that    cannot be
divorced from his/her experience, and that to a large extent
(subject to variations by age, occupation and health status)
the      home      environment      is      an      integral      and      influential
component of this larger  context  or  environment.    It is
therefore to the ecology of ill-health and of health service
use that we turn our attention.

In this chapter, the results of bivariate analyses of
relationships    between    factor    pairs    are    discussed.    The
chapter opens with a  discussion of  the nature  of measures
employed,      arising      as      they      have      from      the      information

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collected and reported upon in the previous chapter. An overview of statistical methods of analysis follows. Results are discussed in accordance with the scale and domains of analysis as illustrated in Figure 4.1, representing the question space generated by the data set and study objectives.

## 4.1 Choice and coding of variables

### 4.1.1 Outcome measures

It was originally hoped that the disaggregated nature of the data would allow for a longitudinal analysis of service use with respect to personal characteristics, household environment and accessibility over the more than two year study period. However frequencies of utilization were generally low, even at the household level and aggregated over weekly and monthly periods, and it was felt that this would create difficulties in the statistical analysis.[1] Instead utilization was collapsed into individual-specific totals, foreclosing on the possibility of service-specific or time-specific analysis beyond the descriptive summary measures introduced in Chapter 3.

It was, however, considered desirable to preserve the distinction between utilization of services for different morbidities. Given that a maximum of two complaints or diagnoses could be recorded for each visit, and that we had

FIGURE 4.1    BIVARIATE ANALYSIS:  THE QUESTION SPACE

|  | Individual utilization | Household utilization | Self-reported morbidity | Personal characteristics | Household residential composition | Household residential stability | Household physical environment | Household behavioural environment | Accessibility |
|---|---|---|---|---|---|---|---|---|---|
| Individual utilization | * | * | * | * | * | * | * | * | * |
| Household utilization |  | * | H | - | * | * | * | * | * |
| Self-reported morbidity |  |  | H | H | H | - | H | H | - |
| Personal characteristics |  |  |  | * | - | - | - | - | - |
| Household residential composition |  |  |  |  | * | * | * | * | * |
| Household residential stability |  |  |  |  |  | * | * | * | * |
| Household physical environment |  |  |  |  |  |  | * | * | * |
| Household behavioural environment |  |  |  |  |  |  |  | * | * |
| Accessibility |  |  |  |  |  |  |  |  | * |

---

Notes:  (1)  Key:  *  covered in this thesis
                   -  not covered explicitly in this thesis
                   H  covered in Hayes (1988)

little indication as to which represented a "primary" symptom prompting service use, individual-specific utilization totals were generated by treating both as significant and summing over the occurrences of specific morbidities rather than over the number of visits made. Thus, by virtue of treating both symptoms as the probable 'cause' initiating service use, we inflated morbidity-specific utilization totals in absolute terms. However, it is unlikely that their relative importance has been significantly altered in the process, as this depends on the degree of bias present in the initial recording of morbidity types at the time of service use. Meanwhile, overall service utilization totals (irrespective of 'cause') for each individual continue to reflect the actual number of visits made for medical care. To illustrate the distinction a hypothetical case is demonstrated in Figure 4.2.

In the light of their highly skewed nature, utilization variables had to be categorized before bivariate and multivariate analysis could be undertaken. In most cases utilization at the individual level was dichotomized for the presence or absence of use for specific morbidities, repeated utilization for specific complaint types being more the exception than the rule.[2]

Once created, individual morbidity-specific utilization was aggregated to the household level,

**FIGURE 4.2    CALCULATING INDIVIDUAL-SPECIFIC MORBIDITY-SPECIFIC UTILIZATION RATES:**
**A HYPOTHETICAL CASE**

Service use as recorded
for individual X

Morbidity-specific
Service use as calculated
for individual X

| | user ID (indiv. X) service provider & date | |
|---|---|---|
| Visit 1 | | |
| | Morbidity A | |
| | Morbidity B | |

| | user ID (indiv. X) service provider & date | |
|---|---|---|
| Visit 2 | | |
| | Morbidity C | |
| | Morbidity A | |

| MORBIDITY | OCCURENCE |
|---|---|
| service use for morbidity A | 2 |
| B | 1 |
| C | 1 |
| service use for complaints (total # of visits) | 2 |

preserving the distinction between disease categories (Figure 4.3). In an attempt to control for household size, "rates" (or proportions) were derived by dividing the sum of visits made by household members for specific complaints by the number of residents recorded at the time of the first census. Having realized the need to remain sensitive to the distribution of service use within the household, the number of household residents who were responsible for these visits formed the denominator, rather than ascribing visits to household members who were not responsible for their occurrence. It must be conceded that this represents only a marginal improvement, given the inability to distinguish levels of responsibility (magnitude) between users at the household level. In other words, we have correctly identified who is responsible for service use but, in so doing, have had to assume that each household user has contributed equally to the service-dependence of the household as a whole.

In keeping with our earlier discussion, household utilization measures were also categorized to control for their skewed distributions. Category boundaries were chosen so as to preserve their substantive meaning in the light of their frequency distributions. Boundary values, value labels and associated frequencies are shown for individual level and household level utilization measures in Tables 4.1

FIGURE 4.3     THE EVOLUTION OF INDIVIDUAL AND HOUSEHOLD-LEVEL UTILIZATION MEASURES



Specific
cases of
service use

Total period service use
by morbidity for specific
individuals

Period service use by
household members

Household service use ratios:
  1. ratio of household utilization to
     number of household members
  2. ratio of household utilization
     to number of household users
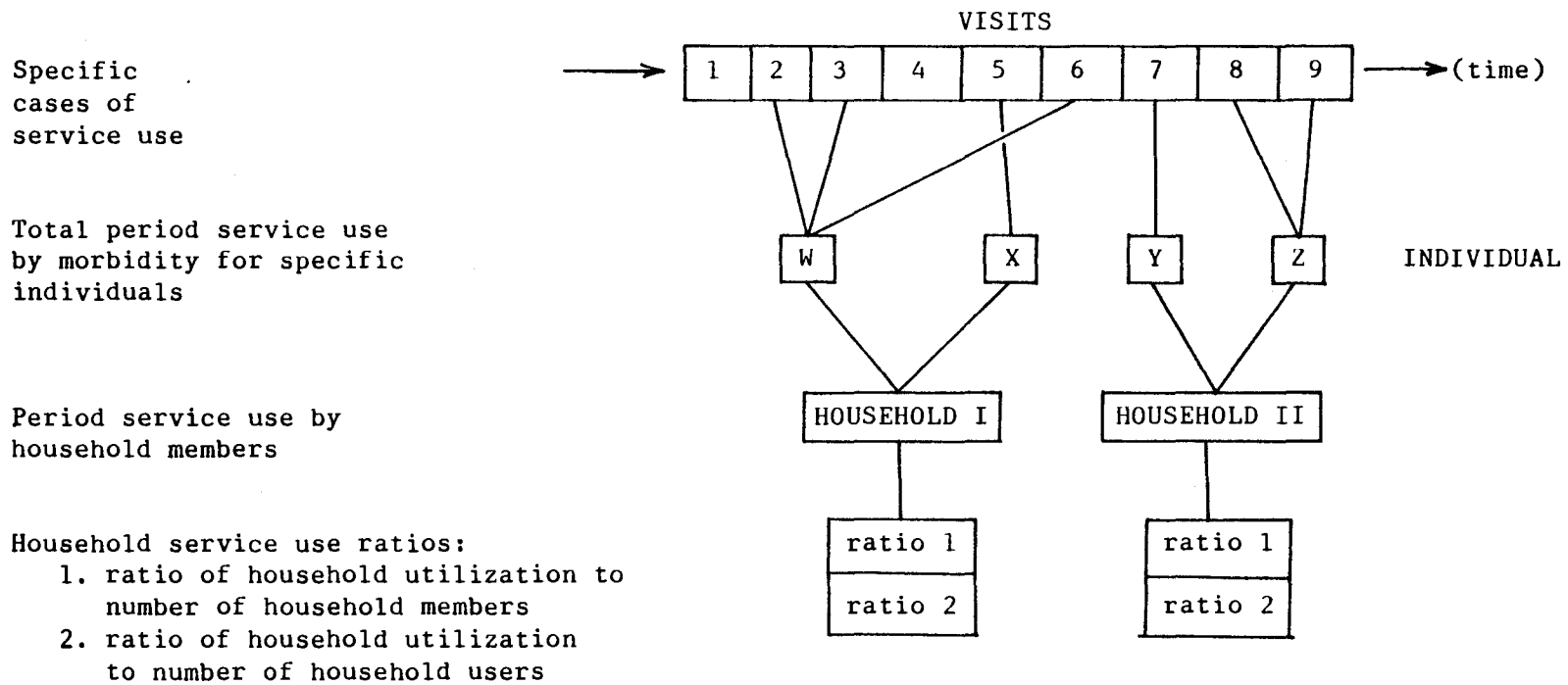
## TABLE 4.1      INDIVIDUAL HEALTH SERVICE UTILIZATION MEASURES

| VARIABLE | VARIABLE LABEL | VALUE | # visits in study period | sample (N=2079) f | % | survey (N=1453) f | % |
|---|---|---|---|---|---|---|---|
| PMORBX | # individual visits in time period (30 months) | 0 | none | 686 | 33.0 | 448 | 30.8 |
| | | 1 | 1 | 419 | 20.2 | 297 | 20.4 |
| | | 2 | 2 | 332 | 16.0 | 239 | 16.4 |
| | | 3 | 3 | 185 | 8.9 | 137 | 9.4 |
| | | 4 | 4 | 129 | 6.2 | 100 | 6.9 |
| | | 5 | 5 | 110 | 5.3 | 79 | 5.4 |
| | | 6 | 6 | 55 | 2.6 | 40 | 2.8 |
| | | 7 | $\geqslant$ 7 | 163 | 7.8 | 113 | 7.8 |
| PMORBX5 | presence or absence of individual use | 0 | none | 686 | 33.0 | 448 | 30.0 |
| | | 1 | $\geqslant$ 1 | 1393 | 67.0 | 1005 | 69.2 |
| PMORBX7 | high versus low use among users | 0 | 1-2 | 751 | 53.9 | 536 | 36.9 |
| | | 1 | $\geqslant$ 3 | 642 | 46.1 | 469 | 32.2 |
| P801X2 | individual use for respiratory | 0 | none | 1536 | 73.9 | 1031 | 71.0 |
| | | 1 | any | 543 | 26.1 | 422 | 29.0 |
| P802X | individual use for digestive | 0 | none | 1633 | 78.5 | 1109 | 76.3 |
| | | 1 | any | 446 | 21.5 | 344 | 23.7 |
| P806X | individual use for skin-rel(d) | 0 | none | 1710 | 82.3 | 1164 | 80.1 |
| | | 1 | any | 369 | 17.7 | 289 | 19.9 |
| P808X | individual use for diarrhoea | 0 | none | 1901 | 91.4 | 1308 | 90.0 |
| | | 1 | any | 178 | 8.6 | 145 | 10.0 |
| P812X | individual use for nervous & sense organ | 0 | none | 1934 | 93.0 | 1342 | 92.4 |
| | | 1 | any | 145 | 7.0 | 111 | 7.6 |
| PIDNVX | individual use for diarrhoea with vomitting | 0 | none | 2022 | 97.3 | 1404 | 96.6 |
| | | 1 | any | 57 | 2.7 | 49 | 3.4 |
| PIDNFX | individual use for diarrhoea with fever | 0 | none | 2063 | 99.2 | 1440 | 99.1 |
| | | 1 | any | 16 | 0.8 | 13 | 0.9 |

**TABLE 4.2        HOUSEHOLD HEALTH SERVICE UTILIZATION MEASURES**

| VARIABLE | VARIABLE LABEL | VALUE | average #visits/ person | survey (N=214) f | % |
|---|---|---|---|---|---|
| HALLMRX | Ratio of total # | 1 | 0-1 | 48 | 22.4 |
|  | visits by all | 2 | 1.01-2 | 66 | 30.8 |
|  | household members | 3 | 2.01-3 | 52 | 24.3 |
|  | to # " residents | 4 | 3.01-4 | 23 | 10.7 |
|  |  | 5 | 4.01-20 | 25 | 11.7 |
| HMR01X | # respiratory in | 0 | none | 46 | 21.5 |
|  | 30 months by all | 1 | .01-.5 | 96 | 44.9 |
|  | household / # of | 2 | .51-1.0 | 42 | 19.6 |
|  | residents in home | 3 | 1.01-10 | 30 | 14.0 |
| HMR02X | # digestive in 30 | 0 | none | 50 | 23.4 |
|  | months by all | 1 | .01-.25 | 65 | 30.4 |
|  | household / # of | 2 | .26-.5 | 59 | 27.6 |
|  | residents in home | 3 | .51-3 | 40 | 18.7 |
| HMR06X | # skin in house- | 0 | none | 76 | 35.5 |
|  | hold / NRES | 1 | .01-.25 | 52 | 24.3 |
|  |  | 2 | .26-.5 | 53 | 24.8 |
|  |  | 3 | .51-3 | 33 | 15.4 |
| HMR08X | # diarrhoea in | 0 | none | 111 | 51.9 |
|  | household / NRES | 1 | any | 103 | 48.1 |
| HMR12X | # nervous & sense | 0 | none | 126 | 58.9 |
|  | organ in home/NRES | 1 | any | 88 | 41.1 |
| HMRDNVX | # diar. & vomitting | 0 | none | 174 | 81.3 |
|  | in household / NRES | 1 | any | 40 | 18.7 |
| HMRDNFX | # diar. & fever in | 0 | none | 201 | 93.9 |
|  | household / NRES | 1 | any | 13 | 6.1 |
| HALMPRX | total household | 1 | 0-2 | 66 | 30.8 |
|  | util / # responsible | 2 | 2.01-3 | 61 | 28.5 |
|  | for them | 3 | 3.01-4 | 48 | 22.4 |
|  |  | 4 | > 4 | 39 | 18.2 |
| HCM01X | # respiratory in | 0 | none | 46 | 21.5 |
|  | household / # re- | 1 | 1-2 | 135 | 63.1 |
|  | sponsible for them | 2 | > 2 | 33 | 15.4 |

and 4.2 respectively.

Noteworthy is the absence of measures for several functional groups introduced in the previous chapter. It was felt that the link between environment as measured and service use for trauma events, repeat meds, muskuloskeletal and mental/emotional complaints would be tenuous at best. Visits for blood-related illness (typically anemias) and circulatory ailments (hypertension, diabetes and so-on as per Appendix C) appear to be limited to a small group of repeat users and were also excluded from further analysis. Service use for the "other" category of complaints were excluded on the grounds that its contents were too diverse to allow for meaningful conclusions when treated as a group. The remaining functional groups (respiratory, digestive, skin-related, diarrhoeal and nervous and sense organ related service use) are in their transmission of a primarily infectious nature.

### 4.1.2 Independent variables

In keeping with Figure 4.1,the independent variables used in this study can be characterized by their scale of measurement and by the aspects of the home environment they capture. Variables measured at the level of the individual include gender, age at the end of study period, and residential stability in the period between census and

survey, as previously indicated in Table 3.1. Meanwhile, four broad aspects of the household environment were examined: residential composition, residential stability, physical environment and behavioural environment (Tables 4.3 to 4.6). Finally, locale-specific accessibility measures were evaluated.

For nominal variables, the number of categories was reduced as far as reasonably possible in anticipation of multivariate logit analyses. The rationale was to reduce the number of cells created to ensure that the models would be as workable and cost-efficient as possible. Categories were collapsed on the basis of the substantive similarities between subgroups and on their relative frequencies.[3] Variables that (a) could be considered continuous in distribution (such as age, number of residents and bedrooms), or (b) were ratio measures, were left at the original scale of measurement.

## 4.2  Statistical methods

Statistical tests are employed to determine the probability that observed differences between samples (grouped on the basis of variable categories or values) exceed a level attributable to chance alone. Significance levels are commonly set _a priori_ to decide the degree of difference necessary to reject the null hypothesis of no

**TABLE 4.3     MEASURES OF HOUSEHOLD RESIDENTIAL COMPOSITION**

| VARIABLE | VARIABLE LABEL | MIN/MAX | DISTRIBUTION |
|---|---|---|---|
| ACOMP2 | ratio of children to adult females | min = .25<br>max = 6 * | $\leqslant$ 1 / aF = 40%<br>$\geqslant$ 2 / aF = 25% |
| NRES | # of residents in household (at time of first census) | min = 2<br>max = 20 | $\leqslant$ 4 = 26.7%<br>$\geqslant$ 8 = 35.5% |
| NRES1 | # of children in household (< 8 y.o) | min = 1<br>max = 10 | $\leqslant$ 2 = 65.0%<br>$\leqslant$ 4 = 93.5% |
| NRES2 | # of teenagers in home (9 - 15 y.o) | min = 0<br>max = 6 | 0 = 43.0%<br>1 = 26.0%<br>2-3 = 29.0% |
| NRES3 | # of adults (16 - 44 y.o.) | min = 0<br>max = 11 | 0-1 = 19.9%<br>2 = 37.0%<br>$\geqslant$ 4 = 26.6% |
| NRES4 | # of middle-aged in home (45 - 59 y.o.) | min = 0<br>max = 2 | 0 = 64.5%<br>1 = 29.0%<br>2 = 6.5% |
| NRES5 | # of elderly in home (60+ y.o.) | min = 0<br>max = 2 | 0 = 77.6%<br>1 = 19.6%<br>2 = 2.8% |
| NOM | # of older men in home (adult or middle-aged) | min = 0<br>max = 8 | 0 = 19.2%<br>1 = 45.3%<br>2 = 21.0%<br>3 = 9.3% |

Notes:   (1)   Note that in 5.1 percent of households no adult females were present, precluding the calculation of ACOMP2 for those homes. [Instead a default number of 20 was asigned in these cases to avoid their rejection in multivariate analyses due to missing values.]

