AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D. C. 20523

BIBLIOGRAPHIC INPUT SHEET

FOR AID USE ONLY
Batch 55

1. SUBJECT CLASSIFICATION
A. PRIMARY: TEMPORARY
B. SECONDARY:

2. TITLE AND SUBTITLE
A model of the demand for medical and health services in west Malaysia

3. AUTHOR(S)
Heller,P.S.

4. DOCUMENT DATE: 1976
5. NUMBER OF PAGES: ~~58p.~~ 61p.
6. ARC NUMBER: ARC

7. REFERENCE ORGANIZATION NAME AND ADDRESS
Mich.

8. SUPPLEMENTARY NOTES (Sponsoring Organization, Publishers, Availability)
(In Discussion paper no.62)

9. ABSTRACT
(HEALTH R&D)

This study tests the validity of the assumption that the demand curve is highly elastic with respect to time and price of health care in public sector health care systems, which have the goal of ensuring adequate medical care for the entire population. The data obtained from a 1975 household survey in West Malyasia is used here to develop a theoretical and econometric model of the demand for medical care. (1) is demand for output and inpatient care sensitive to its cost in time and financial resources? (2) are the principal consumers those with the highest rate of illness? (3) is demand elastic to income? (4) what factors lead to treatment from traditional medical practitioners rather than modern medical facilities? (5) what explains the choice of private rather than public clinics? (6) does the pattern of demand differ across cultures? and finally (7) what is the income distributional impact of the public sector's subsidization of medical care?

The results indicate that total medical demand appears inelastic to cash price, cost in time, or income; also as income rises, households shift their demand away from traditional practitioners and toward modern medical sources. This finding holds across ethnic groups in both urban and rural areas.

10. CONTROL NUMBER
PN-AAD-389

11. PRICE OF DOCUMENT

12. DESCRIPTORS

13. PROJECT NUMBER

14. CONTRACT NUMBER
CSD-2547 211(d)

15. TYPE OF DOCUMENT

AID 590-1 (4-74)

PN-AAI-504

A MODEL OF THE DEMAND FOR MEDICAL AND HEALTH SERVICES IN WEST MALAYSIA

by

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Discussion Paper No. 62

October 1976

ABSTRACT

A Model of the Demand for Medical Care and Health Services in West Malaysia

Peter S. Heller

This paper provides an empirical analysis of the determinants of the demand for medical services in peninsular Malaysia. After elaborating a theoretical model of household demand for medical care in Section 1, an econometric model is specified and estimated in Sections II,III, and IV. The results indicate that total medical demand, as measured by the absolute volume of outpatient and inpatient consumption, is highly inelastic to the cash price and to the cost in time of utilization. Total medical demand is also inelastic with respect to income. Yet consumes are clearly responsive to the relative prices of alternative sources of medical care. Consumers are also sensitive to the way in which the time of utilization is spent, with high travel time causing reduced demand for services. Finally, the paper provides estimates of the income distributional implications of the public sector's subsidization of medical care. It finds that the share of lower income groups in the value of the total public sector subsidy is proportional to their share in the population, viz, that the value of these subsidies relative to income is highly progressive. This suggests that the Malaysian model of health delivery may constitute an effective instrument for redistributing income in developing countries.

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Ce document fournit une analyse empirique des déterminants de la demande en soins médicaux en Malaisie péninsulaire. Après l'élaboration, dans la Section I, d'un modèle théorique de la demande domestique en soins médicaux, un modèle économétrique est déterminé et évalué dans les Sections II, III, et IV. Les résultats indiquent que la demande médicale totale, mesurée par le volume absolu de consommation des malades internes ou externes, ne varie pas selon les prix et les frais au moment de l'utilisation. La demande est également la même quels que soient les revenus. Pourtant, les consommateurs se montrent en faveur des prix relatifs des sources alternatives de soins médicaux. Les consommateurs réagissent également à la manière dont le temps d'utilisation est employé, l'importance du temps passé dans les transports provoquant la réduction de la demande des services. Enfin, ce document fournit des estimations des implications distributives salariales dans la subdivision des soins médicaux du secteur public. Ceci fait apparaître que la portion des groupes à petits revenus dans la valeur de la subvention du secteur public total est proportionnelle à leur portion dans la population, ce qui revient à dire que la valeur de ces subventions en fonction du revenu est grandement progressive. Ceci suggère que le modèle malaisien de livraison des soins pourrait bien constituer un instrument effectif de redistribution du revenu dans les pays en voie de développement.

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A common goal of most public sector health care systems in developing countries (LDC's) is to ensure that an adequate amount of medical care is available to the entire population. Differences in location -- urban or rural -- or in income should not prevent an individual from obtaining medical care in the event of illness. It is not surprising then, that the literature on the economics of health care in LDC's should concentrate disproportionately on the substantive problems of supplying medical services in a resource-poor economy. The factors underlying the demand for care are taken for granted. The commonly observed policy of subsidizing medical care suggests a belief that the demand curve is highly elastic. Policies aimed at reducing the necessary travel time to a clinic and shortening the average waiting and treatment time suggest the belief that the demand for medical care is also elastic with respect to the time price of care. By reducing the price of medical consumption sufficiently, the expectation is that most illnesses will be seen at a health clinic through the self-referral of the patient. Yet few studies have ever tested the validity of these demand assumptions in the context of a developing country.

This paper develops a theoretical and econometric model of the demand for medical care, and empirically tests these demand assumptions on data obtained from a 1975 household survey in West Malaysia. Specifically, is household demand for outpatient and inpatient care sensitive to its cost in time and financial resources? Are the principal consumers of medical care those groups with the highest rate of illness? Is the demand for medical care elastic to income? In addition, we examine several aspects of the demand for medical care that are peculiar to a developing country. What factors lead households to seek treatment from traditional medical practitioners rather than from modern medical facilities? What explains a household's choice of a private rather than public outpatient clinic? Malaysia is a society made up of three ethnic groups with strikingly different cultures -- Malays, Chinese,

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* This paper could not have been written without the efforts of Jacob Meerman in developing the survey data on which this analysis is based and in making it available for this purpose. His comments on an earlier draft were exceedingly helpful. I also gratefully acknowledge the comments, advice and criticism of J. Cross, J. Elliot, P. Feldstein, O. Gish, S. Hymans, J. Kmenta and R. Porter, the research assistance of M. Rosegrant and J. Gerson and the financial assistance of the Center for Research on Economic Development and the International Bank for Reconstruction and Development.

and Indians. Does the pattern of demand differ across these groups? Finally, we can relate the observed pattern of demand for public sector medical services to the cost to the public sector for its provision in order to answer a policy question of overriding importance. What is the income distributional impact of the public sector's subsidization of medical care?

Examination of these issues for the West Malaysian public health system is of particular policy relevance. Within the last 20 years, Malaysia has developed a comparatively dense network of hospitals, health centers and midwife clinics in the urban and rural areas. Extensive reliance is placed on medical auxiliaries for diagnosis and treatment at the primary outpatient clinic level, particularly in rural areas. This has significantly reduced the queueing costs associated with a physician-based system. Mobile medical teams regularly fan out from the health centers to provide care to the dispersed rural population. As a consequence, the mean time cost of utilizing a government outpatient clinic is only one hour. The fees for service are heavily subsidized and a household spends an average of only U.S.$.15 relative to an average household per capita income of U.S.$470. If Malaysia has been successful in providing an adequate network of medical care,[1] one should find that the importance of the cash price and the time cost of care as barriers to medical consumption would be very small. Our analysis should provide evidence on this hypothesis.

In Section IIA, we shall develop a theoretical model that will suggest some of the difficulties in estimating normal price and income effects on the demand for medical care. Section IIB discusses the specification of the econometric model. Section III describes the data and the methodology applied in estimating the model, and the results are evaluated in Section IV. In Section V, we evaluate which income groups are the principal beneficiaries of public health expenditure.

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[1]Many studies have shown that the pool of consumers at an outpatient clinic in the rural areas of LDC's are drawn disproportionately from households residing within a four to five mile radius of the clinics(Bryant(1969), King(1968). In a paper focussing on the U.S., Acton has demonstrated some elasticity in demand for O.E.O. sponsored health services with respect to time (Acton(1975)).

IIA

The Model

An important aspect of our econometric model will be its focus on the effect of variations in the level of household income and in the cost in time and financial resources on the demand for medical care in West Malaysia. In developing a theoretical model, our primary objective is to isolate the basic behavioral and medical relationships underlying this demand and to evaluate what they imply about the role of the above economic variables. What factors differentiate the demand for medical care from that of other goods?

The demand for medical care, whether it be preventive or curative, derives from a more fundamental demand for good health. The consumption of preventive services is made in the belief that they will reduce the likelihood of future illness and in the expectation that the cost in prevention is significantly lower than the expected cost of illness. The demand for curative care arises in response to the perception of symptoms of possible illness and is made in the hope of being cured, for the alleviation of pain, or for the medical assurance that the symptoms are not significant. This suggests that the demand for medical services will be influenced both by an individual's state of health -- i.e., the frequency of illness (morbidity) -- and by the economic factors which are likely to underlie the demand for any kind of good (income, the set of market prices for goods and leisure, etc.). Yet the health status of an individual is not independent of these economic factors, being influenced by the other consumption choices of the individual. Particularly in developing countries, we might expect that the capacity to afford more medical care would be associated with a capacity to afford the kinds of other consumption which would reduce the frequency of illness.

Specifically, several factors determine the quality of an individual's health status. The quality of the external environment -- the virulence and prevalence of pathenogenic agents -- determines the general level of risk of illness. Greater consumption of clothing, shelter, nutrients, treated water, etc. may provide partial insulation against these risks while strengthening the body's ability to resist infection. Consumption of preventive health services may provide immunological resistance, and/or improve the individual's hygienic behavior.

Yet there are limits to a person's ability to insulate against or "prevent" illness. An individual's age influences the likelihood of illness. In developing countries, one might hypothesize a U-shaped relationship between age and morbidity. There are high risks in the infant and toddler years. In later years, bodily aging may be conceptually perceived as the depreciation of human capital. The likelihood of malfunction increases with age. Medical inputs may restore some of the lost capital.

Assume an individual's health status H is the function

$$H = H(x,k,A,E,e) \qquad \ldots(1)$$

where k are preventive services, x a composite commodity of other goods and services, A is the age of the individual, E measures the hygienic quality of the home environment and e is a measure of the virulence of disease agents in the community. In the short run, A, E and e are exogenous to the individual.[1] One would expect that the healthier the individual (in terms of H), the less the need for curative medical services -- both due to the reduced frequency and lesser severity of illness. In other words the minimum level of necessary curative consumption, m, is inversely related to H,

$$m = G(H) = g(x,k;A,E,e), \qquad \ldots(2)$$

where we assume $g_x, g_k < 0, g_{xk} < 0$, and $g_{xx}, g_{kk} > 0$.[2] Consumption of m is necessitated by illness, either for treatment or for the alleviation of pain. Naturally, individuals may differ in the acceptable threshold of pain that can be borne without seeking outside medical care. What is important for our model is that consumption of m is necessary, arising as a consequence of illness, but is less for healthy individuals.

Yet morbidity is not the only factor accounting for the level of medical expenditure. There exists a wide variation in the quality and quantity of medical services consumed by individuals with exactly the same illness or of equivalent health status. This reflects the role of economic factors and/or differences in preference for health relative to other goods

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[1] In the long run, the family is in position to change both E and e, either by investment or migration.

[2] The greater the level of preventive expenditure, the smaller the likelihood of morbidity, though there are decreasing returns to such investment. It is possible that $g_x > 0$, particularly in a developed country setting. High medical risk consumption may be income elastic.

and services. The excess of total medical consumption M over $m, m'=M-m$, represents discretionary purchases of an additional quantity or quality of medical care.

Note that the consumption of m' is not indispensable. As in the case of the hypochondriac it may be provoked by something other than a real physiological need; it may represent a demand arising from a minor illness that other persons would not consider significant enough to warrant medical attention. Alternatively it may constitute demand for additional medical quality or comfort.

Empirically, it is hard to distinguish m and m'. A given outpatient visit or inpatient stay may be necessitated by morbidity but may include the consumption of a higher quality or greater quantity of care. The conceptual importance of this distinction relates to the fact that the economic factors which allow for greater consumption of m' also will produce better health and lower m. The effect of changes in economic variables on demand for medical care will be ambiguous, precisely because of these underlying relationships.

This may be captured in the following model of consumer choice. Assume an individual derives utility, U_t, from three kinds of goods and services; preventive health services, k, discretionary medical care, m', and all other goods and services x, i.e.

$$U = U(k,x,m'), \qquad \ldots(3)$$

where $U_x, U_{m'}, U_k > 0, U_{xx}, U_{kk}, U_{m'm'} < 0$ and $U_{xk}, U_{km'}$ and $U_{m'm'} > 0$. We assume that an individual derives no utility from m, the necessary component of demand for curative service. In effect, consumption of m is an overhead cost of survival, determined from equation (2).

An individual's choices are constrained by the level of nonearned income, y, and of wage earnings, wT, where w is the hourly wage rate and T is the total amount of time available for market and own production of goods and services. Following an earlier model of Acton (1975), we assume consumption of k, M and x not only involves a cash outlay, measured by the respective prices π_1, π_2, π_3, but also an outlay of time and thus a loss in earnings. This takes account of the possible importance of time relative to price as a primary deterrent to utilization in a heavily subsidized medical system. If the time inputs of

consuming k, m and x are t, s and v respectively, an individual faces the budget constraint:

$$(\pi_1+wt)k + (\pi_2+ws)(m+m') + (\pi_3+wv)x \leq Y = y+wT. \qquad \ldots(4)$$

Maximizing the utility function (3) subject to (2) and (4) is equivalent to maximizing the Lagrangian expression

$$L = U(x,k,m') + [(y+wT)-(\pi_1+wt)k-(\pi_2+ws)\ [g(x,k)+m']-(\pi_3+wv)x]. \qquad \ldots(5)$$

The first-order conditions for a maximum are:

$$\frac{U_x}{(\pi_3 + wv) + (\pi_2 + ws)g_x} = \frac{U_k}{(\pi_1 + wt) + (\pi_2 + ws)g_k} = \frac{U_{m'}}{\pi_2 + ws} = \lambda. \qquad \ldots(6)$$

These suggest the nature of the interaction between k and x and necessary curative consumption, m. Since consumption of k or x reduces the rate of illness and thus the need for m, the net price of consuming k or x is the own cash and time price less the induced savings in expenditure on m, e.g.

$$(\pi_3 + wv) + (\pi_2 + ws)g_x < (\pi_3 + wv),$$

since $g_x < 0$. It is possible that these net prices may be negative for the initial increments of consumption of k and x. However, in equilibrium one must assume that the marginal effect of k and x on m, g_k and g_x are sufficiently small that

$$(\pi_3 + wv) + (\pi_2 + ws)g_x > 0 \text{ and}$$
$$(\pi_1 + wt) + (\pi_2 + ws)g_k > 0. \qquad \ldots(7)$$

By totally differentiating the first-order equation system, one may solve for the effect of x, k, m and m' of changes in the cash and time outlay parameters $(\pi_1,\pi_2,\pi_3,s,t,v)$, wage rate w, and non-earned income level y. These results are described in the Appendix. Presently, we shall examine only the implications of the model for the empirically observable demand for curative services $M = (m+m')$.

(1) As one would expect, if the consumer has achieved a maximum (such that the second-order conditions are satisfied) the own-price effects for k, x and m' are negative. However, the sign of the own-cash price effect

on m, and thus M is ambiguous. Since $\frac{dM}{d\pi_2} = \frac{dm'}{d\pi_2} + \frac{dm}{d\pi_2}$, and

$$\frac{dm}{d\pi_2} = g_x \frac{dx}{d\pi_2} + g_k \frac{dk}{d\pi_2} ,$$

the cross-price effects $\frac{dx}{d\pi_2}$ and $\frac{dk}{d\pi_2}$ must be determined. Assume that (i) k,x and m' are normal goods, i.e. have positive income effects and (ii) k, x and m' are substitutes in consumption (or at minimum, noncomplementary).[1] The expression for $\frac{dx}{d\pi_2}$ may be analyzed into four components:

$$\frac{dx}{d\pi_2} = \left(\frac{\partial x}{\partial \pi_2}\right)_{U=\text{constant}} + g_x \left(\frac{\partial x}{\partial \pi_3}\right)_{U=\text{constant}} + g_k \left(\frac{\partial x}{\partial \pi_1}\right)_{U=\text{constant}} - (m+m') \left(\frac{\partial x}{\partial y}\right)_{\bar{\pi}=\text{constant}} \quad (8)$$

A completely analogous expression exists for $dk/d\pi_2$.

The first two terms on the RHS of (8) are positive. The first represents the pure cross-price substitution effect between m' and x; the second that an increase in the price of π_2 is, in effect, a reduction in the net price of x, so that depending on the sensitivity of the relationship between m and x, i.e., g_x, increases in π_2 will lead to an increase in the consumption of x. The third term indicates that an increase in π_2 also lowers the net price of k and thus may cause a substitution to preventive health consumption (k) and away from x. The fourth term measures the negative effect of a decline in real income due to an increase in π_2. Note that if both $\frac{dx}{d\pi_2}$ and $\frac{dk}{d\pi_2}$ are negative, an increase in π_2 increases the rate of illness causing an <u>increase</u> in the necessary level of m. However, since $\frac{dm'}{d\pi_2}$ is unambiguously negative, it is likely, though not certain, that $\frac{dM}{d\pi_2}$ is also negative.

(2) The income effect on M, $\left(\frac{\partial M}{\partial y}\right)_{\bar{\pi}=\text{constant}}$ is uncertain. An increase in income will increase the demand for m', but also lead to a lower rate of illness and as a consequence, a reduced demand for m.

(3) The effect of an increase in the wage rate, w, in this model is both to increase the total income of the household and to raise the price of all goods and services in direct proportion to the amount of time required for their consumption, e.g.,

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[1]There is no obvious complementarity between m', x and k, particularly if one considers each as a bundle of many kinds of goods and services. There will however, be a complementarity between alternative kinds of m goods, as discussed below for curative services. The underlying assumptions necessary for substitutability are discussed in the Appendix.

$$\frac{dx}{dw} = (v+sg_x)\left(\frac{\partial x}{\partial \pi_3}\right)_{U=\text{constant}} + (t+sg_k)\left(\frac{\partial x}{\partial \pi_1}\right)_{U=\text{constant}} + \left(\frac{\partial x}{\partial \pi_2}\right)_{U=\text{constant}} +$$

$$[T-kt-sM-xv]\left(\frac{\partial x}{\partial y}\right)_{\bar{\pi}=\text{constant}} \qquad \ldots(9)$$

with analogous expressions for dk/dw and dm'/dw. In (9) the increase in w probably raises x's own price (unless $v+sg_x<0$) but also is likely to raise the price of substitutes (k and m') as well -- the former with negative effect, the latter with positive. The fourth term, the net income effect on x, is positive, since the total time requirements of consumption, (kt +(s)(g+m') +xv) must be less than T. The net effect on m and M is again ambiguous.

(4) The effect of a change in the amount of <u>time</u> required to consume any good is equivalent to the effect of an increase in the cash price of that good, multiplied by a factor of w, e.g.

$$\frac{dx}{dv} = w\left[\left(\frac{\partial x}{\partial \pi_3}\right)_{U=\text{constant}} - x\left(\frac{\partial x}{\partial y}\right)_{\bar{\pi}=\text{constant}}\right]<0, \qquad \ldots(10)$$

and analogously for $\frac{dk}{dt}$ and $\frac{dm'}{ds}$. For $\frac{dm}{ds}$, and thus $\frac{dM}{ds}$, the sign will depend on the magnitude of $\frac{dx}{ds}$ and $\frac{dk}{ds}$ (as in (i) above). Unlike a change in w, there is no offsetting positive effect due to an increase in earned income wT.

In summary, our model offers unambiguous hypotheses on the effect of changing the cash or time requirements of consuming k, m' and x. Since the demand for curative services M is affected by the externality of consumption of k and x on the frequency of illness, the effect of changes in the wage rate and of own time and cash prices on the total consumption of medical care, M, will be ambiguous. Higher income both raises the capacity of the household to afford a greater quantity and quality of curative care, while lowering the medical need. Though increases in the cost of medical care may induce the consumer to substitute x and k, the real income effect lowers the ability to purchase x and k, and as a consequence, may increase the need for m. This would be particularly true where environmental factors cause a high morbidity burden on the population, so that initial consumption of m is high.