**TABLE 4.4      MEASURES OF HOUSEHOLD RESIDENTIAL STABILITY**

| VARIABLE | VARIABLE LABEL | DISTRIBUTION |
|---|---|---|
| HHMOVERS | household residential stability (no change versus any change from first census to survey) | 0:  72.9%<br>1:  27.1% |
| NOCHG | # stable household members (no residential change from census to survey) | < 2 = 23.0%<br>3-4 = 39.0%<br>5-6 = 24.0%<br>> 7 = 14.0% |
| NEWP | # new persons in home since census | 0 = 78.0%<br>1 = 19.2%<br>> 2 =  2.8% |
| NEWH | # movers out of home during interim between census and survey | 0 = 93.0%<br>> 1 =  7.0% |
| NPR | ratio of NEWP to NOCHG | |
| HHCR | ratio of any change to NOCHG | 0 = 72.4% |

---

Notes:   (1)   Note that N = 214 households.

**TABLE 4.5       MEASURES OF HOUSEHOLD PHYSICAL ENVIRONMENT**

| VARIABLE | VARIABLE LABEL | VALUE | VALUE LABEL | f | % [i] |
|---|---|---|---|---|---|
| HHMATLX2[a] | building material | 1 | any board | 154 | 73.3 |
| | | 2 | concrete | 56 | 26.7 |
| HHWS1X[b] | primary water supply | 1 | piped[j] | 158 | 74.5 |
| | | 2 | other[k] | 54 | 25.5 |
| HHRMS[c] | # bedrooms | – | min = 1 (55) max = 7 (1) | | |
| YCLEAN[d] | cleanliness of yard | 1 | clean | 76 | 36.9 |
| | | 2 | avg. or dirty | 47 | 63.1 |
| HHCLEAN[e] | cleanliness of house (interior) | 1 | clean | 71 | 60.2 |
| | | 2 | avg. or dirty | 47 | 39.8 |
| HHCOND[f] | physical condition of dwelling | 1 | good | 93 | 44.7 |
| | | 2 | average | 81 | 38.9 |
| | | 3 | poor | 34 | 16.3 |
| HHKITCH[g] | type of kitchen | 1 | covered | 198 | 94.7 |
| | | 2 | uncovered | 11 | 5.3 |
| TOIL[h] | toilet type (cadastral survey) | 1 | septic tank | 25 | 18.5 |
| | | 2 | pit latrine | 110 | 81.5 |

Notes:  (a)  missing cases = 4        (b)  missing cases = 2
         (c)  missing cases = 5        (d)  missing cases = 8
         (e)  missing cases = 96       (f)  missing cases = 6
         (g)  missing cases = 5        (h)  missing cases = 79

         (i)  percent of total specified (excluding missing cases)
         (j)  public standpipe or piped into home
         (k)  includes river, roof and reservoir

**TABLE 4.6     MEASURES OF HOUSEHOLD BEHAVIOURAL ENVIRONMENT**

| VARIABLE | VARIABLE LABEL | VALUES | VALUE LABEL | f | %[a] |
|---|---|---|---|---|---|
| HHBOIL | water boiling practices | 1 | always | 61 | 29.5 |
|  |  | 2 | sometimes | 37 | 17.9 |
|  |  | 3 | never | 109 | 52.7 |
| HHBREAST | were any children breastfed? | 1 | yes | 70 | 41.4 |
|  |  | 2 | no | 99 | 58.6 |

Notes: (a) Percentages listed as proportions of the total eligible cases. In the case of HHBOIL, 7 households had missing values; 45 had missing values on HHBREAST.

significant difference.

Parametric tests such as t and F tests assume scores are drawn from a normally distributed population and are so constructed (based on means) as to demand numeric (interval or ratio) data that are homoskedastic and independent one from the other (Seigel, 1956). While there is no general agreement as to what constitutes a slight (and therefore presumably permissible) violation of these assumptions (Seigel, 1956) it is clear that the degree of skew present in our utilization measures required the use of non-parametric tests. Non-parametric tests make no assumptions as to the distribution of values, but rather work with their rankings (medians). Depending on the specific test and sample size, their power and efficiency is comparable to, if marginally lower than, that of parametric tests.[4]

The choice of specific non-parametric test is governed largely by the scale of measurement of the variables being examined, and to a lesser degree on the basis of power and power-efficiency within these confines. Figure 4.4 illustrates the usual tests of choice under these conditions. Notice that all continuous measures are treated as ordinal in these tests. Where categorical variables represented rankings along a single scale (such as cleanliness), they were treated as ordinal. Otherwise, measures involving classification between mutually exclusive

**FIGURE 4.4**     **CHOICE OF STATISTICAL TESTS
AS A FUNCTION OF LEVEL OF MEASUREMENT**

|  | ORDINAL | NOMINAL 2 | NOMINAL > 2 |
|---|---|---|---|
| ORDINAL | A | B | C |
| NOMINAL 2 categories | B | D | E |
| > 2 categories | C | D | E |

---

Notes: Tests employed:

(A)   Spearmans Rank Order Correlation
(B)   Mann-Whitney U Test
(C)   Kruskal-Wallis Test
(D)   Chi-Square Test
(E)   Chi-Square Test   (multiple categories)

categories were treated as nominal level data (presence or absence of specific characteristics, or locale, water supply type and so-forth).[5]

Within the context of the statistical software package employed for the bivariate analysis (SPSSX), observations with missing values on either variable were excluded from the analysis. Occasionally the number of cases excluded was sufficiently high as to throw the generalizability of our results into doubt. Our failure to assess household cleanliness in 96 of 214 cases, for instance, raises serious questions as to the representativeness of our findings along this dimension. The examination of toilet type was similarly affected (79 cases missing from cadastral survey reports). Furthermore, where the missing values in each case pertained to different observations, the number subsequently included in the analysis would be smaller still.

In the descriptive tables discussed below, the range of the level of significance of the relationship was recorded for each paired analysis. Three boundary significance levels were chosen for reporting purposes: p values under 0.1 (C), 0.05 (B), or 0.01 (A). Bracketed letters indicate levels of significance achieved only under 1-tailed tests, the next lower level having been observed in a 2-tailed test of significance. The less conservative

first interval (0.05<p<0.1) was included on the grounds that this was an exploratory analysis intended to probe for likely relationships to be included in subsequent multivariate analysis. However, bracketed symbols at this level of significance - extending as far as p<0.2 on 2-tailed tests - should be ignored for obvious reasons. The direction of significant relationships depended largely on the manner in which variables were coded. Table 4.11 has therefore been provided to summarize key associations in the ecology of the home environment. Otherwise, the reader is referred to the appropriate section of this chapter for a discussion of the most relevant associations.

## 4.3 Relationships among utilization measures

Our results indicate that, with very few exceptions, increased utilization for one complaint is associated with higher service use for other illnesses (Table 4.7).

By and large the exceptions were observed for the use of services where diarrhoea with comorbidities (fever or vomiting) were recorded. This may have resulted from the relatively small number of visits of this type. I also believe that the consistency of service providers in detecting, and particularly in recording, comorbidities for diarrhoea is generally low, and that the unpredictable bias introduced is responsible for the more limited associations

TABLE 4.7     RELATIONSHIPS AMONG UTILIZATION MEASURES

| | Household utilization — ratio 1 | | | | | | | | ratio 2 | | Individual utilization | | | | | | | |
| | All visits | Respiratory | Digestive | Skin-related | Diarrhoea | Nse/sse organ | Diar. & Vom. | Diar. & Fever | All visits | Respiratory | All visits | Respiratory | Digestive | Skin-related | Diarrhoea | Nse/sse organ | Diar. & Vom. | Diar. & Fever |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Household utilization** | | | | | | | | | | | | | | | | | | |
| **(a) ratio 1** | | | | | | | | | | | | | | | | | | |
| All visits | A | A | A | A | A | A | A | A | A | A | | | | | | | | |
| Respiratory | A | A | A | A | A | A | A | B | A | A | | | | | | | | |
| Digestive | | | A | A | A | B | C | | A | A | | | | | | | | |
| Skin-related | | | | A | A | - | - | | A | A | | | | | | | | |
| Diarrhoea | | | | | B | A | A | | A | A | | | | | | | | |
| Nse/sse organ | | | | | | - | C | | A | A | | | | | | | | |
| Diar. & Vom. | | | | | | | - | | B | C | | | | | | | | |
| Diar. & Fever | | | | | | | | | | A | | | | | | | | |
| **(b) ratio 2** | | | | | | | | | | | | | | | | | | |
| All visits | | | | | | | | | | | | | | | | | | |
| Respiratory | | | | | | | | | | | | | | | | | | |
| **Individual utilization** | | | | | | | | | | | | | | | | | | |
| All visits | A | A | A | A | A | A | A | A | A | A | A | A | A | A | A | A | A | A |
| Respiratory | A | A | A | A | A | A | A | A | A | A | | A | A | A | A | A | A | A |
| Digestive | A | A | A | A | A | A | B | - | A | A | | | A | A | A | A | A | A |
| Skin-related | A | A | A | A | A | A | - | - | A | A | | | | A | A | A | A(A) | |
| Diarrhoea | A | A | A | A | A | B | A | A | A | A | | | | | A | A | A | |
| Nse/sse organ | A | A | A | A | B | A | - | (B) | A | B | | | | | | (C | A) | |
| Diar. & Vom. | A | A | B | - | A | - | A(A) | | A | A | | | | | | | | |
| Diar. & Fever | A | B(C) | - | A(C) | - | A | | | (B | C) | | | | | | | | |

Notes: (1)  Key:     A        p<.01

B    .01<p<.05

C    .05<p<.10

( )   above level of significance achieved on 1-tailed test only

−    none of the above levels of significance achieved

with other service use. In any case, one would also expect the presence or absence of service use to react differently when the added dimension of severity is included (as expressed in the association of recorded morbidities within service use events).

Two underlying processes may account for the degree of relationship observed between utilization measures. On the one hand, one might suppose that frequent users are simply more susceptible to illness, or live in more physically stressful environments: in short an etiological or biological link is suspected; that these users are indeed more ill. On the other hand, predisposition to service use may be what characterizes more frequent users. In that case, one would expect a socio-economic bias among the user population (as discussed in Chapter 2). In all likelihood both factors (and doubtless unmeasured others) contribute to the patterns observed. To adequately tease out the effects of each would require both objective measurement of actual health status and an assessment of health beliefs and attitudes to western-style health care. Alternatively, a viable substitute might involve determining the severity of complaints seen. A systematic difference between population subgroups in the severity of complaints brought for medical attention would lend support to the hypothesis that predisposal to service use constituted the primary force

distinguishing high from low users.

From a health planning perspective, whether frequent service use represents abnormal risk (morbidity) or predisposition, it ought nonetheless to be theoretically possible to designate appropriate interventions to foster 'optimal' service use by either reducing actual morbidity or service dependence among these groups.

## 4.4   Self-reported morbidity and utilization

The reliability of self-reported health information is much debated in the health sciences, although it is beyond the purview of this thesis to on comment these issues in detail. The theoretical relationships between illness, utilization and self-reported information is illustrated in Figure 4.5. Of particular interest for this study, is the potential shortfall between true morbidity and utilization, and what constitutes the system's definition of 'appropriate' utilization.

Table 4.8 shows the degree of incongruence between self-reported morbidity and reported utilization. Further analysis by Hayes (1988) indicates that over 17 percent of households reporting service use within the previous three months provided inaccurate information. In a further 60 percent of cases no indication of service use of any kind could be substantiated in the medical records (op.cit.).

**FIGURE 4.5     ILLNESS, UTILIZATION AND SELF-REPORTED MORBIDITY**



UTILIZATION                    ILLNESS

using but          ill and          ill but
not ill            using            not using

SELF-REPORTED                SELF-REPORTED
UTILIZATION                  MORBIDITY

Legend

"inappropriate"
utilization

"appropriate"
utilization

under-utilization

---
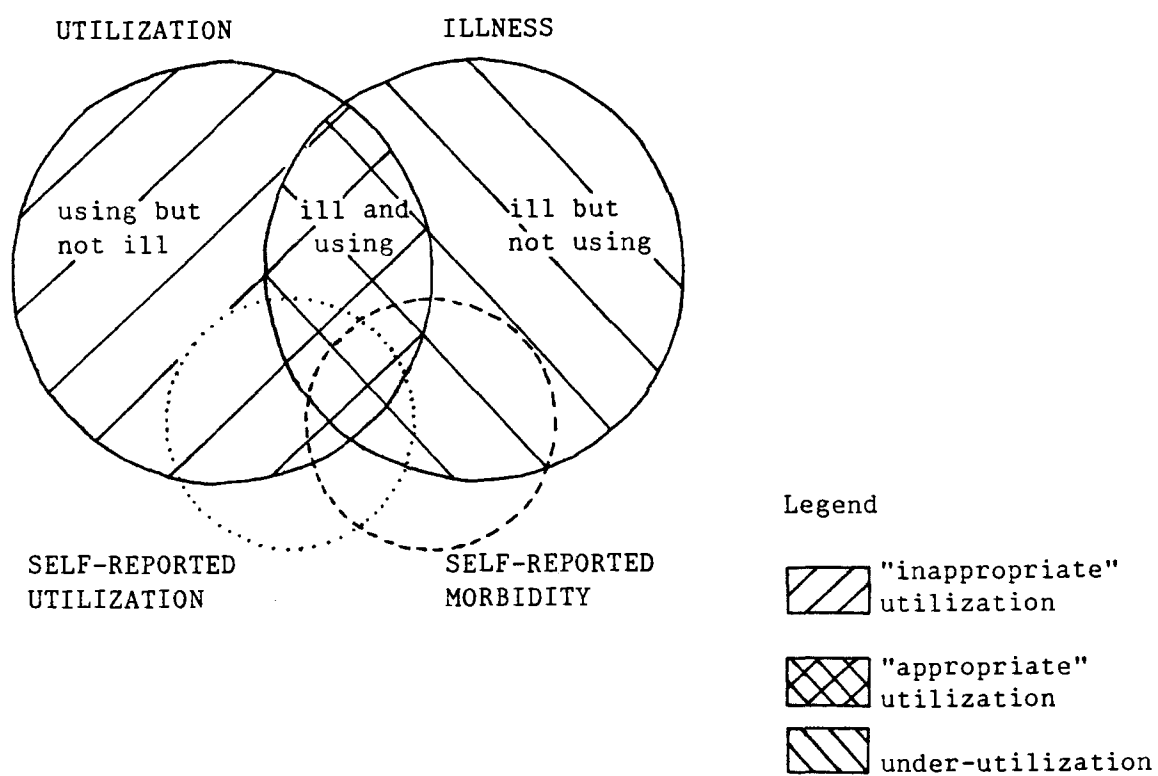
**Notes:**   (1)   The relative sizes of the circles are purely
                   hypothetical

           (2)   See also Table 4.8

**TABLE 4.8**     **SELF-REPORTED MORBIDITY, REPORTED AND ACTUAL SERVICE USE**

| | (a) self-reporting | reported utilization | | | (a-d) |
|---|---|---|---|---|---|
| | | (b) serviced out of area | (c) serviced in area | (d) total (b+c) | |
| Diarrhoea | 59 | 4 | 32 | 36 | 23 |
| Other morbidities | 215 | 43 | 75 | 118 | 97 |
| TOTAL (all morbidity) | 274 | 47 | 107 | 154 | 120 |

Notes:   (1)   Units are individual events recalled over the previous two weeks and three months

         (2)   Best estimate (precise figures unavailable)

Source:   Hayes (1988)

While incompleteness in the records may be partially responsible, this alarming asymetry appears to bode poorly for the accuracy and completeness of self-reported health information.

## 4.5 Multicollinearity: the complex ecology of the field environment

Tables 4.10 and 4.11 summarize the associations uncovered among aspects of the home environment in all the domains examined: those of household residential composition, residential stability, physical and behavioural environment and accessibility to health care facilities. In light of the difficulty in gauging the precise nature of these relationships from Table 4.10, Table 4.11 has been prepared to summarize those of primary interest in the context of this study. These are discussed more fully below as we examine the role of household environment in service use.