IIB. Econometric Specification

In adapting our theoretical model to the data available for analysis, several factors and relationships must be considered. First, a model of household medical demand is necessarily more complex than that for an individual. The head of household makes decisions bearing on the consumption patterns of all household members and the consumption of medical care is influenced by the structure of morbidity within the family.

Second, we noted that it is difficult to differentiate empirically between the demand for "necessary" and "discretionary" curative medical care, m and m'. Such a distinction would necessitate a medical appraisal of the physiological necessity of each outpatient visit or of components of medical expenditure, and this is an almost impossible data requirement. Typically, only quantitative measures of the components of M are available, such as the number of outpatient visits to different kinds of clinics (public or private, hospital or health center, specialty or general medicine), the number and length of stay of inpatient visits, the number of consultations with a practitioner of traditional medicine (i.e., the Malay "bomoh", the Chinese herbalist, and the Indian ayurvetic doctor), or the source of assistance at obstetrical deliveries.

No easy correspondence exists between these components and m and m'. For example, in West Malaysia, an individual may respond to a severe illness by using either a public or a private clinic. For the particular symptoms, both clinics may offer the same medical treatment. It is conceivable that the private clinic is perceived as of higher quality and that the choice of a private clinic does reflect consumption of some m' as well as m. Alternatively, the choice of a private clinic may simply be the consumer's response to the relative time and cash prices of the two sources of care and reflect only consumption of m.

Third, since the theoretical model ignores the forms that consumption of m or m' may take (inpatient care, primary or specialty outpatient care, etc.), it does not consider potential technological and psychological complementarities that may exist between these forms of care. Such complementarities coexist with the normal potential for substitution as between different types of care,

and must be considered in specifying the econometric model.[1] Finally, there are institutional aspects particular to an LDC setting that need to be included in the model.

Thus, our econometric model will focus on the determinants of consumption of particular components of medical and health demand in West Malaysia: outpatient care -- public, private and traditional; inpatient care; the type of obstetrical care; prenatal health care; and the preventive health services consumed in the primary schools. This means that we will be able to make only broad inferences concerning the impact of particular economic variables on total curative demand, M or preventive demand, k.[2]

Outpatient Model. Assume a member of the household displays the symptoms of an illness. The head(s) of the household must decide whether the potential severity of the illness, with its associated cost in pain and potential disability, warrants the purchase of medical services.[3] In principle, the family could decide upon either inpatient or outpatient treatment, but more likely the choice in almost all situations in West Malaysia is between different sources of outpatient care. The typical household will make approximately 10 outpatient clinic visits per year and only .27 inpatient stays. More than two-thirds of all modern outpatient visits will occur at public clinics.

Through its network of public hospitals and Main and Subhealth centers, the West Malaysian government provides fairly easy access to primary medical care at highly subsidized rates. In the rural areas, mobile medical teams

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[1]It is often suggested that patients will go to both the modern and traditional practitioner; the former is said to treat the symptoms, the latter the root cause of the illness (Fabrega). Similarly, the technology of treatment may necessitate that outpatient visits be made after hospitalization.

[2]A single measure of demand is empirically difficult to construct and would necessitate some means of weighting the separate components of medical consumption for their qualitative and quantitative differences. Simply adding outpatient visits does not lead even to a satisfactory measure of total outpatient demand. There are undoubtedly qualitative differences between public, private, and traditional clinic care. A shift from traditional to public, public to private and perhaps outpatient to inpatient care would probably be associated with an increase in M, if it were a quality-adjusted measure. By focussing on measures of M that are not quality-adjusted, our results would underestimate the effect of an increase in income or price on the demand for m' and thus M.

[3]Obviously, in an emergency situation, this decision may be taken out of the hands of the household decision maker.

of medical auxiliaries and maternal-child health nurses regularly extend this network to those smaller villages without a fixed health clinic.[1] In larger rural towns and urban areas, the household may go to a private physician's clinic.[2] Practitioners of traditional medicine are an alternative source of care.[3] Households are likely to view these sources as differing in quality. In the public clinic system, the patient is likely to be examined by a medical auxiliary, rather than by a doctor, particularly in the rural health system. Although there is evidence that the quality and effectiveness of the primary diagnosis obtained from a physician and an auxiliary are comparable,[4] households may still prefer the certainty of a physician, and thus choose a private clinic.

Our econometric model of outpatient demand focuses on the three principal decisions that are made. First, in equation (11) below, we examine the factors which determine whether outpatient care was sought at all, either in the month prior to the sample interview, or in the previous year. Second, equations (12) and (13) focus on the kind of medical care purchased: (i) among those households which have purchased both private and public outpatient services, we examine the determinants of the likelihood of usage of a public outpatient clinic (eqn. (12)),and (ii) the determinants of whether a traditional medical practitioner will be used in general, and in the event of a serious illness (eqn. (13)). Note that use of a traditional practitioner does not preclude a household from having used a

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[1]Heller (1975a).

[2]Unlike many developing countries, private physicians clinics are found in many of the larger rural towns of West Malaysia.

[3]It is also possible that for mild illnesses, households rely on their own devices for treatment, possibly going to a grocery or pharmacy for aspirin or other easily available drugs. Our survey did not include questions on this component of demand for health-related goods and services.

[4]WHO (1973).

modern medical clinic; in fact, such households consume approximately the same level of modern outpatient services as other households.[1]

Third, we focus on the quantity of outpatient care consumed. Our data allow estimation of separate demand equations for the quantity of private, public and total modern[2] outpatient care consumed over the previous 12 months, where the sample in each estimation is restricted to only the set of households that used the respective source of care (eqns. (14) and (15)). The definitions of the variables in the following specification and their respective means and standard deviations are defined in Table 1. The functional forms are discussed in Section III.

$$\text{OP.VISIT}_t = F_1\,(\text{PR.IPSTAY, OPFEE, OPTIME, NCASHINC, CASHINC, IPFEE, IPTIME, CITYSIZE, BOYSO-4, GIRLS 0-4, CH 5-15, ADULT}\leq 45\text{, ADULT}\geq 46\text{, UNHYGH2O, HYG.SEW., INFMRT, PRIVMD/POP, CHINMD/POP, POP/BED, MHC\$/POP}) \quad \ldots(11)$$

$$\frac{\#\text{OPVIS.GV}}{\#\text{OPVIS}} = F_2\,(\text{PR.IPSTAY, (OPFEEGV/OPFEEPR), (OPTIMEGV/OPTIMEPR), (TRAV.TIMEGV/TRAV.TIMEPR), NCASHINC, CASHINC, CITYSIZE BOYSO-4, GIRLSO-4, CH5-15, ADULT}\leq 45\text{, ADULT}\geq 46\text{, UNHYGH2O INFMRT, HYG.SEW}) \quad \ldots(12)$$

$$\begin{matrix}[\text{TRADVIS}] \\ [\text{TRADVIS.SEV.ILL}]\end{matrix} = F_3\,(\text{OPFEE, OPTIME, NCASHINC, CASHINC, CITYSIZE, BOYSO-4, GIRLSO-4, CH5-15, ADULT}\leq 45\text{, ADULT}\geq 46\text{, UNHYGH2O, HYG.SEW, INFMRT, CHINMD/POP}) \quad \ldots(13)$$

$$\begin{matrix}[\#\text{OPVIS.PR}] \\ [\#\text{OPVIS.GV}]\end{matrix} = F_4\,(\text{PR.IPSTAY, OPFEEPR, OPFEEGV, OPTIMEPR, PCT.TRAV. TIMEGV (OR PCT.TRAV.TIMEPR), IPFEE, IPTIME, NCASHINC, CASHINC, CITYSIZE, BOYSO-4, GIRLSO-4, CH5-15, ADULTS}\leq 45\text{, ADULTS}\geq 46\text{, UNHYGH2O, HYG.SEW, INFMRT}) \quad \ldots(14)$$

$$\#\text{OPVIS.} = F_5\,(\text{PR.IPSTAY, OPFEE, OPTIME, IPFEE, IPTIME, PCT.TRAV. TIME, NCASHINC, CASHINC, CITYSIZE, BOYSO-4, GIRLSO-4, CH5-15, ADULT}\leq 45\text{, ADULT}\geq 46\text{, UNHYGH2O, HYG.SEW, INFMRT}) \quad \ldots(15)$$

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[1] Among households that have used a traditional practitioner in the previous 12 months, 90% have also used a modern outpatient clinic and the mean number of such visits is 12.1. Among households that have used a practitioner in the event of a serious illness, 85% have also used a modern outpatient clinic in the previous 12 months, with the mean number of visits equalling 9.3.

[2] Unfortunately, our sample data do not allow us to examine the quantity of traditional medical services.

Table 1

List of Variables with Means and Standard Deviations

		Mean	Standard Deviation
$IP.STAY_j$	= 1 if household j had an inpatient stay during previous 12 months, 0. otherwise.	.17	.37
$PR.IPSTAY_j$	= estimated probability of an inpatient stay by household j (estimated using maximum likelihood procedure).	.23	.18
$\#OPVIS_j$	= total number of outpatient visits by household j in previous 12 months.	10.10	11.56
$\#OPVISPR_j$	= total number of outpatient visits by household j to private modern outpatient clinic in previous 12 mohths.	3.12	6.60
$\#OPVISGV_j$	= total numbei of outpatient visits by household j to government outpatient clinic in previous 12 months.	6.98	9.45
$OPTIMEGV_j$	= average number of minutes of travel, waiting and treatment time experienced by the household j in utilizing a government outpatient clinic in previous 12 months[a].	64.9	22.3
OPTIME	= average number of minutes of travel, waiting and treatment time experienced by the household j in utilizing an outpatient clinic in previous 12 months.	61.3	26.2
$OPTIMEPR_j$	= average number of minutes of travel, waiting and treatment time experienced by the household j in utilizing a private outpatient clinic in previous 12 months[a].	59.8	18.8
$IPTIME_j$	= average number of days per inpatient stay experienced by household j in utilizing a government inpatient facility[a].	11.56	6.83
$OPFEEGV_j$	= average cash outlay of household j in utilizing a government outpatient clinic during previous 12 months[a].	.41	.86
$OPFEEPR_j$	= average cash outlay of household j in utilizing a private medical doctor's clinic during previous 12 months[a].	5.06	1.62
$IPFEE_j$	= average cash outlay per day of inpatient stay in utilizing an inpatient service during previous 12 months[a].	8.62	11.05
$OP.VISIT_t$	= 1 if household had an outpatient visit during period t, 0 if not; t is defined for this variable as either the previous month or previous year.	0.51 [1] 0.89 [2]	0.50 [1]
TRAD.VIS	= 1 if household obtained care from a traditional practitioner during the previous year, 0 if not.	.27	.44

[a]for households that have not had an outpatient visit or inpatient stay during previous month, the average value of the variable for all household's in household j's ethnic group and city size is used.