Relationships between individual characteristics were observed to vary between age groups (Table 4.9). Among children, residential change between census and survey was concentrated among the youngest in the group, confirming that the bulk of newcomers in this period were in fact newborn infants. Among adults, stable residents were generally older, mobility being therefore more prevalent among the young. There would also appear to be more older

## TABLE 4.9      ASSOCIATIONS BETWEEN INDIVIDUAL CHARACTERISTICS

|  | All ages | | | Children | | | "Adults" | | |
|---|---|---|---|---|---|---|---|---|---|
|  | SEX | FAGE | PMVRX | SEX | FAGE | PMVRX | SEX | FAGE | PMVRX |
| **All ages** | | | | | | | | | |
| SEX |  | (C) | B | | | | | | |
| FAGE |  |  | A | | | | | | |
| PMVRX | | | | | | | | | |
| **Children** | | | | | | | | | |
| SEX | | | | | – | (B) | | | |
| FAGE | | | | | | A | | | |
| PMVRX | | | | | | | | | |
| **Adults** | | | | | | | | | |
| SEX | | | | | | | B | – | |
| FAGE | | | | | | | | | (B) |
| PMVRX | | | | | | | | | |

Notes: (1) Key:
     A   $p < .01$
     B   $.01 < p < .05$
     C   $.05 < p < .10$
     () above level of significance achieved on 1-tailed test only
     – none of the above levels of significance achieved

TABLE 4.10     THE ECOLOGY OF THE HOME ENVIRONMENT

Column groups: **Household Residential Composition** (ACOMP2, NRES, NRES1, NRES2, NRES3, NRES4, NRES5, NOM) · **Household Residential Stability** (HHMOVERS, NOCHG, NEWP, NEWH, NPR, HHCR) · **Household Physical Environment** (HHMATLX2, HHWS1X2, HHRMS, YCLEAN, HHCLEAN, HHCOND, HHKITCH, TOIL) · **Household Behavioural Environment** (HHBOIL, HHBREAST) · **Accessibility** (DIST1, DIST2, ACCESS)

| | ACOMP2 | NRES | NRES1 | NRES2 | NRES3 | NRES4 | NRES5 | NOM | HHMOVERS | NOCHG | NEWP | NEWH | NPR | HHCR | HHMATLX2 | HHWS1X2 | HHRMS | YCLEAN | HHCLEAN | HHCOND | HHKITCH | TOIL | HHBOIL | HHBREAST | DIST1 | DIST2 | ACCESS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ACOMP2 | | (B) | A | (C) | A | A | - | A | - | (B) | - | A | - | (C) | A | (C) | A | A | (A) | A | - | (A) | - | B | - | - | - |
| NRES | | | A | A | A | A | (B) | A | (C) | A | A | - | - | (C) | (C) | - | A | - | (B) | - | - | - | - | - | (B) | (C) | - |
| NRES1 | | | | - | A | - | (B) | - | A | A | B | A | (B) | A | A | A | - | (B) | (B) | A | - | A | - | A | - | - | (C) |
| NRES2 | | | | | C | (A) | - | - | B | A | - | B | B | B | - | - | (C) | (A) | - | (C) | - | - | - | - | - | - | - |
| NRES3 | | | | | | A | - | A | (C) | A | (A) | - | (C) | (C) | A | (C) | A | B | (A) | (A) | - | - | (C) | - | (B) | (C) | - |
| NRES4 | | | | | | | (C) | A | - | A | B | B | - | - | A | - | A | (C) | A | A | (B) | - | - | (B) | - | - | - |
| NRES5 | | | | | | | | - | - | - | - | (C) | - | - | (C) | - | A | - | - | - | - | - | - | - | (C) | (B) | - |
| NOM | | | | | | | | | - | A | (B) | - | - | - | A | (C) | A | - | (A) | A | (C) | - | (B) | - | (A) | B | - |
| HHMOVERS | | | | | | | | | | B | A | A | A | A | - | - | - | (C) | - | (B) | - | - | (A) | (B) | - | - | - |
| NOCHG | | | | | | | | | | | - | B | A | A | - | - | A | - | - | - | - | - | - | - | - | - | - |
| NEWP | | | | | | | | | | | | A | A | | - | - | - | (C) | - | - | - | - | (A) | (C) | - | - | - |
| NEWH | | | | | | | | | | | | | A | A | - | - | (C) | - | B | (B) | - | - | - | - | - | (C) | - |
| NPR | | | | | | | | | | | | | | A | - | - | (B) | - | - | (C) | - | - | A | (C) | (C) | (C) | - |
| HHCR | | | | | | | | | | | | | | | - | (C) | (B) | (C) | - | (B) | - | - | A | B | (C) | (C) | - |
| HHMATLX2 | | | | | | | | | | | | | | | | (C) | A | A | (A) | A | (C) | A | - | - | B | A | B |
| HHWS1X2 | | | | | | | | | | | | | | | | | A | A | (A) | A | - | - | - | (A) | A | A | - |
| HHRMS | | | | | | | | | | | | | | | | | | (B) | A | A | A | | - | - | A | A | (B) |
| YCLEAN | | | | | | | | | | | | | | | | | | | A | A | - | A | (C) | - | - | - | A |
| HHCLEAN | | | | | | | | | | | | | | | | | | | | A | A | - | (C) | - | - | - | - |
| HHCOND | | | | | | | | | | | | | | | | | | | | | A | A | (B) | - | (C) | - | - |
| HHKITCH | | | | | | | | | | | | | | | | | | | | | | - | - | - | - | - | - |
| TOIL | | | | | | | | | | | | | | | | | | | | | | | (B) | - | (C) | B | - |
| HHBOIL | | | | | | | | | | | | | | | | | | | | | | | | A | - | - | - |
| HHBREAST | | | | | | | | | | | | | | | | | | | | | | | | | - | - | (A) |
| DIST1 | | | | | | | | | | | | | | | | | | | | | | | | | | | A |
| DIST2 | | | | | | | | | | | | | | | | | | | | | | | | | | | A |
| ACCESS | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Legend

A       p<.01

B       .01<p<.05

C       .05<p<.10

-       none of the above levels of significance achieved

( )     above level of significance achieved on 1-tailed
        test only, the next lower level on a 2-tailed test

TABLE 4.11    KEY ASSOCIATIONS IN THE ECOLOGY OF THE HOME ENVIRONMENT

| | Greater # of residents | Large # of children | Concrete construction | Larger physical size (# bedrooms) | Cleaner yards | Cleaner interiors | Greater tendency to boil their drinking water | Breastfeeding of children |
|---|---|---|---|---|---|---|---|---|
| Larger # of children | | | | | | x | | x |
| Larger # of "stable" residents | x | x | | | | | | |
| Larger # of new residents (incl. babies) | x | | | | | | | |
| Larger # of adults | | | | | | | | |
| Smaller # of children | | | | | x | | | |
| Fewer elderly | | x | | | | | | |
| Concrete construction | x | x | | | | | | |
| Larger # of bedrooms | x | | x | | x | x | | |
| Dirtier yards | | x | | | | | | |
| Cleaner household interior | x | | x | x | x | | x | |
| Poorer physical condition | | x | | | | | | |
| Cleaner yards | | | x | x | | x | x | |
| Better physical condition of home | | | x | x | x | x | | |
| Covered kitchen | | | x | x | | x | | |
| Piped water supply | | | | | x | x | x | x |
| Non-piped water supply | x | x | | | | | | |
| Septic tank | | | x | | x | | x | |
| Potentially more unsanitary toilet system (pit latrine) | | x | | | | | | |
| More likely to have breastfed infants | | x | | | | | x | |
| More likely to boil their drinking water | | | | | x | x | | x |
| Farther from health care services | x | | x | x | | | | |
| Poorer access to health care | | x | x | | | | | |
| Better access to health care | | | | | x | | | |

females than males among adults, despite the parity in numbers between groups across the spectrum of ages.


## 4.6 The role of the home environment in service use

One would expect some of the household character-
istics examined to act as markers of risk and of service
use, some to serve as proxy measures of health behaviour
(socio-economic impact on service use), and others to be
etiologically linked to specific morbidities brought for
medical attention. These factors, as previously stated,
have been grouped into four domains, and it is in this order
that they shall be addressed here: household residential
composition, residential stability, physical environment and
behavioural environment (Table 4.12). An assessment of
their role in the context of household-level utilization
patterns is undertaken before moving to an analysis at the
individual scale. My comments will necessarily be limited
to relationships observed for households with children less
than eight years of age. The generalizability of these
findings to childless households is a matter of speculation,
as they were not included in our survey of the household
environment. In cataloguing the array of statistical
associations uncovered between household environment and
health service use, it is also important to note the danger
of imputing causal links on the basis of statistical

TABLE 4.12     THE ROLE OF HOUSEHOLD ENVIRONMENT AND ACCESSIBILITY IN SERVICE USE

| | HOUSEHOLD RESIDENTIAL COMPOSITION | | | | | | | | HOUSEHOLD RESIDENTIAL STABILITY | | | | | | HOUSEHOLD PHYSICAL ENVIRONMENT | | | | | | | | HOUSEHOLD BEHAVIOURAL ENVIRONMENT | | ACCESSIBILITY | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ACOMP2 | NRES | NRES1 | NRES2 | NRES3 | NRES4 | NRES5 | NOM | HHMOVERS | NOCHG | NEWP | HEWH | NDR | HHCR | HHMATL | HHWS1 | HHRMS | YCLEAN | HHCLEAN | HHCOND | HHKITCH | TOIL | HHBOIL | HHBREAST | DIST1 | DIST2 | ACCESS |
| **ratio 1:** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TOTAL VISITS | - | - | - | - | (C) | - | - | B | (C) | A | B | - | - | (C) | A | (C) | A | (B) | (C) | (B) | - | (C) | - | - | A | A | A |
| RESPIRATORY | (B) | (B) | A | (C) | - | - | (C) | (B) | - | A | (B) | - | - | (B) | A | (B) | (A) | - | - | (C) | - | A | (C) | - | A | A | A |
| DIGESTIVE | - | (A) | (B) | B | - | (C) | - | - | | A | (B) | - | - | (C) | A | - | (A) | B | (B) | (A) | - | B | (C) | - | A | A | B |
| SKIN-RELATED | - | (B) | (A) | (A) | - | - | B | - | | A | - | (C) | - | - | B | - | B | (C) | - | (C) | - | B | - | - | - | (C) | - |
| DIARRHOEA | (C) | A | A | (B) | (C) | - | - | - | | A | (C) | - | - | - | - | - | - | (C) | - | B | - | - | (B) | - | - | - | - |
| NSE/SSE ORGAN | - | B | B | - | (C) | - | - | - | | A | - | - | - | - | (C) | - | - | - | - | - | - | (B) | - | - | (C) | (B) | B |
| D & V | - | (C) | (B) | - | - | (B) | B | - | (C) | A | - | B | B | | B | - | B | - | (C) | A | - | - | (B) | (C) | - | - | - |
| D & F | - | - | - | - | B | - | - | B | (C) | - | - | - | - | | - | - | - | - | (C) | - | - | - | (B) | - | (B) | (B) | - |
| **ratio 2:** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ALL VISITS | - | (C) | - | (C) | - | (B) | (C) | - | | A | (C) | - | - | - | A | (C) | (B) | (B) | - | (B) | - | (A) | (C) | - | A | A | (C) |
| RESPIRATORY | - | A | A | (B) | (C) | - | - | (C) | | A | (B) | - | - | - | A | (C) | (B) | - | - | - | - | A | (C) | - | A | A | (A) |

Notes: (1) Key: A    $p<.01$      C  $.05<p<.10$      – none of the above levels achived

B  $.01<p<.05$      () above level of significance achieved on 1-tailed test only

inference alone.

### 4.6.1 Household residential composition

It was suspected that higher ratios of children to adult females (ACOMP2) might result in poorer quality care for individual children (and therefore greater morbidity leading to service use). However, this was shown to be the case for utilization for only two of the morbidity groups: respiratory complaints and diarrhoea, both infectious ailments. This is suggestive of an element of within-household contagion that has inflated household service use for these diseases out of proportion to household size (given that our household-level utilization ratios are population size independent). Confirmation is found in the consistently positive relationship of the absolute number of both childhood residents and those of all ages with respect to household utilization for many morbidities. These trends are, however, morbidity-specific, and fail to emerge in an analysis of total service use at the household level. Contagion effects would appear to be stronger among younger residents, given the characteristic lack of relationship (and in some cases negative relationship) between the number of older residents and service utilization. I believe this makes intuitive sense if one considers that contact between children is typically more intense, intimate, and limited to

the home environment (particularly in the early years) than for older residents.

Among households with children, those with a larger number of adult men made less frequent use of health services than those with fewer adult males. Improved family income, family security and possible changes in health behaviour and quality of child care among two-parent households may account for this.

That diarrhoea with comorbidity appeared less related to household environment is more likely an indication of the inconsistency with which attendant symptoms were recorded at source, as earlier discussed. Unfortunately this precluded the use of these measures as markers of severity by which to test hypotheses of a clinical gradient in the relationship between home environment and health service utilization.

### 4.6.2  Household residential status

A variety of measures were created to illustrate household residential instability (as detailed earlier). Of these, the absolute number of household residents stable in location between census and survey (NOCHG) was most consistently, strongly and positively associated with service use. Although Bamisaiye (1984) has shown length of residence to be positively associated with likelihood of children being registered with a local maternal and child

health clinic, support for these observations is not uniform. Several authors have noted the greater predisposition of new migrants for health service utilization in developing countries, despite the frequently lower socio-economic status of these migrants and their more limited access to care (Morgan 1973, Gesler 1984). Given the great importance of friendship and family networks in delaying the seeking of formal medical care in Third World settings (Litman 1974), new migrants may be equally predisposed on account of stress and isolation as out of their acculturation or openness to innovation. One would also expect the health status of migrants to be frequently poorer. In this case, both exposure to the household environment (duration thereof) and period of eligibility for local service use, would probably have contributed to the relationship seen. No doubt also, residency conferred, by its duration, a familiarity (and presumably comfort) with the local health service infrastructure that would reduce psychological barriers to their use.[6] Lower utilization among new arrivals (adults only) may also reflect continued travel for more distant care with which they are familiar.

The number of new residents discovered since the first census (NEWP) - and hence the ratio of these to "stable" members (HHCR) - is positively associated with total service use as well as that generated by respiratory,

digestive and diarrhoea-related illness. If we consider the high proportion of (newborn) infants in this group of new arrivals, this is hardly surprising, given that service use among children is highest among infants (see below).

### 4.6.3 Household physical environment

With the exception of utilization for diarrhoea the residents of concrete homes tended to frequent medical facilities less often than those housed in structures of wood, mixed board and concrete, board and "galvanize" (corrugated iron), or bamboo. One suspects the environment (both physical and behavioural) in board-related homes to be more conducive to poor health. Conversely, it would appear that the health behaviour correlates of improved income and education, generally associated with concrete homes, would provide a more healthy environment that has offset any increased (psychological) propensity for service use. The ecology of concrete homes supports these conclusions: concrete homes were found more likely than board ones to have clean yards and interiors, be in good physical condition and to be equipped with a covered kitchen and septic tank (Table 4.11).

The distinction between piped (into home or standpipe) and unpiped primary water supply is only weakly associated with health service use (for respiratory and for

all illness).[7]   Subsequent analysis at the individual level suggested that in some cases this masks opposing trends specific to different age groups and morbidities (see below).

For respiratory, digestive, diarrhoea with vomiting, and skin-related complaints, household physical size was inversely related to the volume of service use, suggesting that for these (primarily infectious) morbidities, crowding is a significant factor in household morbidity.   In addition, it is noted that smaller homes generally had dirtier yards and interiors, were in poorer physical condition, had uncovered kitchens, and less sanitary human waste disposal systems (Table 4.12).

Cleanliness of yard and of house was shown to be weakly and inconsistently associated with the outcomes of interest.  As one would expect, the residents of cleaner environments had lower utilization rates over time.  They also tended to have fewer children, live in larger concrete homes of good physical condition, be privileged with piped water and septic tanks, be more likely to report boiling their drinking water, and have better access to health care (Table 4.11).  Much the same could be said for the physical condition rating of the home.

Finally, homes with septic tanks (numbering 25 in all) had lower rates of utilization.  This doubtless

reflected both improved sanitary conditions afforded by this method of waste disposal, but also the higher socio-economic status of families with the means to afford such systems. I suspect these would also be the families most likely to seek private medical care outside the study area (St. Georges).

### 4.6.4 Household behavioural environment

In the preceding section, it was suggested that several measures had their relationships to service utilization grounded in their association with health-related behaviour. Two explicitly behavioural factors have been isolated for discussion in this section.

The reported frequency with which water is boiled before consumption was found to be weakly to moderately associated with service use of several types. That service use generated by diarrhoea-related complaints was most closely related to water handling practices suggests a stronger etiological component to the relationship insofar as water-borne bacteria account for a large proportion of diarrhoeal cases in the developing world. Yet, paradoxically, it was found that those who reported always boiling their drinking water had lower service use than those who reported doing so only infrequently, while those who reported never boiling their drinking water represented the least morbid group in terms of service use (Table 4.13).

TABLE 4.13    WATER-BOILING PRACTICES AND MORBIDITY-
SPECIFIC HOUSEHOLD SERVICE USE

| | Level of utilization vis a vis how often water boiled | | | Associated | p | value |
|---|---|---|---|---|---|---|
| | High | Middle | Low | Mann-W | Chi-sq | Spearmans |
| ratio 1: | | | | | | |
| ALL VISITS | – | – | – | – | – | NS |
| RESPIRATORY | sometimes | always | never | – | .450 | .113 |
| DIGESTIVE | sometimes | never | always | – | .018 | .081 |
| SKIN | – | – | – | NS | NS | – |
| DIARRHOEA | sometimes | always | never | .070 | .005 | – |
| NSE/SE ORGAN | never | sometimes | always | .187 | .406 | – |
| DIAR+VOMIT | sometimes | always | never | .096 | .125 | – |
| DIAR+FEVER | sometimes | always | never | .086 | .123 | – |
| ratio 2: | | | | | | |
| ALL VISITS | sometimes | always | never | – | .125 | .149 |
| RESPIRATORY | sometimes | always | never | – | .314 | .176 |

Notes:  (1)  Mann-W refers to Mann-Whitney U test of significance
(2)  NS indicates no significant relationship was observed

The processes underlying the results illustrated in Table 4.13 remain to be adequately explained and understood. However, it is plausible that a socio-economic bias underlying the self-reporting of water-handling practices would partially account for the observed relationships. The ecological correlates of boiling water in the study communities clearly support this hypothesis, for they include a higher likelihood of observing cleaner homes and yards, piped water supply, septic tank, and the breastfeeding of infants (Table 4.11).