[1]in previous month [2]in previous year

Table 1 (cont.)

		Mean	Standard Deviation
TRAD.VIS. SEV.ILL	= 1 if household sought assistance from a traditional practitioner in the event of a serious illness, 0 if it obtained care from a modern-medical source.	.57	.50
$OPFEE_j$	= average cash outlay of household j in utilizing a modern outpatient clinic during previous 12 months.	2.07	2.34
$NCASHINC_j$	= total imputed monthly income of household j from (i) monetary value of house rent for owner-occupied houses, (ii) monetary value of food grown or goods produced and consumed at home, (iii) monetary value of animals hunted, poultry bred and fish caught and consumed at home.	50.8	79.4
$CASHINC_j$	= total monthly cash income income of household j from (i) salaries and wages in cash and kind, (ii) sale of produce, (iii) business, (iv) rent and interest, (v) remittances, pensions and allowances, (vi) scholarships, and (vii) monetary value of goods received from outside the household.	461.3	676.2
CHINESE	= 1. if a Chinese household, 0. otherwise.		
INDIAN	= 1. if an Indian household, 0. otherwise.		
PCT.TRAV. TIME	= percentage of total time required for an outpatient clinic visit that was spent in transportation between home and clinic.	.39	.16
PCT.TRAV. TIMEGV	= percentage of total time required for a government outpatient clinic visit that was spent in transportation between home and clinic.	.35	.13
PCT.TRAV. TIMEPR	= percentage of total time required for a private outpatient clinic visit that was spent in transportation between home and clinic	.48	.13
CITYSIZE	= 1 if household j lives in a metropolitan district, 2 if in a large urban center, 3 if in a small urban center, and 4 if in a rural area.	3.09	1.16
$\#BOYS0\text{-}4_j$	= number of boys in household j, aged 0-4 years.	.36	.61
$\#GIRLS0\text{-}4_j$	= number of girls in household j, aged 0-4 years.	.32	.58
$\#CHILD5\text{-}15_j$	= number of children in household j, aged 5-15 years	1.33	1.39
$\#ADULTS\geq46$	= number of adults in household j, aged 46 or more years.	.81	.85
$\#ADULTS\leq45$	= number of adults in household j, aged 16-45.	2.52	1.79

Table 1 (cont.)

		Mean	Standard Deviation
UNHYGH20	= 0 if the household j obtains hygienically treated piped water into the house, 1. otherwise.	.43	.50
MOD.PRACT. DELIV	= 1 if a birth to household in previous year was attended by a modern practitioner (modern nurse, midwife or physician), 0 if not.	.76	
M.D.DELIV	= 1 if a birth to household in previous year was attended by a physician, 0 if not.	.29	
$HYG.SEW_j$	= 0 if household j's night-soil is disposed of by bucket system, pit, curah, over streams or in fields; 1 if flush disposal system is used.	.25	.44
$INFMRT_j$	= infant mortality rate of household j's racial group in district of residence.	40.52	14.58
POP/BED_j	= ratio of population (in units of 10,000) in district of household j's residence to the number of district or general hospital beds.	608.9	406.1
$MHC\$/POP_j$	= level of main and subhealth expenditure per capita in district of household j's.	5.1	3.2
$PRIVMD/POP_j$	= private sector medical doctors per capita in district of household j's residence (in 10000 of population).	1.00	1.12
$CHINMD/POP_j$	= traditional Chinese practitioners per capita in district of household j's residence (in 10000 of population).	.76	.83
$AGRICUL_j$	= 1 if household head or any other member of household^j is an agriculturalist, 0. otherwise. An agriculturalist is defined as (i) owning more than 1/2 acre of land which is being cultivated by the owner or someone else or (ii) cultivator of more than 1/2 acre of land who does not own the land or (iii) owner of livestock who gets more than 1/2 his income from livestock rearing or (iv) livestock rearer who does not own the livestock but gets more than 1/2 his income from this occupation.	.36	.48
DPNDCY	= ratio of number of children, aged 0-9 to total size of household.	.37	.24
POVOCC	= 1 if the household head is engaged in rubber tapping, or is a nonland-holding agricultural laborer, agriculturalist or fisherman.	.50	.50
$PRENATGV_j$	= number of prenatal visits to a government clinic during the previous 12 months made by a household j that had a baby during that period.	3.48	4.27

Table 1 (cont.)

		Mean	Standard Deviation
INNOC.SCH.	= the number of innoculations received by any students in the household during the previous three months, for all households in which there are students.	.50	.95
MED.EX.SCH.	= the number of medical examinations received by any students in the household during the previous three months, for all households in which there are students.	.31	.70
DENT.EX. SCH.	= the number of dental examinations received by any student in the household during the previous three months, for all households in which there are students.		.99
#STUDENTS	= number of students in the household.	2.44	1.42
HOSP.DELIV	= 1 if a birth to household in previous year occurred in a hospital, 0 if not.	.46	

The rationale for this specification may be briefly outlined. Our theoretical model suggests the importance of evaluating the sensitivity of medical consumption to family income, the price of alternative sources of health and medical care and the price of other commodities, where price measures are inclusive of the time cost of utilization. Our measure of income distinguishes between cash and non-cash (imputed) income sources. These are current income measures, and thus do not capture the impact of permanent income variations. Our price measures for curative care are discussed later in this section.

The estimated coefficients on these variables will shed light on other aspects of demand behavior. What is the degree of substitutability of private and public sources of modern outpatient care? Will households shift their consumption as their perception of the relative price of care changes? Is there validity to the conventional wisdom that there is a clear progression in preference toward public and ultimately private outpatient care as household income rises? Third, does the time cost of utilization of medical care effectively operate as an additional price of medical care? Fourth, do patients attach less disutility to time spent in waiting and treatment relative to transportation time? Our specification includes the "percentage of total time required for transportation" to test this hypothesis.

We lack data on the price of nonmedical commodities, of preventive care and of the cost of traditional practitioner's services. This will impute bias in the estimated coefficients and excessive conservatism in testing for their significance. Although we can only guess, the effect is probably to overestimate the size of the coefficients of price variables for modern curative care and of the income variables.[1]

The theoretical model also suggests the necessity of differentiating the effect of medical need on the demand for curative care from those

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[1]We would not expect a significant correlation between the prices of other goods and services (x) and that of outpatient care, so that the omitted variable bias is primarily in overestimating the variance of the estimated coefficient. We would expect a positive correlation between the perceived price of preventive health service, the level of household income and the price of curative medical services. If the cross-price effect of preventive services on the consumption of curative care is positive, the coefficients of the price of curative care and of household income on the demand for curative care will be overestimated.

factors which independently influence the quality and quantity of medical consumption. If we had data on the degree of household morbidity, our income and price variables could capture the latter factors. For example, the sample data underlying the studies of Acton and Grossman included self-evaluations of health status.[1] Lacking household-specific medical need data, we rely on alternative measures that proxy the likelihood of illness at the community, household and individual level.

Community morbidity rates are mirrored by the level of infant morbidity experienced by the household's ethnic group (Chinese, Malay or Indian) in the administrative district of its residence. The health risks associated with the household's own environment are proxied by the quality of the family's sewage disposal system (HYG.SEW) and by the quality of its water supply (UNHYG.H20). At the individual level, we would expect a U-shaped relationship between age and morbidity. Thus for a given family size, the greater the fraction of household members at the extremes of the age distribution, the greater the medical need. We include a set of variables measuring the number of household members in the age groups 0-4, 5-15, 16-45 and over 45. These variables also adjust for the effect of family size differences on demand. Since one might find that parents attach a different priority to the health of boys relative to girls, the number of boys and girls, aged 0-4, are entered as separate variables.

Other factors also influence the decision to utilize an outpatient clinic. Once a visit is made to a primary modern outpatient clinic, whether private or governmental, the physician may recommend the advisability of further treatment. In the American context, Feldstein (1971) argues (i) that there is some limited technical substitutability between inpatient and ambulatory care, both in terms of whether hospitalization occurs at all, and, if it does, in the length of inpatient stay, and (ii) that the hospitalization decision is jointly made by the patient and physician.

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[1] In Grossman's sample, persons were asked whether their health status, was poor, fair, good or excellent and he used this question to index the amount of health capital possessed by an individual. (Grossman (1972)). Acton's measure was probably superior. His variable measured the number of chronic health conditions that limit activity (Acton(1975)).

The West Malaysian public hospital system is heavily subsidized, with inpatient charges covering only a small fraction of the total cost of hospitalization. Rather than income, the use of inpatient capacity is effectively rationed according to the degree of medical need. As a consequence, the patient's role in the hospitalization decision is limited. In a significant fraction of cases, the physician may require or deny hospitalization, regardless of individual preference. In only a small fraction of cases is the patient presented with the choice of hospitalization relative to ambulatory care, and even the decision on the length of inpatient stay is largely medically determined. Where patient participation in the hospitalization decision occurs, it is likely to reflect fears of hospitalization or of cultural 'distance' rather than economic opportunity cost considerations. Nevertheless, we have included the cash and time cost of an inpatient stay to test for any substitutability in demand for outpatient care.