Contrary to the findings of the Taylor et al study for self-reported morbidity, no significant relationship was found between household breastfeeding practices and any measure of health care service use either at the household or at the individual level. However, it appears that breastfeeding may have been related to other health behaviours and to socio-economic status in our study communities. Breastfeeding was more common among households with fewer children, where the ratio of children to adult females was lower, where water was generally boiled, and where the primary water supply was piped into the home or surrounding neighbourhood. It was also reported more frequently among households where infants had recently been born (between census and survey), owing perhaps to the success of recent public health campaigns.

## 4.7 Accessibility and service use

As previously stated, accessibility to permanent health care services was assessed at the level of the locale. As regards service use for all disorders, for respiratory and for digestive complaints, road distance to the nearest permanent health care facility was significantly and negatively associated with frequency of contact at the household level (Table 4.12). The distinction between distance measures with respect to operation of the Florida medical station proved largely unimportant in this context. Relationships between these service use types and ACCESS ratings on the basis of slope and vehicle traffic displayed a similar pattern.

By and large household utilization for skin and diarrhoea-related disorders was not influenced by distance travelled for medical care. The absence of a clear distance-decay function for specific morbidities is to be expected in a small island such as Grenada, where distances travelled for care are short and do not vary substantially between communities.

## 4.8 Individual-level analysis

On the basis of results derived at the household level, key variables were selected for analysis using individual service use as the unit of analysis. An

assessment of the relative influence of personal characteristics and household environment in individual health and decision-making was therefore made possible. It also allowed for an exploration of age-group-specific factors crucial to service use, and permitted the distinction between volume versus presence/absence of use. In so doing, the troublesome interpretation of household level utilization ratios was also circumvented by their substitution with straightforward individual summary measures. It was intended that the results of such an analysis would then inform the choice of variables for inclusion in a multivariate analysis of health care service use.

Of the personal utilization measures listed in Table 4.1, only those related to overall service use and to contacts for respiratory, digestive and diarrhoeal complaints were selected for analysis at the individual level. This was deemed appropriate in the light of time constraints, the priorities of the project, the burden of illness in the study area, and the degree of environmental linkage expected.

Exogenous variables were chosen on the basis of the household level analysis and a desire to reduce duplication of measures within the requisite dimensions of the home environment. In this manner, three measures of household

residential composition and two of household residential status were included in this phase of the study. Household cleanliness was dropped in view of the large number of missing observations. Analysis was performed separately for residents under eight years of age and those above.[9] The influence of personal characteristics (age, sex, residential status) and of household environment on individual health and behaviour are considered in turn.

## 4.8.1 The influence of personal characteristics

While females generated much greater service use than males, disaggregation by age group revealed this only to be the case among "adults" (Table 4.14). When examining the study population as a whole, utilization for most illness seemed inversely related to age. Whereas this was especially true of children, it was not at all the case for overall service use among adults: among adults the degree of service dependence was shown to increase with age, as one would expect. This U-shaped relationship between age and utilization has been widely cited in the literature, as indicated in Chapter 2.

The uniformly negative relationship demonstrated between individual residential status and service use had two very different interpretations specific to the age groups studied. Childhood newcomers since the census

TABLE 4.14    THE INFLUENCE OF PERSONAL CHARACTERISTICS, HOUSEHOLD ENVIRONMENT AND ACCESSIBILITY ON INDIVIDUAL SERVICE USE

HOUSEHOLD ENVIRONMENT

| | PERSONAL CHARACTERISTICS | | | HOUSEHOLD RESIDENTIAL COMPOSITION | | | HOUSEHOLD RESIDENTIAL STABILITY | | HOUSEHOLD PHYSICAL ENVIRONMENT | | | | | | | HOUSEHOLD BEHAVIOURAL ENVIRONMENT | | ACCESSIBILITY | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SEX | AGE | STABILITY | ACOMP2 | NRES | NOM | HOCHG | HHCR | HHMATL | HHWS1 | HHRMS | YCLEAN | HHCOND | HHKITCH | TOIL | HHBOIL | HHBREAST | DIST1 | DIST2 | ACCESS |
| **all ages:** | | | | | | | | | | | | | | | | | | | | |
| USE YES/NO | A | B | A | - | - | A | A | - | B | - | B | - | (C) | - | - | - | - | (B) | (A) | A |
| HI/LOW USERS | A | - | - | - | - | A | (B) | (C) | A | - | B | (C) | B | - | A | A | - | A | A | B |
| **children: N=565** | | | | | | | | | | | | | | | | | | | | |
| USE YES/NO | - | - | A | - | - | - | A | (B) | (A) | - | - | - | (C) | - | - | (C) | - | (B) | B | (A) |
| HI/LOW USERS | - | B | A | (B) | (C) | - | A | - | A | - | (C) | - | - | - | B | (C) | - | A | A | - |
| RESPIRATORY | - | (A) | - | - | - | - | A | A | (A) | (B) | (C) | - | - | - | - | (B) | - | A | A | (B) |
| DIGESTIVE | (C) | A | B | | | | | | | | | | | | | | | | | |
| DIARRHOEA | - | A | (B) | - | - | - | B | - | (A) | (B) | (C) | - | - | - | - | (B) | - | A | A | (B) |
| **"adults": N=1511** | | | | | | | | | | | | | | | | | | | | |
| USE YES/NO | A | B | A | - | - | A | A | - | - | - | (C) | - | - | - | - | - | - | - | (C) | B |
| HI/LOW USERS | A | A | - | - | (C) | (A) | - | (C) | A | - | A | - | (C) | - | A | B | - | A | A | A |
| RESPIRATORY | A | A | - | - | - | (A) | A | - | A | B | (A) | (C) | - | - | (B) | - | - | A | A | (A) |
| DIGESTIVE | A | - | - | (C) | - | (C) | A | - | - | (C) | (B) | - | (C) | - | | (C) | - | (C) | (C) | (C) |
| DIARRHOEA | - | - | C | - | - | - | A | - | - | B | - | - | - | - | - | - | - | (C) | - | - |

Notes: (1) Key:   A    p<.01       C  .05<p<.10
                  B  .01<p<.05     ()  above level of significance achieved on 1-tailed test only
                                   -   none of the above levels of significance achieved

(generally newborn infants) generated lower service use than their older counterparts, reflecting perhaps a degree of post-weaning susceptibility. Among adults, stable residents with the longest residential history in the study area contributed most to overall service use. It is unclear whether this was conferred to a greater degree by virtue of a larger period of eligibility, or by inherent differences between movers and non-movers. A confounding influence of age in the relationship between mobility and service use may also be expected.

### 4.8.2 The influence of household environment and accessibility on individual service use

As suspected, household size (NRES) and ratio of children to adult females exerted greater influence on the degree of service use than whether or not medical attention was sought over the study period. The number of older men proved only significant in relation to "adult" use of medical services. Its failure to impact childhood utilization calls into question my earlier hypothesis that two-parent double-income families would, on the basis of improved child care and socio-economic status, experience reduced physical need for medical attention. Rather, it would appear that the utilization of the men themselves is at issue.

With regard to household residential stability, the number of stable residents (between census and survey) was strongly associated with all utilization measures at the individual level except for the volume of use among 'adult' users (Table 4.14). This was not as consistently reflected in the ratio of movers to stable household residents (HHCR), or in household size (NRES). The correct interpretation of these results is unclear.

On the whole, correlations of household physical and behavioural environment with individual utilization variables were consistent with the patterns described in the household level analysis, albeit with several noteworthy exceptions. While household building material, for instance, was not found to be significantly associated with diarrhea-related utilization for the study population as a whole, disaggregation by age demonstrated the strong tendency for children from board homes to have more frequently sought medical attention for diarrhoea.

Piped water supply was significantly positively associated with childhood diarrhoea and respiratory illness, while the opposite was true for diarrhoea among "adults". The lack of a significant relationship in analyses at the household level may have reflected a cancelling out of these two effects. Primary source of water was largely unrelated to the use, or degree of use, of health care services either

by children or by "adults".

In contrast to the negative relationship previously reported at the household level between household size (number of bedrooms) and service utilization, this was positive for individual children, and negative for "adults". Within-household contagion effects between siblings may be a contributing factor to the positive nature of the relationship between household size and childhood utilization. It is also likely that socio-economic status (reflected in physical household size) may result in predisposition to higher pediatric utilization (regardless of health status), as indicated in Chapter 2, but lower service use among (healthier) adults.

Toilet type accounted for a degree of non-specific service dependence among users but little else. Relationships observed between household behavioural environment and individual service use did not vary substantially from those noted at the household level. The same could be said for the influence of accessibility measures, as indicated in Table 4.14.

## 4.9 Conclusion

The foregoing discussion focussed on the influence on individual and household utilization of personal characteristics, home environment (comprising household

residential composition, residential stability, physical and behavioural environment) and locale-specific measures of accessibility. Generally speaking, sex, age, stability, household building material, household size, and accessibility have been shown to be most significantly associated with the utilization measures examined. Both an etiological link to service use based on actual health status, and a socio-economic link based on psychological predisposal to service use have been postulated to underlie the observed relationships. It was suggested at the outset that to properly distinguish these two effects would require the ability to distinguish between levels of severity in the disorders brought for medical attention. Attempts to include such measures here, on the basis of recorded comorbidity for diarrhoea, have met with limited success, as a result of inconsistencies in the recording of symptoms at source.

The degree to which one can draw conclusions about the nature and ecology of service use in Grenada (or indeed in our study communities alone) will depend on (a) the (statistical) strength of observed relationships, (b) the representativeness of the processes or circumstances involved (the etiological and socio-economic links), and (c) the representativeness of the sample population (households with children in these five communities).

Chapter 5 extends this bivariate analysis by selecting key variables for inclusion in a multivariate analysis of individual age-group specific and morbidity specific utilization.

# FOOTNOTES TO CHAPTER 4

1.  Furthermore, our exogenous variables had been measured only cross-sectionally, so that a suitable longitudinal data base was not available.

2.  This was not the case for repeat meds. However this was one of several morbidity groups dropped from subsequent analysis for reasons elucidated below.

3.  For example, homes of partially board construction were contrasted with uniquely concrete ones (to form HHMATLX2), and piped water supplies separated from freestanding water bodies (HHWS1X2).

4.  The power of a test denotes the probability of correctly rejecting the null hypothesis ($H_o$) of no significant difference between samples. The probability of falsely rejecting the null hypothesis (Type I error) is given by the significance level chosen ( , or p value) at which $H_o$ is to be rejected. The probability of falsely accepting the null hypothesis (Type II error) can be denoted by  . For any given sample and test there is a trade-off between error types. However increasing the sample size (number of observations) will reduce both  and  , thereby improving the power of the test (where power = 1 -  ). The degree to which this occurs is referred to as the power-efficiency of the test. For detailed information consult Hammond and McCullagh (1980), Siegel (1956), Ebdon (198_) or any other introductory statistics text.

5.  Tables 4.1 through 4.6 indicate the level of measurement of the study variables.

6.  The author's impression was that on the whole the threshold of discomfort triggering service use is higher among Grenadians than it is for the majority of North Americans.

7.  The bracketed values suggest relationships with p values greater than 0.1 on a 2-tailed test.

8.       In the interest of simplicity, those over eight years of age will hitherto be referred to as "adults".

# CHAPTER 5

## MODELLING MORBIDITY-SPECIFIC UTILIZATION:  LOGIT ANALYSES

A  central  objective  of  this  study is to identify components of the home environment as markers of service use to inform  the allocation  of scarce  health care resources. The relationships between variable pairs within a variety of domains  were  documented  in  the  previous  chapter.  The ecology of the home environment was particularly highlighted in its  relationship to  utilization at the household and at the individual  level.  A multivariate  analysis offers the opportunity to  assess the  combined effects of variables on selected outcome measures.  Of particular  interest in this context  is  determining  what factors emerge as significant when these shared effects are examined.

In the context of a largely exploratory study, I have not been  concerned with the precise magnitude of individual beta  parameters,  so  long  as  their  association with utilization is significant.  Equally, it seems inappropriate to focus on the  amount  of  variance  'explained'  in these multivariate models,  since no attempt was made to model the entirity  of  the  utilization  process.  As  indicated in Chapter 2,  the omission  of central  psychosocial and other

ecological influences on health service use will clearly bias the precision of resultant parameter estimates. To an extent, the dimensions captured in this study will (and have been shown to) act as proxies for some of the influences not directly measured.

The chapter opens with a discussion of the selection of eligible variables, and of statistical methods, before moving to a substantive interpretation of the results.

## 5.1 Choice of variables

### 5.1.1 Utilization measures

To assess the role of personal characteristics as well as household environment in service use, multivariate analysis was conducted at the individual level. In light of the differences observed between children and "adults" at the bivariate level, the distinction between age groups was maintained. Within the limitations of a Masters thesis, it was considered appropriate to further reduce the number of morbidity-specific utilization measures considered at the multivariate level.

My desire was, therefore, to model overall service use for both age groups and, given the project mandate, to model utilization for diarrhoea among children. Overall service use was examined along two dimensions: (a) the presence or absence of service use during the thirty month

study period, and (b) the degree of revealed service
dependence among users. Utilization for diarrhoeal
complaints was represented by a dichotomy indicating the
presence or absence of such use in the study period, as
previously described.

### 5.1.2 Exogenous variables

Key environmental and personal factors were selected
for further analysis on the basis of the strength of their
bivariate association to overall or morbidity-specific
service use at the individual level, as documented in
Chapter 4. The strength and direction of relationship for
these measures as revealed using bivariate analysis are
shown in Figure 5.1. Where very similar measures were
concerned, the most representative (or the most strongly
associated) was chosen, in an effort to avoid duplication
(and thus excessive multicollinearity).

### 5.2 The logit model: selection and assessment of fit

In Chapter 4, the need to categorize response
variables as a means of compensating for their skewed
distributions was discussed. Logistic regression models
allow for the multivariate analysis of k categorical and/or
interval-level variables on $Y_i$ constrained to two values
(over i observations) without restriction on $b_k X_{ik}$ (the

**FIGURE 5.1     DETERMINING MODEL SENSITIVITY AND SPECIFICITY**

Service users

Actual

|  |  | N | Y |
|---|---|---|---|
|  | N | a | b |
| Predicted |  |  |  |
|  | Y | c | d |

Sensitivity = d / b+d
         = ratio of predicted users to total users

Specificity = a / a+c
         = ratio of predicted non-users to total non-users

exogenous variable set and their parameters) or their associated error term. Logit models do not presuppose a linear or normal distribution in the response variable for the unbiased estimation of parameter estimates. Instead a logistic distribution is assumed. The resultant S-shaped curve is generally considered representative of choice behaviour (Wrigley, 1985). In our study, the use of such models implies that the shifts in exogenous variables (contextual health environment) necessary to impact service use are greater at the extreme ranges of their probability values.

Logistic models assume statistical independence among response variable observations (as drawn randomly from a sample size N) and the absence of perfect collinearity among independent variable observations. For N-k>100 the asymptotic properties of unbiasedness, efficiency and normality have been shown to hold for logistic parameter estimates (Aldrich and Nelson, 1984). These desirable properties of robustness in the presence of multicollinearity, limited assumptions, ease of application, and immediately available software guided our choice of the logit model in the context of the limitations in the data.

BMDP software was employed to perform stepwise logistic regression. The PLR subroutine in BMDP utilizes an iterative least squares algorithm to derive maximum

likelihood estimates (Dixon 1985).[1] As previously stipulated, attention was not focussed on variable-specific measures generated in the analysis, but on the selection of variables meeting the stepwise criteria for inclusion (p<0.1), and on the overall fit of the model.

Several measures have been proposed to assess the fit of a logistic model.[2] For the purposes of this study, the ability to correctly discriminate between user groups at a given probability level was judged to be of primary concern. In distinguishing between health service users and non-users, the ability of the model to correctly identify users is given by the ratio of predicted users to total (actual) users. This is referred to as the sensitivity of the model (Figure 5.1). Specificity, on the other hand, refers to the ratio of predicted non-users to actual non-users. Both measures may assume values between zero and one, and typically an adjustment in probability levels leads to an improvement in one measure at the expense of the other. The relationship between probability level and prediction success is illustrated in Figure 5.2. Chi-square values associated with specific probability levels can be calculated to indicate whether the model represents a significant improvement over a 2x2 classification of cases based on observed marginal frequencies (ie expected values).[3]

FIGURE 5.2    PROBABILITY LEVELS AND PREDICTED SUCCESS
RATIOS

```
        ┌─────────────────────┬──────────────────────┐
        │ falsely predicted   │                      │
        │ as non-users        │correctly predicted   │
        │                     │     x x     as users │
(a) actual                    │     x x x            │
    users           x       x │ x x x x x            │
        │     x    x x    x x x x x x x x     x       │
        │   x x x x x x x x x x x x x x x x      x    │
        ├─────────────────────┼──────────────────────┤
        │ correctly           │                      │
        │ predicted as   x    │falsely predicted     │
        │ non-users    x x    │          as users    │
(b) actual          x x x x x │                      │
    non-   x       x x x x x x │        x             │
    users  x     x x x x x x x x      x x    x        │
        │x x x x x x x x x x x x x x     x    x        │
        └─────────────────────┴──────────────────────┘
              probability = 0.5
```
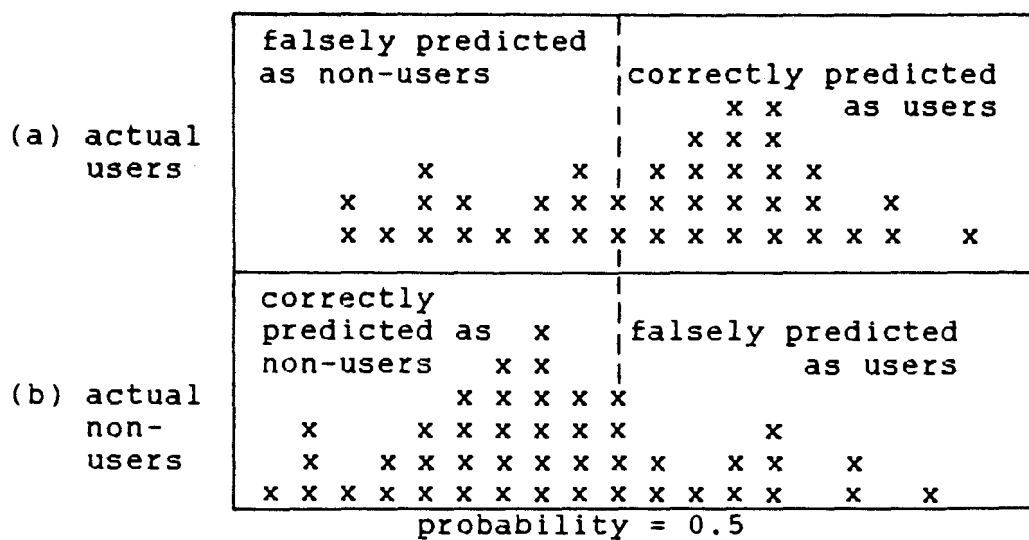
Histogram of predicted probability of success
(service use) for observed users and non-users
at the 0.5 probability level

## 5.3 Further analytical considerations

A cautionary note is in order regarding shortfalls in the logistic modelling procedure and potential biases in the data set. Wrigley (1985) has noted the unreliability of weighted least squares procedures for categorical variables under conditions where the number of repetitions (frequency) in each sub-population, and therefore the ratio of sample size to number of cells, is small. With reference to Table 5.1 it is clear that small cell sizes predominate in all the multivariate analyses performed. The extent and direction of bias introduced on the selection of variables and goodness of fit in this study is unclear.

Several authors have reported the standard chi-square and log likelihood test statistics in simple logit models to be biased by the clustering and stratification typical of sample survey data (Bull, 1988; Roberts, 1987; Roberts, Rao and Kumar, 1987). Typically the nature of this bias is to inflate the Type I error rate (falsely rejecting the null hypothesis) in the presence of intra-cluster correlation, particularly within large samples.[4] It is argued that adjustments are necessary to avoid inappropriate inferences from test statistics and goodness of fit measures generated in logistic analysis, and that adjustments are also required to diagnostic procedures to avoid erroneous results. While we did not systematically employ stratified cluster-based

TABLE 5.1     INPUT SPECIFICATIONS FOR LOGIT ANALYSES

| RESPONSE VARIABLE | AGE GROUP | CASES SURVEYED | # WITH MISSING VALUES | # CASES ELIG. | # OF CELLS | # EXPECTED VALUES < 5 | INDEP. VARIABLES INPUT | INTERV./ CATEG. | SIGNIF. |
|---|---|---|---|---|---|---|---|---|---|
| Childhood diarrhoea | < 8 | 565 | 113 | 452 | 442 | 692 | HHRMS | I | * |
|  |  |  |  |  |  |  | FAGE | I | *** |
|  |  |  |  |  |  |  | DIST1 | I | *** |
| N = 356 |  |  |  |  |  |  | NOCHG | I | ** |
| Y =  96 |  |  |  |  |  |  | HHMATLX2 | C | *** |
|  |  |  |  |  |  |  | HHWS1X2 | C | ** |
|  |  |  |  |  |  |  | HHBOIL | C | ** |
|  |  |  |  |  |  |  | PMVRX | C | ** |
| Childhood utilization | < 8 | 565 | 67 | 498 | 139 | 47 | DIST1 | I | ** |
|  |  |  |  |  |  |  | NOCHG | I | *** |
| N = 125 |  |  |  |  |  |  | HHCR | I | ** |
| Y = 373 |  |  |  |  |  |  | HHMATLX2 | C | *** |
|  |  |  |  |  |  |  | ACCESS | C | ** |
| "Adult" utilization | > 8 | 946 | 54 | 892 | 668 | 56 | FAGE | I | ** |
|  |  |  |  |  |  |  | NOCHG | I | *** |
|  |  |  |  |  |  |  | SEX | C | *** |
| N = 300 |  |  |  |  |  |  | PMVRX | C | *** |
| Y = 592 |  |  |  |  |  |  | ACCESS | C | ** |
| "Adult" utilization | > 8 | 946 | 357 | 589 | 578 | 525 | HHRMS | I | *** |
|  |  |  |  |  |  |  | DIST1 | I | *** |
|  |  |  |  |  |  |  | FAGE | I | *** |
| low = 332 |  |  |  |  |  |  | SEX | C | *** |
| high = 257 |  |  |  |  |  |  | HHMATLX2 | C | *** |
|  |  |  |  |  |  |  | HHCOND | C | * |
|  |  |  |  |  |  |  | HHBOIL | C | ** |
|  |  |  |  |  |  |  | ACCESS | C | *** |
| Childhood utilization | < 8 | 565 | 192 | 373 | 354 | 664 | FAGE | I | ** |
|  |  |  |  |  |  |  | ACOMP2 | I | ** |
|  |  |  |  |  |  |  | NOCHG | I | *** |
| low = 180 |  |  |  |  |  |  | DIST1 | I | *** |
| high = 193 |  |  |  |  |  |  | HHMATLX2 | C | *** |

Notes:  (1)   I = interval; C = categorical

(2)   Significance levels are those achieved on one-tailed tests of bivariate correlation.

(3)   ***        $p < .01$
      **   $.01 < p < .05$
      *    $.05 < p < .10$

**TABLE 5.2      OUTPUT SPECIFICATIONS FOR LOGIT ANALYSES**

| RESPONSE VARIABLE | VARIABLES INCLUDED IN MODEL | MODEL GOODNESS OF FIT | | PROBABILITY LEVEL | SENSI-TIVITY | SPECI-FICITY | PROBABILITY-SPECIFIC IMPROVEMENT | | |
|---|---|---|---|---|---|---|---|---|---|
| | | CHI SQ | P VALUE | | | | CHI SQ | D.F. | P VALUE |
| Utiliza-tion for childhood diarrhoea | FAGE PMVRX HHMATLX2 HHBOIL DIST1 | 392.5 | .929 | .33 | .49 | .84 | 46.8 | 2 | < .001 |
| Presence /absence of child -hood utiliza-tion | NOCHG HHMATLX2 ACCESS | 191.8 | .001 | .50 | .98 | .78 | 330.3 | 2 | < .001 |
| Presence /absence of adult utiliza-tion | SEX PMVRX NOCHG | 762.9 | .005 | .50 | .89 | .37 | 89.6 | 2 | < .001 |
| Adult service depen-dence | FAGE SEX HHMATLX2 ACCESS | 745.7 | .000 | .50 | .49 | .71 | 26.5 | 2 | < .001 |
| Childhood service depen-dence | FAGE NOCHG HHMATLX2 DIST1 | 472.5 | .000 | .50 | .64 | .58 | 18.2 | 2 | < .001 |

sampling, it would be unfair to suggest that our sampling procedures were entirely bias-free. This is particularly relevant in the analysis of adult utilization, considering only households with children were surveyed. Notwithstanding, Bull (1988) found corrections to moderately-sized samples (several hundred) produced only marginal and insignificant improvements in model estimation.

It should also be acknowledged that a strong distance and locale-specific bias in household environment measures was observed in our data set. Spatial autocorrelation (the systematic ordering of observation values in space) potentially violates the assumption of independence between response variable observations, and suggests that some analysis at the intra-locale level would be warranted, were cell frequencies sufficiently large. Curiously, the well-developed fields of spatial process modelling and spatial time series analysis remain to be successfully applied in the context of categorical data analysis (Wrigley, 1985).

Similarly, the modelling techniques employed were not controlled for interaction effects between exogenous variables in this study. It should also be mentioned, in conclusion, that to adequately address issues of causation would require the incorporation of feedback systems into multiple-equation or recursive equation systems in logit models to allow for the simultaneous evaluation of

interelationships between variables. However, for the purposes of this study, simple covariance is sufficient to establish a relationship that if consistent (significant) and generalizeable (representative) can form the basis for an informed targetting of health care resources.

## 5.4 Modelling childhood service use for diarrhoeal illness

Of the 565 children surveyed, 452 were eligible for inclusion in this logit analysis, the remainder having missing values on any of the variables pre-selected for examination (Table 5.1). Twenty-one percent of cases were recorded as having visited a health service in our catchment area for diarrhoeal illness during the course of the study period. Ten variables were selected for multivariate analysis on the basis of their bivariate relationship to diarrhoea-related utilization of services by children. Five of these were categorical variables. Due to varying sample sizes and differences in the bivariate tests employed, the reported p values were not directly comparable between variables and again only their range is reported here (Table 5.1).

Five variables were selected as significant predictors of childhood utilization for diarrhoea (Table 5.2). Among children, age was observed to be inversely associated with the outcome of interest, as revealed in the

bivariate analysis. Length of stay (residential stability between censuses) was associated with higher service use among children. This may reflect a degree of post-weaning susceptibility, given that newcomers among infants were mostly young infants. Alternatively, higher utilization per unit of time among infants could have been offset by somewhat lower utilization rates among older childeren spread over longer periods of time. [In other words, the influence of length of stay on utilization may well be confounded by age.]

A socio-economic effect is implicated in the association of household water boiling practices to pediatric utilization for diarrhoea. Caregivers reporting the occasional boiling of water had children with higher revealed morbidity than those who reported always boiling their water. The ecological correlates of self-reporting such behaviour bear this out, as reported in Chapter 4.

In keeping with earlier results, children from concrete homes were found to be less likely to frequent medical services with diarrhoeal complaints. It is plausible that household environmental and behavioural correlates of board construction, as illustrated in Chapter 4, may be such as to compromise the quality of care and the health status of childhood residents.

Finally, childhood utilization for diarrhoea was shown to vary significantly and inversely with distance of the home from the nearest permanent health care facility.

While the model does represent a significant improvement over using expected values from utilization totals alone, its sensitivity is disappointing even at lower probability levels. The model is therefore far more accurate in identifying non-users for childhood diarrhoea than in identifying users.

## 5.5 Modelling the presence or absence of service utilization by age group

It was hypothesized (and demonstrated in bivariate analyses) that factors influencing the presence or absence of service utilization would differ from those distinguishing between levels of service dependence among users of medical services, and that these would also differ between children and "adults". Five variables were entered and three emerged as significant in each model. For both children and "adults", the number of household residents stable from first census to survey was strongly and positively associated with having made use of medical facilities in the region. The possibility that within-household contagion may account for some of this relationship was discussed in the preceding chapter. It is also possible that the likelihood of service use among

children would rise in proportion to the number of siblings and other family members who themselves might require medical attention and whose visit might involve the child's attendence as well. For example, mothers might bring all the children to the health clinic on account of one of them being sick, possibly to continue minding them, but also to have them checked for more minor complaints that by themselves would not have prompted a separate trip for care.

The logit analysis also indicated that children from concrete homes were significantly less likely to require medical attention, although the possibility of service use outside the study area cannot be ignored. Children having more accessibility to permanent health care facilities were found to have much higher probabilities of making use of these services during the thirty month study period. These two factors were not observed to be significant in the context of "adult" health service utilization.

Among older residents, individual mobility was significantly and negatively associated with the likelihood of service use. This need not imply that mobile individuals are healthier as a group. It is interesting to note that mobility was seen to be a poor predictor of service dependence among "adult" users. This suggests the presence of psychological barriers to initiating local service utilization among new migrants.[5] Given that migration could

also be directed out of the study area, it is also true that, in reducing length of stay (and exposure to the home environment), early out-migrants were at lower "risk" of using health care services in the area.

The predominance of females over males in the utilization records for adults is to be expected and does not warrant further comment here.

At conventional probability levels (0.5), the sensitivity and specificity of the two models are promising. This is particularly true of service use among children. Again, the chi-square values indicate a significant improvement in predictive power over constant-only models.

## 5.6 Modelling service dependence among users, by age group

The overall service dependence, or extent of service use, among "adult" and childhood service users was modelled on the basis of eight and five variables respectively, five emerging as significant in each case (Tables 5.1 and 5.2). For both groups, household construction material once again emerged as a strong predictor of service use, in the same manner as earlier documented. Age also emerged as significant for both groups. Among children, utilization decreased with increasing age, as seen in the case of childhood diarrhoea. Among "adults", however, service dependence was shown to increase substantially with age.

This is not unique to our sample but also typical of North American utilization patterns (see Chapter 2).

As demonstrated in the case of utilization for diarrhoea, logit analysis revealed distance as an important predictor of service use by children.

Among "adults", females were shown to have higher rates of utilization than males. Improved access also coincided with greater service use among "adults". Interestingly, individual residential stability was not seen to be relevant to service dependence, but only to whether services were used or not. This would appear to reinforce the hypothesis of psychological barriers to initial service use posited above.

Despite indications of a significant improvement in predictive power achieved by these model specifications (chi-squares with p values < .001), sensitivity and specificity measures were not very encouraging.

## 5.7 Assessing the effects of the home environment on utilization

Of the household physical environment variables, only construction material showed a consistent and strong relationship to individuals' service use. Given the predominance of board homes in our communities, it is clear that this relationship is more useful in identifying non-users (high specificity) than service users (low

sensitivity).    Among  household  behavioural  environment measures, boiling water practices were relevant, but only as a (socio-economic) influence on use for childhood diarrhoea. With   respect   to   household   residential   composition,   the number  of  residents  locationally  stable  between  first  and second census was significant to the  presence, but  not the degree,  of  individual service  use during the study period. It is unclear whether the  relationship  of  service  use to distance and accessibility indicated unserved populations in the  periphery,  overly  service-dependent  populations  in central  localities,   or  real  differences  in  objective  health status.

Predictive success only reached  acceptable levels at the 0.5  level in models designed to predict the presence of utilization by children or "adults" over the study period.

In conclusion, multivariate analysis has demonstrated that by and large the home environment is important, perhaps even central, to the use of  health care  services.   Of the household measures  that emerge  in logistic modelling, many appear to act as  proxy  variables  for  health  beliefs and health behaviour  underlying service  use, although some are suggestive of an etiological  link between  home environment and objective health status.    By  and  large,  personal characteristics (age, sex,  and  length  of  residence),  and accessibility  play  a  more consistent role in successfully

predicting health care service use in our communities. However, it is clear from the discussion in Chapter 2 that these factors also mask a variety of psychosocial and situational influences themselves more directly ('causally') linked to the utilization of health services in Grenada. It would appear that the home environment (as we have measured it) is an important dimension of influence, but, as is to be expected, not all important in a singularly deterministic fashion.

# FOOTNOTES FOR CHAPTER FIVE

1. See Wrigley (1985) for further discussion of iterative least squares procedures.

2. Aldrich and Nelson (1984) propose a "pseudo $R^2$" = $c/(N+c)$, where $N$ = sample size and $c$ = overall goodness of fit chi-square. The latter is provided following each iteration in the BMDP program output. Wrigley (1985) advocates the use of a prodiction success index analogous to the sensitivity indices detailed below but standardized for the influence of observed proportions (marginal frequencies).

3. The chi-square does not indicate the degree to which the model represents an improvement over observed shares. this is provided by measures of sensitivity and specificity.

4. Clustering and stratification violate the assumption of multinomial sampling implicit in logistic modelling (Roberts, 1987).

5. Lower utilization among new arrivals may also represent continued use of more distant services outside our catchment area with which the migrant is more familiar.

# CHAPTER 6

## SUMMARY AND CONCLUSION

### 6.1 Summary

The objective of this thesis has been to identify components of the home environment as markers of health service use among the study population. It has sought to describe utilization patterns in the study communities, to explore the role of the home environment in service use, and to advance informed hypotheses to account for observed relationships between the field environment and health service utilization. Attempts were also made at modelling utilization on the basis of these factors as a means of assessing their predictive strength and contribution to the utilization process.

The centrality of health in development and the potential importance of utilization studies to effective and efficient health planning was underlined in the opening sections of Chapter 2. Several models of utilization were reviewed. These incorporated both demand-side and supply-side factors, mediated by intervening consumer perceptions of the health care system.

A wide range of factors were reviewed for their proposed relevance to the utilization process. It is apparent throughout the literature that the lack of

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standardized definition and measurement of variables has compounded the confusion over their impact on health and health service utilization. This has been further complicated by the fact that variables examined are often related by virtue of their relationship to a third implicit, unmeasured influence: they are merely proxies for other underlying causes.

Furthermore, the paucity of truly comprehensive multivariate modelling in this field has left the relative importance of these factors much debated. Of particular concern, in the context of this thesis, is the relative neglect of the home environment in utilization studies. While there is considerable evidence of the importance of the family unit to the health of its constituent members, such analyses have rarely been extended to an examination of their impact on individual health service use. The nature of the home environment as a psychosocial milieu appears to have been particularly neglected in this context. A systems approach, embodied in the socio-ecological model of health, is advocated as a suitable conceptual framework in which to set this and future investigations of the ecology of health service utilization.