Outpatient visits are often required as a complement to a completed inpatient stay. The physician asks the patient to return for periodic examiniations. This suggests a model of outpatient demand where $IPSTAY_{t-1}$ is an independent variable. Unfortunately, our data are not dated and do not allow us to distinguish the sequencing of the inpatient stays and outpatient visits reported in the 12 months prior to the interview. To proxy the likelihood of an inpatient stay during the period, we have included the variable $IPSTAY_t$. Since this variable is endogenous to our model, the resulting outpatient equation system was estimated using a simultaneous equation estimation procedure - two stage least squares (TSLS). An instrument for $IPSTAY_t$ is derived from the first stage estimation.

Finally, there may be cultural differences in family resource allocation decisions on medical care across Malaysia's three principal ethnic groups. These differences may emerge most sharply in terms of the impact of demographic and morbidity factors. For example, one could normally expect comparable morbidity for children of the same age group, regardless of ethnic group (assuming that differentials in morbidity due to socioeconomic differences are already considered). Parental response to that morbidity, in terms of the type and level of demand, may differ, so that an Indian may consume more outpatient services than a Malay. In addition to ethnic intercept terms,

multiplicative dummies test for ethnic differences with respect to the demographic variables and the infant mortality rate variable.

Inpatient Model: The structural equation for the demand for inpatient services is comparable in structure to the outpatient model, though there are some important differences:

$$IPSTAY = F_6\ [\#OPVIS,\ NCASHINC,\ CASHINC,\ IPFEE,\ IPTIME,\ OPFEEPR,\ OPFEEGV,\ OPTIMEGV,\ OPTIMEPR,\ CITYSIZE,\ BOYS0\text{-}4,\ GIRLS0\text{-}4,\ CH5\text{-}15,\ ADULTS\leq 45,\ ADULTS\ 46,\ UNHYGH20,\ INFMRT,\ AGRICUL,\ POVOCC,\ DPNDCY] \quad \ldots(16)$$

The dependent variable in these equations is dichotomous--whether or not a hospitalization occurred in the previous 12 months. Although we had complete information on the number of inpatient stays, 97% of all households had no more than one visit, and thus it appeared more appropriate to use an estimation procedure that allows for the heteroscedastic character of an estimation with a dichotomous dependent variable (see Section III). Our specification tests for the sensitivity of inpatient demand to changes in the time and cash prices of inpatient care, changes in the price of outpatient services and to changes in income. For the reasons outlined above, one would not hypothesize substantial price or income elasticity of demand.

Several other factors are also relevent. Normally an inpatient stay follows an initial outpatient visit. Households with frequent outpatient visits may have a higher likelihood of hospitalization. Ideally, one would desire an estimate of the number of outpatient visits in the previous period; lacking this, the endogenous variable, $\#OPVIS_t$ is included, and TSLS is used to estimate this equation.

Second, the price measures used in the outpatient model may prove inadequate where the principal opportunity cost of utilization is the cost of child care rather than lost earnings. Similarly, an average time cost episode may not capture the potentially high variance in time costs to a farmer; depending on the season. Two additional measures of cost are included: the dependency ratio (DPNDCY) (proxy for cost of child care) and a dummy variable for whether the household head is a farmer (AGRICUL) (see Table 1). Finally, in many LDC's, there may be cultural barriers to hospitalization, particularly among the very poor. A variable denoting whether the household head is engaged in a "poverty" occupation is used to test for this.

Finally, obstetrical care is one area of inpatient demand where the

patient has a substantial degree of discretion. Although districts vary in the quality of their obstetrical capacity, it is generally possible for any woman to be hospitalized for a birth if she so desires. The choice of birth attendant--traditional village midwife, government midwife or government physician--and of place of delivery--hospital, health center or home--are determined by the family, except where complications are expected. The observed choice may partially reflect the demand for m'. Only where traditional preferences strongly dominate would this hypothesis be questionable. Since we can identify these choices from our data for all women in the sample with deliveries in the previous year, we shall test the income sensitivity of this demand. Unfortunately, we lack a measure of the relative price of higher quality maternity care.[1] Our model is of the form:

$$\left.\begin{array}{l}[\text{HOSP. DELIV}]\\ [\text{MOD. PRACT. DELIV.}]\\ [\text{MD DELIV.}]\end{array}\right\} = F_7[\text{NCASHINC, CASHINC, CITYSIZE, DPNDCY, AGRICUL, TRAD.PRAC.}] \quad \ldots(17)$$

Preventive Health Services: Since Malaysian public health institutions purport to provide an integrated program of maternal-child health, dental and school health services, it is possible to evaluate what factors determine the consumption of some of these services. In particular we examine (i) the level of demand for prenatal care at a government health center and (ii) whether school children receive school health services: innoculations, medical and dental examinations. These are the only measures of consumption of preventive services (k) included in our model. Our model specification reflects the considerations underlying our outpatient model:

$$[\text{PRENAT. VIS}] = F_8\ (\text{OPFEEPR, OPFEEGV, OPTIMEPR, OPTIMEGV, NCASHINC, CASHINC, CITYSIZE, MHC\$/POP}) \quad \ldots(18)$$

$$\left.\begin{array}{l}[\text{INNOC. SCH}]\\ [\text{MED. EX SCH.}]\\ [\text{DENT EX. SCH}]\end{array}\right. = F_9\ [\text{CITYSIZE, STUDENTS, POV. OCC., MHC\$/POP, AGRICUL}] \quad \ldots(19)$$

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[1]Since one would expect a positive correlation between the perceived price of higher quality maternity care and our income measures, and a negative coefficient of such a price variable on demand, the coefficients of the income variables will probably be underestimated.

Since we lack specific data on the time and fee required for prenatal care, we will use our price estimates for outpatient clinic visits as proxies.

The factors underlying the level of school health services consumed reflects more the criteria underlying public sector provision than household demand considerations. Clearly households with few students are less likely to have received such public services. The greater the population served by a Main or Subhealth Center of a given staff size, the fewer the feasible number of school health visits possible. Conceivably, there is discrimination in favor of rural groups or students of households engaged in poverty occupations.

Price Variables: Since prices are central to the model's specification, it is important to describe the method by which they are measured. In our model we argue that the cost of utilization of any service includes the fee for treatment and drugs and the cost in time and resources required in order to receive the services. The latter include the costs associated with time spent in transportation, waiting and treatment. It is the *perceived* rather than the actual price that is relevant for explaining household behavior, *ex ante*. Thus one might anticipate household-specific prices based on the household's location relative to the different sources of care and its past experience with each. Yet the *ex ante* perceived price is difficult to measure *ex post*, since the household's perceptions have been revised through the experience of utilization.

In our survey, households were asked the time required for transportation, waiting, and treatment and the cash outlay for drugs and treatment associated with each outpatient clinic visit made by members of the household during the preceding month.[1] For each household, the average cash outlay and time requirement are calculated separately for modern private and government outpatient clinics. This effectively assumes that recent outpatient experience is representative of the prices which motivated outpatient decisions

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[1]In our sample, there were no more than 5 outpatient visits per family in the previous month.

throughout the previous year.[1] This is an important assumption. If invalid, our price elasticity measures are open to serious question.[2] Since many households had no outpatient experience in the previous month, we are forced to impute from the data on user families estimates of the perceived price of the nonusers. For any nonuser household we associate the mean price and time variables associated with its ethnic group and location (urban or rural). Estimates of the mean cash outlay for a public and private outpatient clinic visit confirm the highly subsidized character of the former-- M$.41 relative to M$5.06 (or U.S. $.19 relative to U.S. $2.30).

The same methodology was applied to estimate the perceived price of an inpatient stay for the household. For the 211 households with at least one inpatient stay in the previous 12 months, time is measured by the average number of days per stay (IPTIME). The perceived daily inpatient fee is similarly estimated. The means of these variables for each ethnic group in the rural and urban areas are assumed to be the inpatient price measures of the remaining 1253 non-user households. Though still highly subsidized, the daily outpatient fee is not negligible, averaging Mal $8.62 per day.

In our theoretical model, the time cost equals the cost in lost wage income due to the allocation of time to medical consumption. Although this is unambiguous for a wage-earning individual, the opportunity cost of time in a household with dependents and nonearners will depend on who is ill and whether or not the earner accompanies the patient. In an LDC, the opportunity cost is also likely to depend on the type of job, season and form of remuneration at the time of the visit.

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[1]It should be noted that the mix of government facilities on which user data is available for any household will obviously differ according to the household's experience. One family may exclusively use Main or Subhealth Centers; another may use District hospital outpatient clinics. Our methodology implicitly assumes that this is representative of the mix of facilities used in general by the household.

[2]For example, cash outlay for public outpatient visits is extremely low- M$.41. If for a large proportion of households, drug costs are the significant element in the cash costs of the visits, (fees being negligible), it is arguable whether one can assume that the outlays for drugs experienced in the past are reasonable proxies for the ex ante expected cash outlay for an outpatient visit.

We estimated a time cost measure where the time of utilization was weighted by a measure of foregone earnings. Assumptions were made concerning the number of working minutes per month, and total household cash income was used to calculate a time cost per minute. The assumption that an earner accompanied the ill member of the household was arbitrarily made. Since the resulting variable proved highly correlated with cash income (r=.91),[1] inclusion of both variables resulted in multicollinearity. Thus, we shall include the time of utilization, unweighted by foregone earnings. This implies an omitted variable error bias in our estimates, which might tend to yield coefficients biased to zero. However, there is evidence[2] that an even greater bias would have arisen due to the error in estimating the opportunity cost of the time of utilization. One effect of the specification is that the cash income variable may capture both a positive income effect and a negative time cost effect (even if our "medical need" variables have taken account of the effect of income on morbidity).

Another difficulty with our price measures is that they do not fully capture the relative "accessibility" of health facilities. Precise data on the ex ante perceived cost of utilization would implicitly take account of whether a particular district contained an outpatient facility or whether it was regularly visited by a mobile medical team. If not, the cost in transportation to another district would simply be relatively high. Yet if the cost was so high as to discourage any use, our user data would be biased in its composition. It would not differentiate between those nonusers who were effectively precluded from utilization, from those who simply chose not to consume. The mean time estimates for public and private facilities, 64.9 and 61.3 minutes respectively, would thus be underestimated.

This is likely to be a significant problem only for a model of health services demand in developing countries. In general, private physicians'

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[1]The correlation coefficient between cash income and the estimated time costs of (i) an inpatient stay, (ii) a public outpatient visit and (iii) a private outpatient visit are .86, .88 and .71 respectively.

[2]Acton (1975) has argued that such an omission will bias the estimated effect of time to zero, if the time of utilization, s, and the opportunity cost of time, w, are negatively correlated. However, w and s have only negligible correlation; the correlations between cash income and (i) IPTIME, (ii) OPTIMEGV, (iii) OPTIMEPR equal -.01, .03, -.01, respectively. Moreover, Acton's study found that the bias due to the error in measuring the opportunity cost of time is greater than the bias caused by omitting it from the specification Acton (4/1973).

clinics exist only in urban centers, and the density of the network of government clinics is of questionable adequacy. However, West Malaysia is relatively advanced in its provision of rural health facilities, primarily because the Malay majority is predominantly rural. Nevertheless, reasonable accessibility cannot be assumed. To correct for this possible bias in our price measures, variables measuring the density of health capacity are included. This problem arises only in the equations where we examine the factors which discriminate between users and nonusers. Four variables are included: the rates of health center expenditure per capita,[1] the population per hospital bed, the number of modern private sector physicians per capita in the household's district, and the number of traditional Chinese practitioners per capita.[2] This problem is less relevant for the inpatient demand model, since there is a fairly effective government ambulance service to transport patients from districts lacking district hospitals.

Finally, an obvious limitation on our analysis is that the household experience underlying the observed data may not contain sufficient variance to estimate the demand curve over all ranges of price and time cost relevant for policy generalizations to other developing countries. Specifically, if the supply of medical care is sufficiently dense that the maximum time of utilization is never at levels common to other developing countries, our analysis cannot evaluate the elasticity of demand at those levels. Similarly, the price of government medical care in West Malaysia is sufficiently subsidized that inferences on the price elasticity of demand for government care at price levels equal to that of a private clinic are not possible. This is less of a problem for our total outpatient demand equations since the price measure in these is the average price experienced by a household in its use of both private and public care; this price measure has greater variability.

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[1] We have used the level of expenditure on Main and Sub-health Centers rather than the number of health centers as the numerator, since the latter does not correct for differences in the staff size of health centers.

[2] The data on the number of traditional Chinese practitioners were compiled from a detailed survey by Melinda Meade and were generously made available. Unfortunately, we lack data on the number of traditional Malay practitioners ("bomoh").

III

The Data and Methodology

The survey data used in the analysis were designed to identify the primary beneficiaries of public expenditure and to assess whether and how public expenditure serves to redistribute income. Detailed questions were asked concerning the range and frequency of access to, or utilization of, each category of public expenditure in health, education, agricultural extension, public utilities, etc.

In the public health and medical sector, these questions covered a wide range of services. Through its urban hospitals and rural health centers and clinics, the public sector provides (i) outpatient services, both general and specialized, (ii) inpatient care, (iii) maternal-child health services, (iv) school health clinics, (v) dental health services, (vi) mass innoculation programs and (vii) environmental health services. To estimate expenditure incidence requires detailed probing on the frequency of utilization of each service, the nature of the services received and the cost of utilization. In addition to the sectoral-specific data, background data was collected for each household, including family composition, cash and noncash income sources, race and religion.

The survey's sampling frame, designed by the Department of Statistics of West Malaysia, was stratified by town size and geographic region. Sampling was in two stages, circular and random, with 160 primary sampling units. The achieved sample, which was 79 percent of the drawn sample, conformed very closely to the 1970 Household Census parameters for race, town size, region and so forth. It included 640 urban and 825 rural households drawn from the 11 states of West Malaysia. Broken down by ethnic group, 854 Malay, 452 Chinese, 148 Indian and 11 other households were included.[1] It encompasses households at all income levels. The mean per capita household income level of the five income quintiles in the sample are US$110, $203, $290, $437 and $1,236 respectively, (with an overall mean of US$471).

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[1]For a more precise description of the sampling frame and survey characteristics, see (i) Eastern Market Assessment Survey , and (ii) J. Meerman (1976).

The simultaneous equations system model is estimated using two-stage least squares (TSLS). The use of cross-sectional data for estimating the demand equations in (14) and (15) suggests the possibility of heteroscedasticity. After estimating the second stage of the TSLS estimation, an estimate of the variance of the disturbance was calculated by income quintile for each ethnic group and these were judged to be significantly different so as to require a generalized least squares estimation to correct for heteroscedasticity. Thus for (14) and (15), each observation on each variable X_{ij}, was divided by σ_{ij} the estimated standard deviation of the disturbance for that ethnic (i) and income quintile (j) group. The cash income quintile cutoff points were calculated for the sample as a whole and applied to each of the ethnic groups.

In estimating the demand equations for inpatient care, for the likelihood of outpatient care, for obstetrical quality and for the likelihood of usage of a traditional medical practitioner, (eqns. (11), (13), (16) and (17)), heteroscedasticity arises as a consequence of dichotomous dependent variables. Using a maximum-likelihood estimation procedure, a logit model of the form:

$$\log_e\left[\frac{P(Y=1)}{(1-P(Y=1))}\right] = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots + \beta_n X_n + \varepsilon \qquad \ldots(20)$$

was used to estimate these equations, where P(Y=1) is the probability that the $Y^{\underline{th}}$ event has occurred.[1] In our equation (12), we are able to estimate P(Y) directly, where P(Y=1) is the fraction of total outpatient visits made to a public outpatient clinic, for all users of both private and public care. The logit model in (20) was then estimated directly by TSLS after transforming the dependent variable.

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[1]See J. Kmenta (1971), pp. 462-463 and W. DuMouschel.

IV
RESULTS

The econometric results are presented in Tables 2 through 4. Table 2 provides estimates of the demand model differentiating users from nonusers of outpatient, inpatient and traditional care. Table 3 presents estimates of the determinants of the quantity of public, private and total outpatient services demanded and Table 4 presents estimates of the demand for quality in obstetrical care, and the demand for preventive health services. Our discussion will highlight the impact of time and cash costs of utilization, income, morbidity, ethnic group and technological complimentarities on the structure of medical and health services demand.

(1) Cash Price Effects: The results suggest that the demand for outpatient and inpatient care is highly inelastic to cash price. From Table 2, cash price does not prove to be a factor differentiating users from nonusers of modern medical care, whether outpatient or inpatient. Neither is the total quantity consumed influenced by the cash price. Though the sign of the own-cash price coefficients are negative (Table 3, eqns. 5, 6), the coefficients are statistically insignificant. The estimated elasticities of demand range from -.01 for public outpatient clinics to -.05 for total outpatient demand.

Nevertheless, in their choice among medical alternatives, consumers are clearly responsive to the relative cash prices of private and public outpatient clinics (Table 3, eqns. 1-4). The cross elasticity of demand for public care due to changes in private outpatient prices is approximately +.17. Perhaps because the mean and variance of public sector prices are quite low relative to private sector prices, variations in public sector prices have a smaller impact on the demand for private outpatient clinics. Among those households that have used both kinds of clinics, a higher perceived ratio in the price of public relative to private care significantly reduces the probability of a public clinic visit.[1]

Relative price effects are also relevant in differentiating those households that have used a traditional practitioner in normal circumstances

[1]In making these estimates, we assume that all price measures are exogenous to the consumer. Yet it might be argued that the fees set by government and private clinics are income related. We tested this and found a significantly positive effect of cash income on the average household fee to government outpatient clinics but this accounts for a negligible fraction (1.45%) of the actual variance in perceived average cash outlay by households.

Table 2

Econometric Estimates on the Probability of Outpatient and Inpatient Demand

Equation Number	1		2		3		4		5		6	
Dependent Variable	OP VISIT (in PREV. YEAR)		OP VISIT (in PREV. MONTH)		PR. USE TRAD. PRACT.		PR. USE TRAD. PRAC. for SEVERE ILLNESS		IPSTAY		IPSTAY	
Independent Variable	β	t	β	t	β	t	β	t	β	t	β	t
Endogenous												
#OP VIS									.021	.66	.023	.68
PR. IPSTAY	2.768	1.28	2.464	2.27								
Exogenous												
PCT. TRAV. TIME	-.064	-.08	-.906	-2.00								
OPFEE	.017	.29	.046	1.47	.036	1.12	.197	2.43				
OPTIME (in 100 minutes)	-.029	-.06	.05	.19	.4	1.58	-.2	-.31				
NCASH INC (in Malaysian $1000)	-2.359	-1.42	-1.333	-1.31	.584	.56	2.616	.88	-.718	-.64	-.496	-.44
CASH INC (in Malaysian $1000)	.286	.89	.190	1.46	-.415	-2.11	-.395	-.93	.079	.52	.092	.60
IPFEE	-.005	-.36	-.012	-1.38					.95-3	.09	.003	.38
IPTIME	-.022	-1.28	-.007	-.78					.586-3	.08	.0009	.09
CITYSIZE	-.239	-1.96	-.029	-.44	-1.36	-2.04	.05	.31	-.054	-.67	-.006	-.08
BOYS 0-4: TOTAL	.32	1.00	.020	.13	-.16	-1.29	-.187	-.78	.458	3.43		
MALAY											.148	.82
CHINESE*											.598	1.70
INDIAN*											.935	2.15
GIRLS 0-4: TOTAL	.359	1.46	.122	1.03	.08	.63	-.34	-1.31	.456	3.30		
MALAY											.169	.92
CHINESE*											.637	2.03
INDIAN*											.899	1.86
CH5-15: TOTAL	.25	2.26	.101	1.78	.238	3.02	-.12	-1.06	-.058	-.61		
MALAY											-.069	-.60
CHINESE*											-.251	-1.40
INDIAN*											.17	1.42
ADULT 15-45: TOTAL	.14	1.41	.044	-.89	-.007	-.18	-.05	-.49	.137	2.07		
MALAY											.271	2.95
CHINESE*											.062	-2.29
INDIAN*											.129	-.96
ADULT ≥46: TOTAL	.05	.31	.037	.40	.195	2.3	.003	.01	.211	1.86		
MALAY											.048	.30
CHINESE*											.347	1.44
INDIAN*											.414	1.24
UN HYG. H_2O	-.69	-2.59	-.191	-1.26	.27	1.59	.35	.91	-.05	-.24	.119	.55
HYG. SEW.	.276	.68	.025	.14	-.43	-2.24	.10	.22				
INFMRT: TOTAL	-.006	-.38	-.007	-.93	.021	3.59	.051	3.36	.016	2.30		
MALAY											.009	.96
CHINESE*											.046	1.82
INDIAN*											.027	1.12
PRIV MD/POP	-.97	-4.43	-.611	-5.18								
CHIN MD/POP	1.13	3.93	.696	4.72	.12	1.30	-.837	-3.40				
POP/BED (in 1000)	.139	.52	.057	.38								
MCHS/POP	.139	3.08	.016	.79								
AGRICUL					.090	.51	-.41	-.91	-.232	-1.05	-.228	-1.00
POV.OCC					.114	.73	.499	.39	-.020	-.11	-.062	-.32
DPNDCY.					-.676	-1.25			1.01	1.41	1.269	1.70
OP FEE PR									.007	.12	.011	.20
OP FEE GV									.049	.56	.067	.74
OPTIME GV (in 100 minutes)									.1	.37	.2	.58
OPTIME PR (in 100 minutes)									-.02	-.04	.044	.08
CHINESE	.512	1.33	-.017	-.09	1.468	6.64	.167	.30	.299	1.06	-.689	-.85
INDIAN	.250	.41	-.25	-.84	-.564	-1.54	-1.492	-2.74	.964	3.47	-.745	-.69
CONSTANT	1.73	1.51	.24	.38	-2.522	-5.38	-1.379	-1.19	-3.84	-5.76	-3.958	-5.26
R^2	12.9		.09		.10		.28		.09		.11	
(N)	1315		1315		1342		241		1315		1315	
ESTIMATION PROCEDURE	LOGIT .MLE TSLS		LOGIT MLE TSLS		LOGIT: M.L.E. TSLS		LOGIT MLE TSLS		LOGIT MLE TSLS		LOGIT .MLE TSLS	