The collection of census, survey and utilization data was documented in Chapter 3. The combination of these data sets provided a rich collection of individual, household and

locale-specific measures encompassing dimensions of age, sex, residential mobility, household composition, physical and behavioural environment, and accessibility. Summary measures of these characteristics indicate the relative homogeneity of the study communities with respect to major dimensions of interest, and indicated mean levels of utilization comparable to those reported for other developing countries.

The results of a detailed exploration of the ecology of utilization in Grenada were discussed in Chapter 4. Numerous relationships emerged in this morbidity-specific analysis at the bivariate level. In keeping with the literature, a clustering of morbidity within households and individuals was reported. Observed discrepancies between self-reported morbidity, reported utilization and actual utilization raised serious questions about the validity and reliability of self-reporting as a measurement tool in developing-area health studies. Of particular interest was the complexity of the field environment revealed in an analysis of relationships between independent variables. This finding reinforces the need for a holistic socio-ecological perspective on health service utilization.

Analyses of the influence of the home environment on the use of medical care indicated that elements of all four dimensions examined were significant. Both an etiological

link to service use based on actual health status, and a socio-economic link based on psychological predisposition to service use were postulated to underlie the observed relationships. It was argued that to adequately distinguish between these two effects would require the ability to differentiate levels of severity in complaints brought for medical attention. While this was not feasible in this study, an assessment of the ecological correlates of observed relationships was often suggestive of one influence or the other.

In keeping with the literature, analyses at the individual level revealed interesting and sometimes marked age-specific differences in the direction and degree of relationships from those discovered at the household scale. On the whole, locale-specific accessibility measures were strongly correlated with service use, although morbidity-specific exceptions were understandably observed, given the small scale of the island.

Attempts at modelling health service utilization on the basis of characteristics isolated in Chapter 4 met with mixed success. As indicated in Chapter 5, the sensitivity and specificity of models derived for the prediction of the presence or absence of utilization (all complaints, both age groups) exceeded those obtained for the volume of utilization among children or adults, or the occurrence of

childhood utilization for diarrhoeal illness.

## 6.2 Conclusions

This thesis represents one of the first comprehensive examinations of health service utilization in the West Indies. It is one of the first studies to focus explicitly on the role of the home environment in the use of medical care. It extends the work of the McMaster-Grenada Child Health Project on the environment and health to the environment and health care use, and does so in a socio-ecological framework, a systems approach providing both organization and flexibility in the study of health service utilization. This study also represents one of a growing number successfully bridging the 'divide' in medical geography between disease ecology and health service research.

This thesis has clearly established the importance of the home environment to health service utilization in five communities in Grenada. While extensive, it must be acknowledged that not all possible dimensions of the home environment were examined in this study. The necessary omission of psycho-social parameters was particularly unfortunate. It is also important to remain cognizant of the types of morbidity retained in the analysis, as these were generally infectious in nature (see Chapters 3 and 4).

Furthermore, the study focus on the home environment (as well as select personal and community characteristics), while justified in an exploratory study of a subsystem within the ecology of utilization, will have necessarily implied the exclusion of many other parameters of service use. This has probably diminished the study's ability to comprehensively account for observed utilization patterns in the study communities. By the same token, it is a powerful testament to the influence of the home environment that it was capable of predicting utilization with the accuracy reported above. The inevitable conclusion of this work, then, is that the home environment (as we have measured it) is an important dimension of influence, but not all-important.

The potential importance of utilization research to health care planning has been stressed throughout my dissertation. The theoretical implications of my work should be clear: given the complexity of the utilization process, a socio-ecological perspective is required. The need to recognize the importance of the home environment should be equally apparent. It is suggested, therefore, that health-related interventions be increasingly targeted at the household level. This is not a new suggestion, except insofar as it addresses interventions designed to promote the appropriate use of medical care. Without

independent measures of need (health status), it is difficult to comment on the appropriateness of current utilization in Grenada. However, to the degree that proxies of socio-economic status and distance measures correlate with utilization, it is not. In this sense, etiological components of utilization represent use on the basis of need. The factors isolated in the multivariate analysis were more successful in distinguishing between users and non-users than between high and low (average) service dependence. Both distinctions are important to health planners in ensuring the optimal utilization of available services and in planning for future ones.

The generalizability of the results of this study to Grenada as a whole (or beyond) has yet to be established. It depends both on the representativeness of the processes and circumstances underlying the observed relationships, and the representativeness of the sample population (households with children in these five communities).

## 6.3 Recommendations for further research

This was primarily an exploratory study testing the hypothesis of a relationship between the home environment and utilization. Subsequent confirmatory studies might do well to probe the nature of these relationships in greater detail than was possible here. This will also assist in

determining the stability of these relationships over space and time. Since many of the factors examined in this study are proxies for more indirect underlying causal influences, establishing the consistency of their relationship to utilization will involve working at both levels: the relationship of the variable to underlying phenomena as well as to utilization outcomes. This will be complex and costly because of the need to assess psychosocial dimensions, and to do so in a valid and reliable manner. Yet only if consistency can be established is the continued use of proxy variables meaningful.

This is an appropriate moment to reiterate an earlier plea for the examination of utilization as a dynamic process, rather than as a static end state. It would be particularly cogent to this study to document the evolution of utilization behaviour within the home environment.

I believe these issues must be addressed if we are to further our understanding of health service utilization. Such an understanding will be particularly welcome in the promotion of appropriate ('optimal') service use. The urgency of this work is reinforced in the observation of two opposing trends: rationalization in the health sector, and increasing dependence and rising expectations among target populations.

**APPENDIX A**

Grenada Child Health Survey: Verbal Portion

Household No. ____

<div style="text-align:center">GRENADA CHILD HEALTH SURVEY    HOUSEHOLD RESPONSE FORM</div>

CITY _____        Page __ of __

Interview Date __/__/__

| POPULATION | | | | SICK | | | DIARRHEA | | | FEEDING | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Census | Given Age | Residence | Primary Caregiver | 2wks | 4ayday | Dr/Nurse | 2wks | 4ayday | Dr/Nurse | BBB | start breast | stop breast | start solid | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |

WATER

Source 1 _____ Boil  A/M/N        NO. ROOMS ◯

Source 2 _____ Boil  A/M/N        COOKING ◯ _____

# APPENDIX B

Grenada Child Health Survey: Household Observation Sheet

GRENADA CHILD HEALTH SURVEY

   - OBSERVATION SHEET-

HH#  _____

/ / 
d    m    yr

| | | | | |
|---|---|---|---|---|
| 1. | CLEANLINESS OF YARD | Clean | Average | Dirty |
| 2 | CLEANLINESS OF HOUSE | Clean | Average | Dirty |
| 3. | CONSTRUCTION MATERIAL | | Board<br>Concrete<br>Board & Concrete<br>Bamboo<br>Other  _____ | |
| 4 | CONDITION OF DWELLING | Good | Average | Poor |

WEIGHT IN FIRST 4 YEARS OF LIFE
(From child's growth chart)

| | Name | DoB | B | 4 | 8 | 12 | 16 | 20 | 24 | 28 | 32 | 36 | 40 | 48 | ___ | ___ | ___ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | | | |
| 3. | | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | | |
| 7. | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | |

CHILD # ___   DIP month ___   DIP weight ___   _____

**APPENDIX C**

Classification of morbidity categories

## UTILIZATION/MORBIDITY CATEGORIES
### (Customized WONCA coding)

1. RESPIRATORY (801)

| | | | | | |
|---|---|---|---|---|---|
| 7 | sore throat | 138 | bronchitis | 145 | hay fever |
| 133 | acute URTI | 139 | influenza | 269 | dyspnea |
| 134 | sinusitis | 140 | pneumonia | 270 | cough/cold |
| 135 | tonsilitis | 143 | emphysema | 490 | dry cough |
| 137 | laryngitis | 144 | asthma | | |

2. DIGESTIVE (802)

| | | | |
|---|---|---|---|
| | | 275 | heartburn |
| 130 | hemorrhoids | 279 | abdominal pain, gripe, waist pain, umbilical pain |
| 148 | dental disorders | 293 | weight loss, loss of appetite, not eating |
| 150 | esophageal disorder | 400 | worms |
| 151 | deodenal ulcer | 404 | stomatitis |
| 153 | gastritis indigestion, epigastric | 451 | blood in stool |
| 156 | hernia | 452 | spitting blood |
| 159 | irritated bowel, pain in anus | 453 | dehydration |
| 161 | constipation | | |

3. TRAUMA (803)

| | | | |
|---|---|---|---|
| 311 | fractures, x-ray | 329 | foreign body in tissues |
| 321 | sprain, strain, injury, swelling | 330 | foreign body in eye |
| 323 | laceration, open wound, amputation | 406 | mongoose bite |
| 326 | abrasion, scratch, blister | 416 | ingestion of poison |
| 328 | burns, scalds | 418 | dog bite |

4. GENITO-URINARY (804)

| | | | |
|---|---|---|---|
| 23 | G.C. | 191 | dysmenorrhea |
| 170 | cystitis & UTI | 193 | disorders of menstruation |
| 172 | urethritis, burning on urinating (see 280) | 195 | infertility |
| 175 | prostatic hypertrophy | 280 | dysuria |
| 176 | protatitis | 283 | frequency of urination |
| 181 | chronic cystic breast disease | 350 | diagnosing pregnancy |
| 183 | pelvic inflammatory disease | 407 | antenatal |
| 184 | cervicitis | 408 | abortion |
| 185 | vaginitis, vaginal discharge | 415 | post paritum |
| 187 | menopausal symptoms | 417 | ectopic pregnancy |
| | | 480 | sexually transmitted diseases |

## 5. MUSCULOSKELETAL & CONNECTIVE TISSUE (805)

| | |
|---|---|
| 35 breast-related problems | 234 muscle pain, pain all over body |
| 110 angina chr isch, chest pains | 238 back pain, retrosternal |
| 141 plecritic pain | 239 disc disease, sciatica etc |
| 228 rh arthritis & allied conditions | 262 chest pain (see 110) |
| 229 OA & allied conditions | 286 pain in limb |
| 232 shoulder syndromes | 288 pain in joint |
| 233 other bursitis & allied conditions | 460 musculoskeletal pain (side, calf, knee, leg) |

## 6. SKIN-RELATED (806)

| | |
|---|---|
| 24 dermatophytosis | 221 ingrown tonail |
| 207 skin ulcer, boils, blisters | 292 rash (see 214) |
| 210 impetigo | 401 scabies |
| 213 eczema & allergic dermatitis | 402 skin infections (incl. sores, septic sores, scabies without impetigo) |
| 214 dermatitis | |
| 215 diaper rash | 403 insect bites |
| 224 acne | 414 lice |

## 7. REPEAT MEDS (807)

419 neonatal
470 diabetes/hypertension mgt, well baby clinics, referals, checkups

## 8. DIARRHOEA (808)

2 diarrhoea

## 9. MENTAL/EMOTIONAL (809)

| | |
|---|---|
| 67 schizophrenia, mental illness (general) | 80 alcohol abuse |
| 71 hysteria and hypochondriac neurosis | 82 tobacco abuse |
| 77 trans sit disturb adj reaction | 84 personal and character disorder |
| 78 behavioural disorder | 70 anxiety/nervousness |

## 10. CIRCULATORY (810)

| | |
|---|---|
| 50 diabetes | 119 elevated BP NYD |
| 109 acute MI | 120 hypertension (uncomplicated) |
| 112 heart condition | 121 hypertension (target organ involved) |
| 113 atrial fib | 128 phlebitis & thrombophlebitis |
| 115 ecoptic beats | 129 varicose viens |
| 116 murmurs NYD functional | 265 edema |

11. BLOOD DISEASES (811)

```
58
59  anemia
405
```

12. NERVOUS SYSTEM AND SENSE ORGANS (812)

```
18  conjunctivitis - viral        102  otitis media, chronic serious
89  epilepsy                      105  deafness
100 otitis - external             106  wax in ear
101 otitis media, acute           107  tinnitus
```

13. OTHER (813)

```
32                                256  dizziness, giddiness, weakness, 'bad feelings'
33                                258  headache
34                                266  swollen glands
35  various neoplasia             274  vomiting (nausea)
36                                291  fever (undetermined cause)
39                                295  fatigue
45                                412  measles
46                                413  mumps
90  migrain                       450  miscellaneous  (incl. gum abscess, blood,
                                       preanular
                                       sinus,
                                       eating  sand, eating  soap,
                                       eating
                                       aud, itch,
                                       eye, eye problem, painful vien
                                       on
                                       leg, suo-
                                       scapula, burning sensation in
                                       chest,
                                       RIH,
                                       gas and
                                       blackout)
```

14. UNKNOWN (814)

```
666  illegible (Otway)

999  unknown/unlisted
```

APPENDIX D

Sample Government of Grenada Cadastral Survey Map
and Property Information Form

# Government Of Grenada

## CADASTRAL REPORT

Final Parcel Number _____

Preliminary Parcel Number _____

Section "A" ( Information requested of property occupant )

...er's Name ——————————————————————————————

2. Owner's Address .... .....   .——————————————————————————

3. Possessor's or Occupant's name   ——————————————————————

4. Area of Parcel .....  . 5. No. Date of deeds and land Registry Number ——————

6. Chattel house land rent per year ———————— 7. Improved property, rent per month ————

8. If rented, what does landlord furnish besided real estate? ————————————————

9. Number of rooms ———— 10. Number of baths ————— 11. Sewer ——— Septic tank ——— Pit ————

12. Year built ———— ———— 13. Condition poor ——— average ——— good ——— new ———

14. Insurance value of the building ————————————————————————

Section "B" (Information to be completed by data collector)

15. Property Location ————————————————————————————

16. Principal use of Parcel ————————————————————————————
        (If principal use is Agriculture, complete Agriculture Form and skip Nos. 10 to 14)

17. Predominant slope of Parcel. Level $\frac{}{5°}$ Gentle $\frac{}{5°-15°}$ Moderate $\frac{}{15°-30°}$ Steep $\frac{}{30°}$ ————

18. Parcel grade: at road level ———— above road level ———— below road level ————

19. Number of house sites that parcel could reasonably be expected to yield ————————

20. Automobile access: none ——— poor ——— good ——— 21. Unusual features of parcel ————————

22. Type of building (see manual) Res. ——— Comm. ——— Indust.——— Other ———

23. Walls ————————————————— 24. Roof shape ————————————————

25. Roof cover ———————————————— 26. Interior finish ———————————————

27. Est. year built.———————————— 28. Condition: poor ——— average ——— good ——— new ————

29. Diagram all structures on the back of this report.

Data Collector / date

| Year Value | | | | | | |
|---|---|---|---|---|---|---|
| Land | | | | | | |
| Bldg. | | | | | | |
| Total | | | | | | |

CLOZIER

KEITH WILLIAMS 19.7.84
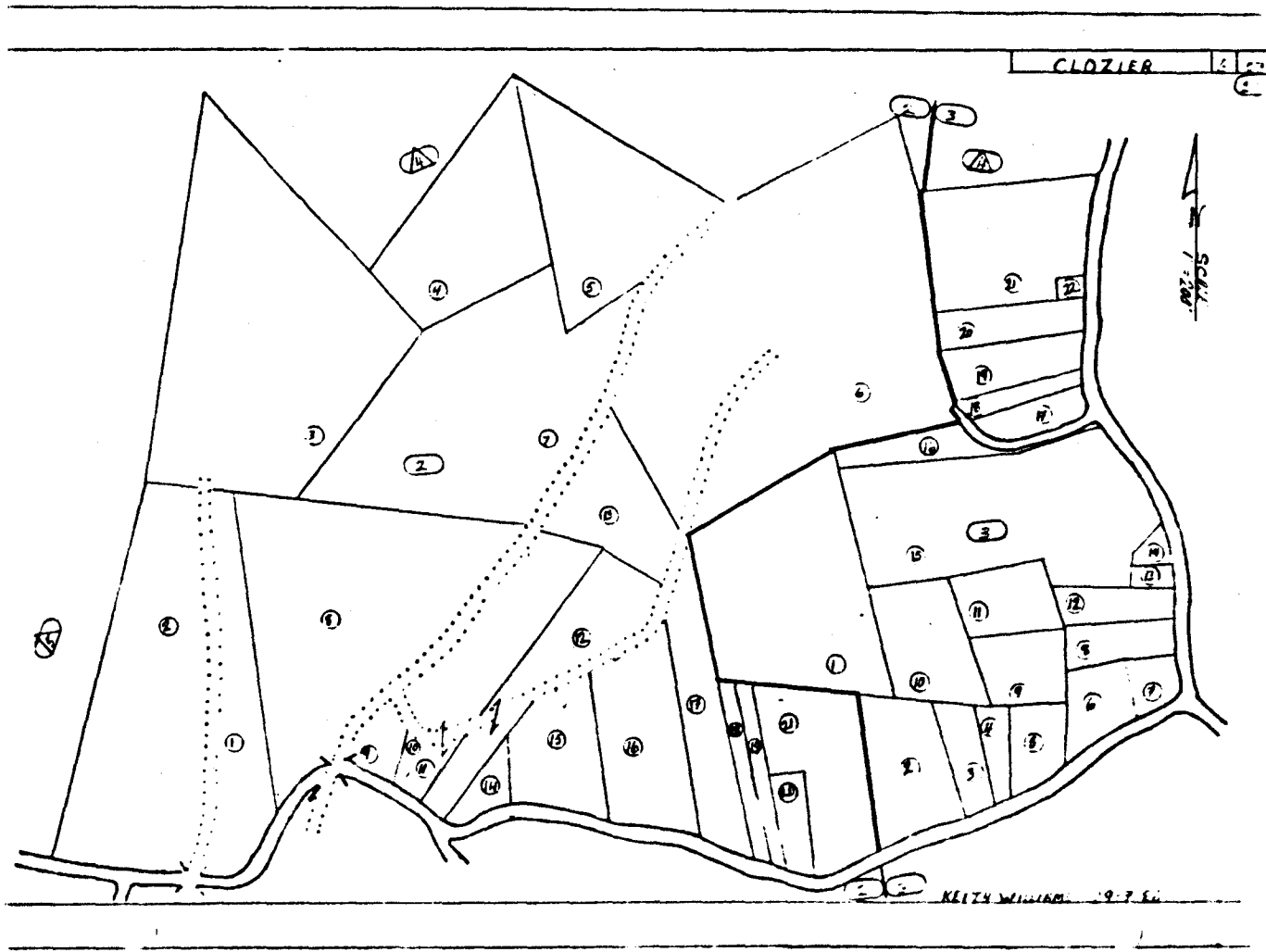
# BIBLIOGRAPHY

Abu-Zeid, H., and Dann, W. 1985. Health services utilization and cost in Ismailia, Egypt. _Social Science and Medicine_. 21:451-61.

Acuna, H. 1981. Health priorities in Latin America and the Pan American Health Organization. _Social Science and Medicine_. 15D: 537-9.

Agarwal, D. et al. 1980. Morbidity pattern and source of first contact care in rural underfive children. _Indian Pediatrics_. 17:931-7.

Ajzen, I., and Fishbein, M. 1980. _Understanding and predicting social behaviour_. Englewood Cliffs: Prentice Hall.

Akesode, F. 1982. Factors affecting the use of primary health care clinics for children. _Journal of Epidemiology and Community Health_. 36:310-4.

Aldrich, J., and Nelson, F. 1984. _Linear, probability, logit, and probit models_. Sage University Paper series on Quantitative Applications in the Social Sciences No. 45. Beverly Hills: Sage.

Alpert, J. et al. 1967. A month of illness and health care among low income families. _Public Health Reports_. 82:705-13.

Andersen, A., and Laake, P. 1987. A model for physician utilization within 2 weeks: analysis of Norwegian data. _Medical Care_. 25:300-10.

-------- and Laake, P. 1983. A causal model for physician utilization. _Medical Care_. 21:266-78.

Andersen, J. 1973. Health services utilization: framework and review. _Health Services Research_. 8:184-99.

Andersen, R. 1968. <u>A behavioural model of families use of health services</u>. Chicago: University of Chicago, Center for Health Administration Studies, Research Series No.25.

-------- and Kasper, J. 1973. The structural influence of family size on children's use of physicians services. <u>Journal of Comparative Family Studies</u>. 4:116-30.

-------- and Newman, F. 1973. Societal and individual determinants of medical care utilization in the U.S.. <u>Milibank Memorial Fund Quarterly</u>. 51:95-124.

--------, Kravits, J.; and Anderson, O. 1975. <u>Equity in health services: empirical analyses in social policy</u>. Cambridge, MA: Ballinger.

-------- et al (ed). 1975. <u>Equity in health services</u>. Cambridge, MA: Ballinger Publishing Co.

Angulo, J. 1987. Interdisciplinary approaches in epidemic studies - II: four geographic models of the flow of contagious disease. <u>Social Science and Medicine</u>. 24:57-69.

Annis, S. 1981. Physical access and utilization of health services in rural Guatemala. <u>Social Science and Medicine</u>. 15D:515-23.

Backett, E.; Davies, A.; and Petros-Barvazian, A. 1984. <u>The risk approach in health care, with special reference to maternal and child health, including family planning</u>. World Health Organization: Public Health Papers No. 76.

Bamisaiye, A. 1984. Selected factors influencing the coverage of an Medical CareH clinic in Lagos, Nigeria. <u>Journal of Tropical Pediatrics</u>. 30:256-61.

Barber, G. 1987. <u>Elementary statistics for geographers</u>. New York: Guilford.

Barer, M. et al. 1987. Aging and health care utilization: new evidence on old fallacies. <u>Social Science and Medicine</u>. 24:851-62.

Barrett, F. 1981. The development and current status of medical geography in Canada. Social Science and Medicine. 15D:21-6.

Bayer, R.; Caplan, A.; and Daniels, N. 1983. In search of equity: health needs and the health care system. Plenum.

Becker, M., and Maiman, L. 1975. Socio-behavioural determinantsof compliance with health and medical care recommendations. Medical Care. 13:10-24.

Beland, F. 1982. The utilization of health services: sequence of visits to general practitioners. Social Science and Medicine. 16:2065-72.

Belcher, D. et al. 1976. A household morbidity survey in rural Africa. International Journal of Epidemiology. 5:113-20.

Benyoussef, A., and Wessen, A. 1974. Utilization of health services in developing coutries - Tunisia. Social Science and Medicine. 8:287-304.

Bergwall, D.; Reeves, P.; and Woodside, N. 1974. Introduction to health planning. Washington, D.C.: Information Resources Press.

Berkanovic, E., and Reeder, L. 1974. Can money buy the appropriate use of services? Some notes on the meaning of utilization data. Journal of Health and Social Behavior. 15:93-9.

Bishop, Y.; Fienberg, S.; and Holland, P. 1977. Discrete multivariate analysis: theory and practice, (3rd ed). Cambridge, MA: MIT Press.

Bonney, G. 1986. Regressive logistic models for familial disease and other binary traits. Biometrics. 42:611-25.

Browner, W., and Nelson, F. 1987. Are all significant P values created equal? The analogy between diagnostic tests and clinical research. Journal of the American Medical Association. 257(18):2459-63.

Broyles, R. et al. 1983. The use of physician services under a national insurance scheme, an examination of the Canadian Health Survey. Medical Care. 21:1037-57.

Bull, S., and Pederson, L. 1988. Variances for polychotomous logistic regression using complex survey data. University of Western Ontario: Unpublished Manuscript.

Burns, H. et al. 1984. The revo and the U.S.: health care in Grenada. Health/PAC Bulletin. 14:43-53.

Callahan, D. 1973. The WHO definition of 'health'. The Hastings Center Studies. I:77-88.

Campion, P., and Gabriel, J. 1985. Illness behaviour in mothers with young children. Social Science and Medicine. 20:325-30.

Cassell, J. 1976. The contribution of social environment to host resistance. American Journal of Epidemiology. 104:107-23.

-------- et al. 1960. Epidemiological analysis of health implications of cultural change: a conceptual model. Annals of the New York Academy of Science. 84:938-49.

Chambers, L.W. 1982. Health program review in Canada: measurement of health status. Canadian Journal of Public Health. 73:26-34.

Chen, P. 1975. Medical systems in Malaysia: cultural bases and differential use. Social Science and Medicine. 171-180.

Chojnacka, H., and Olukunle, A. 1984. The determinants of infant and child morbidity in Lagos, Nigeria. Social Science and Medicine. 19:799-810.

Cleary, P., and Angel, R. 1984. The analysis of relationships involving dichotomous dependent variables. Journal of Health and Social Behaviour. 25:334-48.

Cleary, P.; Mechanic, D.; and Greenley, J. 1982. Sex differences in medical care utilization: an empirical investigation. Journal of Health and Social Behavior. 23:106-19.

Cohen, M., and Lee, H. 1985. The determinants of spatial distribution of hospital utilization in a region. Medical Care. 23:27-38.

Colson, A. 1971. The differential use of medical resources in developing countries. Journal of Health and Social Behavior. 12:226-37.

Crandall, L., and Duncan. R. 1981. Attitudinal and situational factors in the use of physician services by low-income persons. Journal of Health and Social Behavior. 22:64-77.

Culyer, A. 1978. Measuring health: lessons for Ontario. Ontario Economic Council (University of Toronto Press).

Desbarats, J. 1983. Spatial choice and constraints on behaviour. Annals of the AAG. 73(3):340-57.

Diaz, C. et al. 1986. Ill health and use of medical care: community-based assessment of morbidity in children. Medical Care. 24:848-56.

Dingle, J. 1959. An epidemiological study of illness in families. New York: Academic Press.

Dixon, W. (ed). 1985. BMDP statistical software. Berkeley: University of California Press.

Donabedian, A. 1972. Models for organizing the delivery of personal health services and criteria for evaluating them. Millbank Memorial Fund Quarterly. 50:103-21.

Dunn, F. 1984. Social determinants of tropical disease. In (eds) K. Warren and A. Mahmoud, Tropical and geographical medicine, McGraw-Hill.

Dunn, R., and Wrigley, N. 1985. Beta-logistic models of urban shopping centre choice. Geographical Analysis. 17:95-113.

--------; Reader, S.; and Wrigley, N. 1987. A nonparametric approach to the incorporation of heterogeneity into repeated polytomous choice models of urban shopping behaviour. Transportation Research Annals. 21A: [forthcoming].

Dutton, D. 1985. Socio-economic status and children's health. Medical Care. 23:142-56.

Egbuonu, L., and Starfield, B. 1982. Child health and social status. Pediatrics. 69:550-7.

Engels, F. 1845. The condition of the working class in England in 1844. London: Swan Sonnenschein & Co.

Etlin, D.; Milner, J.; and White, N. 1981. An ecological-interactional view of disease. In The health conundrum, ed. N. White, The Ontario Educational Communications Authority.

Evans, A. 1976. Causation and disease: the Henle-Koch postulates revisited. The Yale Journal of Biology and Medicine. 49:175-95.

Evashwick, C. et al. 1984. Factors explaining the use of health care services by the elderly. Health Services Research. 19:357-82.

Eyles, J. 1987. The geography of the national health: an essay in welfare geography. Croom Helm.

--------. 1982. Health and medicine in urban society: the social construction and fetishism of health. Dept.Geography, Queen Mary College, London, Occaisional Paper. 20:13-34.

--------, and Woods, K. 1983. The Social Geography of Medicine and Health. New York: St. Martin's Press.

Fabrega, H., and Zucker, M. 1979. Components of illness and type of medical practice: a comparative study. Social Science and Medicine. 13A:13-23.

Feachem, R. 1986. Preventing diarrhoea: what are the policy options?. Health Policy and Planning. 1(2):109-17.

--------. 1984. Interventions for the control of diarrhoeal diseases among young children: promotion of personal and domestic hygiene. Bulletin of the World Health Organization. 62(3):467-76.

--------, and Koblinsky, M. 1984. Interventions for the control of diarrhoeal diseases among young children: promotion of breast-feeding. Bulletin of the World Health Organization. 62(2):271-91.

Feachem, R.; Hogan, R.; and Merson, M. 1983. Diarrhoeal disease control: reviews of potential interventions. Bulletin of the World Health Organization. 61(4):637-40.

Fergusson, D. M. et al. 1984. The utilisation of preschool health and education services. Social Science and Medicine. 19:1173-80.

Fiedler, J. 1981. A review of the literature on access to and utilization of medical care with special emphasis on rural primary care. Social Science and Medicine. 15C:129-42.

Fienberg, S. 1978. The Analysis of Cross-Classified Categorical Data. Cambridge, MA: MIT Press.

‑‑‑‑‑‑‑‑ et al. 1985. Cognitive aspects of health survey methodology: an overview. Milbank Memorial Fund Quarterly. 63(1):547-65

Foets, M.; Berghmans, F.; and Janssens, L. 1985. The primary health care project in Belgium: Social Science and Medicine. 20:181-90.

Freeman, D. et al. 1983. A categorical data analysis of contact with the family health clinic, Calabar, Nigeria. Social Science and Medicine. 17:571-8.

Gesler, W. 1984. Health care in developing countries. Washington, D.C.: Association of American Geographers.

‑‑‑‑‑‑‑‑. 1979. Illness and health practitioner use in Calaber, Nigeria. Social Science and Medicine. 13D:23-30.

Good, C. 1977. Traditional medicine: an agenda for medical geography. Social Science and Medicine. 11: .

Gortmaker, S.; Eckenrode, J.; and Gore, S. 1982. Stress and the utilization of health services: a time series and cross-sectional analysis. Journal of Health and Social Behavior. 23:25-38.

Gray, A.M. 1982. Inequalities in health. The Black Report: a summary and comment. International Journal of Health Services. 12:349-81.

Green, L. 1985. Some challenges to health services research on children and the elderly. Health Services Research. 19:793-815.

Green, L. 1975. Should health education abandon attitude change strategies? Perspectives from recent research. Health Education Monographs. 3(30):25-48.

Grosse, R., and Harkavy, O. 1980. The role of health in development. Social Science and Medicine. 14C:165-9.

Habib, O., and Vaughan, J. 1986. The determinants of health services utilization in southern Iraq: a household interview survey. International Journal of Epidemiology. 15:395-402.

Haddock, K. 1979. Disease and development in the tropics: a review of Chagas' disease. Social Science and Medicine. 13D:53-60.

Hammond R., and McCullagh P. 1980. Quantitative techniques in geography: an introduction (2nd ed). Oxford: Clarendon Press.

Hanlon, J. 1974. Public health: administratin and practice. Saint Louis: The C. V. Mosby Company.

Hare, E., and Shaw, G. 1965. A study in family health: a comparison of the health of fathers, mothers and children. British Journal of Psychiatry. 111:467-71.

Harvard Child Health Project Task Force. 1977a. Toward a primary medical care system responsive to children's needs. Cambridge, MA: Ballinger.

————. 1977b. Developing a better health care system for children. Cambridge, MA: Ballinger.

Hassinger, E. 1982. Rural health organization: social networks and regionalization. Ames, Iowa: Iowa State University Press.

Hayes, M. 1988. The risk approach in diarrhoeal disease interventions in Grenada, West Indies. McMaster University: forthcoming PhD thesis.

Hershey, J.; Luft, H.; and Gianaris, J. 1975. Making sense out of utilization data. Medical Care. 13:838-54.

Hill, A.B. 1965. The environment and disease: association or causation? Proceedings of the Royal Society of Medicine. Section of Occupational Medicine. 58:295-   .

Hodgson, J. 1984. A general purpose distance matrix generator. The Operational Geographer. (5):10-16.

Holland, W.W. (ed). 1983. Evaluation of health care. Oxford University Press.

Horn, D. 1976. A model for the study of personal choice health behaviour. International Journal of Health Education. 19(2):89-98.

Horowitz, S.; Morgenster, H.; Berkman, L. 1985. The use of pediatric medical care: a critical review. Journal of Chronic Disease. 38:935-45.

Hunter, J., and Shannon, G. 1985. Jarvis revisited: distance decay in service areas of mid-19th century asylums. Professional Geography. 37:296-302.

--------, and Shannon, G. 1984. Exercises on distance decay using mental health historical data. Journal of Geography. 83:277-84.

Islam S., and Khan M. 1986. Risk factors for diarrhoeal deaths: a case-control study at a diarrhoeal disease hospital in Bangladesh. International Journal of Epidemiology. 15(1):116-21.

Isley, R. 1982. Evaluating the role of health education strategies in the prevention of diarrhea and dehydration. Journal of Tropical Pediatrics. 28:253-61.

Jakobsen, O. 1978. Economic and geographical factors influencing child malnutrition in the southern highlands, Tanzania. GeoJournal. 2:355-76.

Jelley, D. et al. 1984. The uptake of preventive and curative child health services in Maputa, Mozambique. Annals of Tropical Pediatrics. 4:177-82.

Jette, A. et al. 1981. The structure and reliability of health belief indices. Health Services Research. 16:81-98.

Jong, G., and Rutten, F. 1983. Justice and health for all. Social Science and Medicine. 17C:1085-95.

Joseph, A. 1979. The referral system as a modifier of distance decay effects in the utilization of mental health care services. Canadian Geographer. 23:159-69.

--------, and Phillips, D. 1984. Accessibility and utilization: geographical perspectives on health care delivery. New York: Harper and Row.

--------, and Poyner, A. 1982. Interpreting patterns of public service utilization in rural areas. Economic Geography. 58:262-73.

Kasl, S., and Cobb, S. 1966. Health behaviour, illness behaviour and sick role behaviour. Archives of Environmental Health. 12:246-66.

Khan, R. 1971. Purpose, scope and progress in medical geography. International Geographical Journal. 46:1-9.

King, P.E. 1979. Problems of spatial analysis in geographical epidemiology. Social Science and Medicine. 13D:249-52.

King, M. (ed). 1966. Medical care in developing countries. Nairobi: Oxford University Press.

Kleinman, J.; Gold, M.; Makuc, D. 1981. Use of ambulatory medical care by the poor: another look at equity. Medical Care. 19:1011-29.

Kloos, H. et al. 1987. Illness and health behaviour in Addis Ababa and rural central Ethiopia. Social Science and Medicine. 25:1003-19.

Knowles, J. 1980. Health, population and development. Social Science and Medicine. 14C:67-70.

Kohn, R. and White, K. (eds). 1976. Health care: an international study. Oxford University Press.

Kratochoil, O.   1971.   The importance of medical geography in medicine. Geographical Medicine. 2:74-108.

Kroeger, A. 1983. Health interview surveys in developing countries: a review of the methods and results. International Journal of Epidemiology. 12:465-81.

Kronenfeld, J.   1980.   Sources of ambulatory care and utilization models. Health Services Research. 15:3-20.

Lalonde, M. 1974.  A new perspective on the health of Canadians:  a working document. Ottawa: Government of Canada.