*These variables were estimated through the use of multiplicative dummy terms. For example, for the variable "INFMRT", three variables were included: (i) var A = INFMRT, (ii) var B = var A for the Chinese, 0. otherwise, (iii) var C = var A for the Indians, 0. otherwise. The marginal coefficient for the effect of Infant Mortality on the demand of the Malays is β_A, for the demand of the Chinese $\beta_A + \beta_B$ and on the demand of the Indians $\beta_A + \beta_C$. In presenting the results in this and subsequent tables, we have already made the above addition for all multiplicative dummy expressions in order to facilitate the interpretation of the results. The "t" statistic displayed corresponds to β_A, β_B or β_C, etc. For any given set of multiplicative dummies, the nonstarred term is equivalent to variable A in the above example.

Table 3

Econometric Estimates on the Demand for Outpatient Care

Equation Number	1		2		3		4		5		6	
Dependent Variable	#OP. VIS. GV		#OP. VIS. GV		#OP. VIS. PR.		Prob. of Public Outpatient Visit		#OP. VIS. TOT		#OP. VIS. TOT	
Independent Variable	β	t	β	t	β	t	β	t	β	t	β	t
Endogenous												
PR. IPSTAY	18.940	5.22	19.09	5.28	14.295	3.52	-.415	-.627	27.37	4.21	27.65	6.59
Exogenous												
OP FEE PR	.312	1.44	.268	1.22	-.055	-.39						
OP FEE GV	-.172	-.66	-.058	-.21	.038	.19			} -.054	-.39	} -.057	-.41
OPTIME GV	-.055	-.44	-.002	-.16	-.018	-1.41						
OPTIME PR	-.019	-1.15	-.02	-1.25	-.003	-.25			} -.006	-.58	} -.009	-.79
PCT. TRAV. TIME GV	-3.24	-1.68	-3.194	-1.66								
PCT. TRAV. TIME PR					-1.294	-.70			} -1.867	-.99	} -1.56	-.83
NCASH INC (in Malaysian $1000)	4.76	1.04	5.51	1.17	3.98	.95	-1.30	-1.75	6.244	1.23	6.993	1.38
CASH INC (in Malaysian $1000)	-1.93	-2.95	-1.97	-2.95	.426	.83	-.266	2.36	-.052	-.08	-.088	-.13
CITYSIZE	-.51	-1.95	-.420	-1.55	-.19	-.79	-.057	1.20	-.229	-.79	-.133	-.45
BOYS 0-4 TOTAL	-1.53	-2.64					.305	2.56	2.678	-4.01		
MALAY			-1.225	-1.89	-2.29	-3.37					-2.23	-3.09
CHINESE*			-2.364	-1.39	-2.15	.15					-4.46	-2.03
INDIAN*			-1.940	-.42	-1.06	.90					-3.55	-.79
GIRLS 0-4: TOTAL	-.878	-1.99					.064	.67	-1.145	-2.24		
MALAY			-.794	-1.46	-.989	-1.44					-1.083	-1.83
CHINESE*			-1.425	-.71	-1.629	-.68					-1.751	-.58
INDIAN*			-.111	.417	.159	.78					-1.11	-.02
CH5-15: TOTAL	.127	.60					.003	.07	.22	.92		
MALAY			.192	.765	.028	.11					-.067	-.25
CHINESE*			.024	-.43	.71	1.99					.794	1.79
INDIAN*			.726	.746	.936	1.57					1.320	1.95
ADULT <45: TOTAL	.237	1.17					-.008	-.19	.211	.95		
MALAY			.343	1.34							.243	13
CHINESE*			.267	-.25							250	08
INDIAN*			-1.330	-2.76							-.816	-1.71
ADULT ≥46: TOTAL	-.255	-.71					.018	.25	-.375	-.936		
MALAY			-.820	-1.81	-.475	-1.01					-.989	2.03
CHINESE*			+.220	1.78	-.164	.55					.419	1.84
INDIAN*			1.02	1.71	.328	.84					1.540	2.29
UN HYG. H_2O	.167	.29	.368	.62	-.67	-1.14	-.036	-.27	-.444	-.68	-.103	.16
HYG. SEW.	-1.007	-1.31	-.919	-1.19	-1.018	-1.43	-.02	.16	-2.571	-2.89	-2.343	-2.63
INFMRT: TOTAL	-.051	-1.94					.008	1.22	-.075	-2.56		
MALAY			-.067	-2.29	-.064	-1.171					-.110	-3.45
CHINESE			.043	1.99	.065	2.08					.111	2.92
INDIAN			-.142	-1.22	-.006	1.00					-.064	.69
IP. TIME	.023	.67	.022	.63	.051	1.09	.02	1.99	-.013	-.34	-.018	-.46
IP. FEE	-.086	-2.45	-.087	-2.49	-.028	-.89	.001	.15	-.094	-2.30	-.084	-2.03
(OPFEE GV/OPFEE PR)					-.230	-1.60	-.23	-1.30				
(OPTIME GV/OPTIME PR)					-.053	-.72	-.053	-.72				
(TRAV. TIME GV/TRAV. TIME. PR)					-.35	-2.62	-.352	-2.63				
CHINESE	-.60	-.70	-3.550	-1.59	-4.932	-1.97	-.237	-1.39	2.067	2.19	-5.907	-2.19
INDIAN	-1.78	-1.39	3.396	.83	-6.884	-2.11	.238	1.01	-3.59	-2.66	-6.500	-1.54
CONSTANT	8.04	3.41	8.73	3.55	8.705	3.55	.364	.82	11.54	4.99	13.075	5.51
R^2	.16		.18		.20		.15		.14		.16	
(N)	995		995		586		409		1175		1175	
ESTIMATION PROCEDURE	GLS-TSLS		GLS-TSLS		GLS-TSLS		LOGIT:M.L.E.		GLS-TSLS		GLS-TSLS	
Sample	Class of households who have used a government outpatient service at least once.				Class of households who have used a private outpatient clinic at least once.		Set of households which have used both a private and government clinic at least once.		Class of households who have had at least one outpatient visit.			

a/ Dependent Variable equals log $\left(\frac{P(t)}{1-P(t)}\right)$ where P(t) is the probability of a public outpatient visit, 1-P(t), the probability of a private outpatient visit.

*See starred footnote on Table 2.

Table 4

Econometric Estimation of the Demand for Alternative Maternity Services andSchool Health Care

Dependent Variable	Maternity Care Demand a/						Prenatal Visits to Gov. Clinic		Preventive Care to School Children					
Independent Variable	Hosp. Deliv.		Mod. Pract. Deliv.		M.D. Deliv.				Innoc. Sch.		Med. Ex. Sch		Dent. Ex. Sch.	
	β	t	β	t	β	t	β	t	β	t	β	t	β	t
Endogenous														
Trad Pract Use	-1.001	-1.99	-.929	-2.26	-1.629	-2.94								
Exogenous														
OP FEE PR							.006	.03						
OP FEE GV							-.489	-1.16						
OPTIME GV							-.012	-1.03						
OPTIME PR							-.018	-.95						
NCASH INC	-.004	-1.30	-.001	-.37	-.002	-.78	-4.95	-1.01						
CASH INC	-.002	1.85	.484	.69	.001	2.03	2.51	2.42						
CITYSIZE	-.201	-1.04	.146	.71	-.413	-2.44	.189	.79	-.006	-.19	.050	2.27	.024	.79
#STUDENTS									.103	4.85	.081	5.09	.145	6.50
POV.OCC.									.353	5.19	.198	3.79	.234	3.27
DPNDCY	-1.672	-1.50												
POP/MHC									-.0001	-2.42	-.00003	.46	0.	0.
AGRICUL	-.264	-.57	-.898	-1.90	-.677	-1.44			.105	1.47	-.013	-.24	-.045	-.60
PRIV MD/POP														
MCHS/POP							-.011	-.12						
CHINESE	2.938	5.61	2.300	3.00	1.110	2.56	-1.13	-1.34						
INDIAN	2.908	4.16	1.988	1.89	1.391	2.47	-.067	-.07						
CONSTANT	.257	.28	.802	1.07	-.155	-.25	4.42	2.28	.167	1.61	-.149	-1.92	.133	1.21
R^2	.46		.20		.28		.06		.07		.06		.05	
N	194		194		194		194		946		946		946	
ESTIMATION PROCEDURE	LOGIT: M.L.E.		LOGIT M.L.E.		LOGIT M.L.E.		GLS		OLS		OLS		OLS	

and in the event of a severe illness. The cross elasticities of demand for traditional care due to a change in modern outpatient prices are .05 and .17, respectively (Table 2, eqns. 3 and 4) and the latter is statistically significant.