Langlie, J. 1977.   Social networks, health beliefs and preventive health behaviour. Journal of Health and Social Behaviour.  18:244-60.

Learmonth, A. 1981. Geographers and health and disease studies 1972-80.  Social Science and Medicine. 15D:9-19.

--------. 1978.   Patterns of disease and hunger. Newton Abbot: David and Charles.

--------. 1975. Ecological medical geography. Progress in Geography. 7:201-26.

--------. 1969. Viewpoints on medical geography.  Special Libraries Association, Geography and Map Division Bulletin. (78):32-8.

Linder-Pelz, S.   1982a.   Toward a theory of patient satisfaction. Social Science and Medicine. 16:577-82.

--------. 1982b.   Social psychological determinants of patient satisfaction:  a test of five hypotheses. Social Science and Medicine. 16:583-9.

Litman, T. 1974. The family as a basic unit in health and medical care: a social-behavioral overview. Social Science and Medicine. 8:495-519.

--------. 1971. Health care and the family:  a three-generational analysis. Medical Care. 9:67-81.

Luft, H. 1978. <u>Poverty and health: economic causes and consequences of health problems</u>. Massachusetts: Ballinger Publishing Company.

Maiman, L. et al. 1977. Scales for measuring health belief model dimensions. <u>Health Education Monographs</u>. 5(3):215-30.

Mann, K. et al (eds). 1970. <u>Visits to doctors</u>. Jerusalem: Jerusalem Academic Press.

Martin, A. 1967. Environment, housing and health. <u>Urban Studies</u>. 4:1-21.

May, J. 1952. <u>History, definition, and problems of medical geography: a general review. Report to the Commission on Medical Geography of the International Geographical Union</u>. Washington: IGU/UNESCO.

--------. 1950. Medical geography: its methods and objectives. <u>Geographical Review</u>. 40:9-41.

Mayer, J. 1983. The role of spatial analysis and geographic data in the detection of disease causation. <u>Social Science and Medicine</u>. 17:1213-1221.

--------. 1982a. Medical geography: some unsolved problems. <u>Professional Geographer</u>. 34(2):261-9.

--------. 1982b. Relations between two traditions of medical geography: health systems planning and geographical epidemiology. <u>Progress in Human Geography</u>. 6:216-30.

Mburu, F. et al. 1978. The determinants of health services utilization in a rural community in Kenya. <u>Social Science and Medicine</u>. 12A:211-17.

McGlashan, N. (ed). 1972. <u>Medical Geography: Techniques and Field Studies</u>. London: Methuen.

--------, and Blunden, J. (eds). 1983. <u>Geographical aspects of health</u>. New York: Academic Press.

McGuirck, M., and Porell, F. 1984. Spatial patterns of hospital utilization: the impact of distance and time. <u>Inquiry</u>. 21:84-95.

McKeown, T.   1985.   Looking at disease in the light of human development.   <u>World Health Forum</u>.   6(1):70-5.

--------.   1978.   Determinants of health.   <u>Human Nature</u>. 1(4):54-8.

--------.   1976.   <u>The role of medicine:   dream, mirage or nemesis?</u>.   Nuffield Provincial Hospitals Trust.

McKinlay, J.   1972.   Some approaches and problems in the study of the use of services - an overview.   <u>Journal of Health and Social Behavior</u>.   13:115-52.

Meade, M. (ed).   1980.   <u>Conceptual and Methodological Issues in Medical Geography</u>.   Univ. of North Carolina at Chapel Hill:   Dept.   of Geography,   Studies   in Geography No. 15.

--------.   1977.   Medical geography as human ecology:   the dimension of population movement.   <u>The Geographical Review</u>.   67:379-93.

Mechanic, D.   1979.   Correlates of physician utilization. <u>Journal of Health and Social Behaviour</u>.   20:387-96.

--------.   1964.   The   influence   of   mothers   on   their children's   health   attitudes   and   behavior. <u>Pediatrics</u>.   33:444-53.

--------, and Volkart, E.   1960.   Stress,   illness behaviour and   the   sick   role.   <u>Journal of Chronic Disease</u>. 1:51-8.

Miles, I.   1987.   Some   observations   on   'unemployment and health'   research.   <u>Social   Science   and Medicine</u>. 25:223-25.

Milio, N.   1977.   An ecological approach   to health planning for illness   prevention.   <u>American Journal of Health Planning</u>.   2:7-11.

Miller, F. J.   1974.   The epidimiological   approach to the family   as   a   unit   in   health   statistics   and the measurement of community health.   <u>Social Science and Medicine</u>.   8:479-82.

Morgan, M.   1980.   Marital   status, health, illness and service use.   <u>Social Science and Medicine</u>.   14A:633-43.

Morgan, R. 1973. Migration as a factor in the acceptance of medical care. Social Science and Medicine. 7:865-73.

Morrill, R.; Earickson, R.; and Rees, P. 1970. Factors influencing distances travelled to hospitals. Economic Geography. 46:401-22.

Mullen, P.; Hersey, J.; and Iverson, D. 1987. Health behaviour models compared. Social Science and Medicine. 24:973-81.

Muller, C. 1986. Review of twenty years of research on medical care utilization. Health Services Research. 21:129-44.

Mwabu, G. 1986. Health care decisions at the household level: results of a rural health survey in Kenya. Social Science and Medicine. 22:315-319.

Myers, J. 1982. Human behaviour-ecological model of disease causation: diarrhoeal disease among preschool children in Grenada. McMaster University: Research Proposal for PhD Dissertation.

Nchinda, T. 1977. A household study of illness prevalence and health care preferences in a rural district of Cameroon. International Journal of Epidemiology. 6:231-41.

Newacheck, P., and Halfon, N. 1986. The Association between mother's and children's use of physician services. Medical Care. 24:30-8.

Ogionwo, W. 1973. Socio-psychological factors in health behaviour: an experimental study on methods and attitude change. International Journal of Health Education. 16:supplement.

Ojanuga, D., and Lefcowitz, M. 1982. Typology of health care consumers in Nigeria. Social Science and Medicine. 16:1649-52.

Orr, S.; Miller, C.; and James, S. 1984. Differences in use of health services by children according to race: relative importance of cultural and system-related factors. Medical Care. 22:848-53.

Osterweis, M.; Bush, P.; and Zuckerman, A. 1979. Family context as a predictor of individual medicine use. Social Science and Medicine. 13A:287-91.

Paul, B. 1985. Approaches to medical geography: an historical perspective. Social Science and Medicine. 20(4):399-409.

Pelto, G. 1987. Cultural issues in maternal and child health and nutrition. Social Science and Medicine. 25:553-59.

Phillips, D. 1985. Directions for medical geography in the 1980's: some observations from the U.K.. Social Science and Medicine. 20(4):404-405.

Pickering, H. 1985. Social and environmental factors associated with diarrhoea and growth in young children: child health in urban Africa. Social Science and Medicine. 21:121-7.

Pless, I. 1984. The family as a resource unit in health care: changing patterns. Social Science and Medicine. 19:385-89.

Poland, B. 1987. Determining the role of beliefs, attitudes and behaviour in the epidemiology of disease: the evolution of a conceptual framework. Unpublished manuscript.

--------. 1986. The role of medical geography in the study of water-related disease: a review of the literature with emphasis on schistosomiasis. Ottawa: Carleton University, unpublished B.A. Thesis.

Polissar, L., and Diehr, P. 1982. Regression analysis in health services research: the use of dummy variables. Medical Care. 20:959-66.

Pregibon, D. 1982. Resistant fits of some commonly used logistic models with medical applications. Biometrics. 38:485-98.

--------. 1981. Logistic regression diagnostics. Annual Statatistician. 9:705-24.

Pyle, G. 1979a. Applied Medical Geography. Toronto: Wiley.

Pyle, G.   1979b.   Expanding North American perspectives on medical geography.   Social Science and Medicine. 13D:205-7.

--------.   1977.   International communication and medical geography.   Social Science and Medicine.   11:679-82.

--------.   1976.   Introduction:   foundations to medical geography.   Economic Geography.   52:95-102.

Rabin,   D.;   Kalimo,   E.;   and   Mabry,   J.   1974.   The World Health   Organization   international   collaborative study   of   medical   care   utilization:   a summary of methodological   studies   and   preliminary   findings. Social Science and Medicine.   8:255-62.

Ramachandran,   H.,   and   Shastri,   G.   1983.   Movement for medical treatment:   a study on contact patterns of a rural   population.   Social   Science   and Medicine. 17:177-87.

Ramalingaswami, P.   1986.   The child as  a focus  for health promotion in  the developing  world.  Social Science and Medicine.   22:1181-86.

Reinke,   W.   1976.   Alternative   methods   for determining resource   requirements:   the   Chile   example. International Journal of Health Services.  6:123-37.

Roberts, G.   1987.   Generalized  response models  for survey data.   Statistics Canada:   Unpublished Manuscript.

--------; Rao, J.; and Kumar, S.  1987.  Logistic regression analysis   of   sample   survey   data.   Biometrika. 74(1):1-12.

Rodwin,   V.   1987.   The  health  planning  predicament. Berkeley, CA:  University of California Press.

Rosenburg, M.  1983.  Accessibility to health care:  a North American perspective.   Progress in Human Geography. 7:78-87.

Rosenstock, I.  ·1966.   Why  people  use  health services. Milbank Memorial Fund Quarterly.   44(3):94-127.

Ross, D.,  and Vaughan,  J.  1986.  Health interview surveys in developing  countries:   a methodological review. Studies in Family Planning.   17:78-94.

Roundy, R. 1978. A model for combining human behaviour and disease ecology to assess disease hazard in a community: rural Ethiopia as a model. Social Science and Medicine. 12D:121-30.

--------; Roundy, L.; and Nawalinski, T. 1983. Scale in the relationship between behaviour and disease. In Geographical aspects of health, eds N. McGlashan and J. Blunden, New York: Academic Press.

Saeed, A. 1984. Utilization of primary health services in Port Sudan, Sudan. Tropical and Geographical Medicine. 36:267-72.

Safer, M. et al. 1979. Determinants of three stages of delay in seeking care at a medical clinic. Medical Care. 17:11-29.

Schor, E. et al. 1987. Family health: utilization and effects of family membership. Medical Care. 25:616-26.

Schulpen, T., and Swinkles, W. 1980. Machakos Project studies: agents affecting health of mother and child in a rural area of Kenya, XIX. The utilization of health services in a rural area of Kenya. Tropical and Geographical Medicine. 32:340-9.

Seigel, S. 1956. Non-parametric statistics for the behavioural sciences. McGraw-Hill.

Shah, C.; Kahan, M.; and Krauser, J. 1987. The health of children of low-income families. Canadian Medical Association Journal. 137:485-90.

Shannon, G. 1980. The utility of medical geography research. Social Science and Medicine. 14D:1-2.

--------. 1977. Space, time and illness behaviour. Social Science and Medicine. 11:683-9.

--------, and Dever, G. 1974. Health care delivery: spatial perspectives. New York: McGraw-Hill.

--------, and Metzner, C. 1971. Some ecological differentials in the use of medical services. Health Services. 6:61-75.

Shannon, G.; Bashur, R.; and Metzner, C. 1969. The concept of distance as a factor in accessibility and utilization of health care. <u>Medical Care Review</u>. 26:143-61.

--------; Skinner, J.; and Bashur, R. 1973. Time and distance: the journey for medical care. <u>International Journal of Health Services</u>. 3:237-44.

-------- et al. 1975. A method for evaluating the geographic accessibility of health services. <u>Professional Geographer</u>. 27:30-6.

Shapiro, J. 1983. Family reactions and coping strategies in response to the physically ill or handicapped child: a review. <u>Social Science and Medicine</u>. 17:913-31.

Snyder, J., and Merson, M. 1982. The magnitude of the global problem of acute diarrhoeal disease: a review of active surveillance data. <u>Bulletin of the World Health Organization</u>. 60:605-13.

Sprague, H., and May J. 1978. Family age in the epidemiology of family health. <u>Social Science and Medicine</u>. 12:271-75.

SPSSX Inc. 1986. <u>SPSSX user's guide, 2nd ed</u>. Chicago: SPSX Inc.

Starfield, B. 1982. Child health and socio-economic status. <u>American Journal of Public Health</u>. 72: 532-4.

-------- et al. 1985. Utilization and morbidity: random or tandem? <u>Pediatrics</u>. 75:241-6.

-------- et al. 1984. Morbidity in childhood: a longitudinal view. <u>The New England Journal of Medicine</u>. 310:824-9.

Steele, J., and McBroom, W. 1972. Conceptual and empirical dimensions of health behaviour. <u>Journal of Health and Social Behavior</u>. 13: 382-92.

Stock, R. 1983. Distance and the utilization of health facilities in rural Nigeria. <u>Social Science and Medicine</u>. 17:563-70.

Suchman, E. 1965. Social patterns of illness and medical care. <u>Journal of Health and Human Behaviour</u>. 6:2-16.

--------. 1964. Sociomedical variation among ethnic groups. <u>American Journal of Sociology</u>. 70:319-31.

Swinkles, W., and Schulpen, T. 1980. Machakos Project studies: agents affecting health of mother and child in a rural area of Kenya, XX. A dynamic approach to the utilization of health services in a rural area of Machakos, Kenya. <u>Tropical and Geographical Medicine</u>. 32:350-7.

Syme, S., and Berkman, L. 1976. Social class, susceptibility and sickness. <u>American Journal of Epidemiology</u>. 104:1-8.

Taylor, S. et al. 1986. Modelling the incidence of childhood diarrhea. <u>Social Science and Medicine</u>. 23:995-1002.

Tessler, R. 1980. Birth order, family size, and children's use of physician services. <u>Health Services Research</u>. 15:55-62.

Thomas, W., and Penchansky, R. 1984. Relating satisfaction with access to utilization of services. <u>Medical Care</u>. 22:553-68.

Thouez, J-P. 1987. <u>Organisation spatiale des systemes de soins</u>. Montreal, Que.: Les Presses de l'Universite de Montreal.

--------; Muran, L.; Nabahi, I. 1981. Facteurs associes avec l'utilisation des soins de sante en milieu rural. <u>Social Science and Medicine</u>. 15D:379-87.

Townsend, P., and Davidson, N. 1982. <u>Inequalities in health: the Black Report</u>. Penguin.

Verbrugge, L. 1982. Sex differentials in health. <u>Public Health Reports</u>. 97:417-37.

Walsh, J., and Warren, K. 1979. Selective primary health care: an interim strategy for disease control in developing countries. <u>New England Journal of Medicine</u>. 301:967-74.

Warren, K., and Mahmoud, A. 1984. <u>Tropical and geographical medicine</u>. McGraw-Hill.

Weiss, , and Greenlick, . 1970. Determinants of medical care utilization: the effects of social class and distance on contacts with the medical system. <u>Medical Care</u>. 8:456-62.

White, N. 1986. <u>The health quadrant model: key morbidity distinctions for health promotion planning</u>. Paper presented to a WHO-HWC-CPH Conference on Health Promotion, 17-21 November, 1986, Ottawa.

--------. 1983. <u>Social determinants of health, disease and illness</u>. Paper presented to the Action Centre '83 Annual Conference of District Health Councils, 16 September 1983, London, Ontario.

--------. 1982. <u>Health and morbidity: socio-ecological factors</u>. Health Science 771 Reference Paper.

-------- (ed). 1981. <u>The health conundrum</u>. Toronto: Ontario Educational Communications Authority.

--------, and Taylor, S. 1986. <u>Community participation in the reduction of childhood morbidity: operations research component</u>. Hamilton, Ontario: McMaster University.

Wilcox-Gok, V. 1983. Sibling data and the family background influence on child health. <u>Medical Care</u>. 21:630-8.

Wolfe, B. 1980. Children's utilization of medical care. <u>Medical Care</u>. 18:1196-1207.

Wolinsky, F. et al. 1983. Health services utilization among the non-institutionalized elderly. <u>Journal of Health and Social Behaviour</u>. 24:325-37.

--------. 1978. Assessing the effects of predisposing, enabling, and illness-morbidity characteristics on health service utilization. <u>Journal of Health and Human Behaviour</u>. 19:384-96.

World Health Organization. 1978a. <u>Primary health care: Alma Ata 1978</u>. Geneva: World Health Organization.

--------. 1978b. <u>Risk approach for maternal and child health care</u>. Geneva: World Health Organization.

World Organization of Nation Colleges, Academies and Academic Associations of General Practitioners/Family Physicians (WONCA). 1983. International classification of health patterns in primary care, (3rd ed.). Oxford: Oxford University Press.

Wrigley N. 1986. Quantitative methods: the era of longitudinal data analysis. Progress in Human Geography. 10(1):84-102.

--------. 1985. Categorical data analysis for geographers and environmental scientists. New York: Longman.

--------. 1983. Quantitative methods: on data and diagnostics. Progress in Human Geography. 7(4):567-77.

--------. 1976. Introduction to the Use of Logit Models in Geography. Concepts and Techniques in Modern Geography No. 10. Norwich, U.K.: Geo Abstracts.

--------, and Dunn, R. 1986. Graphical diagnostics for logistic oil exploration models. Mathematical Geology. 18(4):355-74.

Young, T.K. 1985. BCG vaccination among Canadian Indians and Inuit: the epidemiological bases for policy decision. Canadian Journal of Public Health. 76:124-9.

Zanna, M. et al. 1980. Attitude-behaviour consistency: an individual difference perspective. Journal of Personality and Social Psychology. 38(3):432-40.