The price inelasticity of demand for inpatient care is not surprising. Particularly where the rate schedule is deliberately subsidized for lower income groups, the cash burden of hospitalization never becomes large enough to prevent hospitalization. The decision to hospitalize is primarily an exogenously made decision by a medical authority -- the government or private physician.

(2) Time Effects: From our theoretical model, we would expect that our time cost variable would have an effect comparable to a change in cash price. Our results partially verify this. Neither the probability of an outpatient visit nor the level of total demand are affected by time requirements. As with the cash outlay variable, the own-time effects are negative, but statstically of low significance and elasticity (-.06 for total outpatient visits). Similarily, the probability of hospitalization is not influenced by the expectation of the length of an inpatient stay.

Unlike prices, the cross-price effects of time cost are negative. An increase in the time required for a private (public) visit reduces the demand for public (private) outpatient care as well. Ironically, the cross-time effects are positive only with respect to the probability of use of a traditional practitioner. Since one of the reputed advantages of traditional practitioners is the convenience and informality of access, time may at the margin shift demand away from the modern medical system.

These results suggest the inelasticity of demand to the total time required for utilization. Yet the level and likelihood of household outpatient demand does prove sensitive to how the time required for utilization is spent. Travel time emerges as a deterrent factor. Our variable measuring the fraction of utilization time spent travelling to and from the clinic, as opposed to waiting or treatment, emerges with a negative coefficient that is particularly significant in terms of the demand for government clinics and the probability of outpatient demand in the previous month. However, it is not an insurmountable obstacle. The probability of demand in the previous year is unaffected by the variable. It is also interesting that among

households using both government and private clinics, it is the relative transport time requirements rather than the relative time requirements for treatment and waiting that proves important in the choice of a public rather than private clinic; the higher the relative time spent in transportation to a government clinic, the lower the probability of usage.

Other evidence exists which supports the conventional wisdom that transport time or physical accessibility may operate as a deterrent to consumption. Since we were forced to use mean price estimates for nonuser households, extreme levels in perceived time cost and its effect on non-utilization are not captured by our time variable. It is in the rural areas that the time cost issue would be most pressing. The significant positive relationship between our measure of the density of rural medical supply -- the per capita expenditure on Main and Subhealth Centers -- and the probability of outpatient usage supports the conventional wisdom. It may also be one explanation for why our urbanization index suggests rural households have a lower level of outpatient demand.

Finally, the inelasticity of the total time variable has two implications. First, any negative elasticity with respect to travel time cannot be very high. This may simply reflect that Malaysia's rural health network is sufficiently dense that the travel time is not excessive for most citizens. Mobile medical teams sharply reduce the mean travel time throughout the system. Second the disutility associated with waiting and treatment may be low. In an LDC, patients may enjoy the chance for "socializing" associated with outpatient clinic use. Households may also perceive a positive relationship between the quality of care received and the fraction of utilization time spent in treatment.

(3) Interations of Inpatient and Outpatient Care: The hypothesized technological complementarity between inpatient and outpatient care is verified only in one direction -- hospitalization results in greater usage of outpatient clinics, with a slightly stronger effect on public outpatient clinics (Table 3, eqns. 1-3). Households that frequently use outpatient services are not more likely to be hospitalized (Table 2, eqn. 6). Given the insignificant level of private inpatient capacity[1] and the independence of government and private practices, the decision to hospitalize, even by a private practitioner,

[1]Private inpatient facilities exist in Penang and Kuala Lumpur; they are of limited capacity.

guarantees that inpatient and subsequent outpatient care for the particular disease episode will be provided to a larger extent through the public medical system.

Neither do our results suggest significant ex ante substitutability between inpatient and outpatient care. The effect of an increase in the daily inpatient fee is to decrease the number and likelihood of outpatient visits, particularly government clinic visits. This might reflect the complementarity mentioned above, but since we found inelasticity in the own-price effect on inpatient care, this is unlikely.

(4) Income Effects: There are several consequences of an increase in cash income on household consumption of medical care. First, it will have only a minor impact on whether the household seeks outpatient or inpatient care or on the total quantity of outpatient care consumed by the household. Since the effect of an increase in household cash income implies both positive income and negative price effects on medical demand (even if one has taken account of the indirect effect of medical need), the estimated coefficient of the cash income variable is not indicative of the narrow income effect of the theoretical model. This is particularly the case in the absence of an opportunity cost-weighted measure of the time cost of medical care and without taking account of family size differences (see below).

Second, it will strongly increase the consumption of prenatal care (Table 4), and perhaps by inference, the demand for other preventive goods and services. Third, it shifts the pattern of discretionary demand toward those services generally perceived by modernizing groups as of higher quality, though also of higher price. At higher income levels, households clearly shift their demand from public to private outpatient clinics (Table 3, eqn. 4). Since the mean utilization time for public and private clinics is comparable, the shift to the former clinics is presumably not a response to a lower opportunity cost of time for their utilization. For obstetrical care, there is a shift to deliveries within a hospital by physicians or Western-trained nurses, as opposed to home deliveries by local village midwives (Table 4). These results indirectly suggest a positive income effect on m'.

These results are confirmed by examination of the mean level of consumption of several medical and preventive services by income quintile (Table 5). The cutoff per capita income level for each quintile is calculated so that each quintile includes 20% of the population.[1] It is clear that the level of medical consumption is approximately the same across income quintiles. Unlike most other developing countries, income does not operate as a barrier to access to medical care. However, it is also clear that if one takes account of differences in family size, the mean level of outpatient and preventive services consumption per capita within the household rises with income. Econometrically, these results emerge from the less than proportionate increases in demand with increasing family size implied by the coefficients. From Table 5, the total number of outpatient visits per capita rises from 1.31 for the lowest quintile to 2.06 for the highest. The number of prenatal visits per birth rises from 2.72 to 6.96. Inpatient care per capita is far less sensitive to income, with no systematic pattern of higher consumption across income quintiles. Table 5 also indicates the slightly lower per capita consumption level for rural households. In summary, cash income is not a barrier to access, but clearly does influence the level and structure of per capita medical consumption, particularly for discretionary medical demand.

Finally, more puzzling from the results is the countervailing effect of changes in non-cash income. For example, an increase in non-cash income reduces the probability of use of an outpatient clinic. On the other hand, whereas cash income has no effect on total outpatient demand and negative impact on government outpatient demand, noncash income appears with a positive effect on average. Approximately 66% of noncash income is from imputed rental income; the residual is the sum of imputed own consumption. Only the latter might imply a time price effect, the former a narrow income effect. One potential source of difficulty may be the multi-collinearity between the two income variables (r=.56).

(5) Health Status and the Demand for Medical Services: Our results suggest that higher levels of community morbidity (as proxied by the infant mortality rate (INFMRT)) do not necessarily lead to substantially higher

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[1] This means that the number of households per quintile will obviously differ, given the differences in observed family size at different income levels. In presenting statistics by ethnic group and urban-rural breakdown, the income cut-off points per quintile are those used for the entire population. Thus, although the sum of the population of the Malay, Chinese and Indian households recorded as in quintile I equal 20% of the total population, individually, the fraction of the population of the ethnic group in a particular quintile may be more or less than 20%.

Table 5

Mean Consumption Levels Per Household and Per Capita of Medical Services: By Income Quintile, Location & Race

Income Quantile							Urban Households					Rural Households				
		I	II	III	IV	V	I	II	III	IV	V	I	II	III	IV	V
#OPVIS	per household	8.67	10.75	9.71	11.44	9.81	9.25	12.70	11.43	12.88	11.02	8.44	9.79	8.67	10.13	7.56
#OPVISGV	per household	7.81	8.28	7.03	7.63	4.88	7.65	9.03	7.65	8.50	4.85	7.87	7.91	6.65	6.83	4.87
#OPVISPR	per household	.86	2.47	2.68	3.81	4.94	1.61	3.67	3.78	4.38	6.16	.57	1.88	2.02	3.30	2.69
PRENAT.VIS.	per household	.49	.49	.69	.66	.42	.57	.57	.71	.58	.35	.46	.46	.67	.74	.54
TRADEUSE	per household	.25	.28	.29	.32	.23	.26	.35	.33	.39	.24	.24	.24	.27	.26	.21
INNOC.SCH.	per household	.63	.43	.34	.21	.12	.85	.47	.40	.23	.13	.55	.41	.30	.19	.07
MED.EX.SCH.	per household	.46	.26	.19	.13	.05	.48	.20	.16	.10	.04	.45	.30	.21	.15	.06
DENT.EX.SCH.	per household	.81	.53	.45	.29	.18	.90	.54	.53	.26	.21	.77	.52	.41	.32	.14
IPSTAY	per household	.25	.23	.17	.28	.16	.23	.29	.26	.24	.16	.25	.23	.11	.31	.17
#HOUSEHOLDS		257	273	280	296	359	71	90	105	141	233	186	183	175	155	125
NCASH.INC.	per capita[a]	5.64	6.73	8.41	9.39	17.08	5.22	4.35	7.11	7.19	17.40	5.80	7.90	9.19	10.67	16.54
CASH.INC.	per capita[a]	18.46	33.87	49.40	78.00	230.19	18.31	34.59	50.14	79.85	256.68	18.52	33.51	48.96	76.32	164.91
#OPVIS.	per capita	1.31	1.71	1.59	1.98	2.06	1.36	1.86	1.83	2.22	2.28	1.28	1.66	1.44	1.76	1.64
#OPVISGV	per capita	1.18	1.32	1.15	1.32	1.02	1.13	1.32	1.23	1.46	1.00	1.19	1.33	1.10	1.13	1.05
#OPVISPR	per capita	.13	.40	.44	.66	1.04	.23	.54	.60	.76	1.28	.09	.33	.34	.63	.59
IPSTAY	per capita	.04	.40	.03	.05	.03	.03	.04	.04	.04	.03	.04	.04	.02	.03	.04
PRENAT.VIS	per capita	2.72	3.01	4.48	4.50	6.96	2.48	3.68	4.64	4.04	7.04	2.89	2.69	4.37	4.96	6.11
HOMEVIS.BYNURSE	per birth	2.76	3.25	3.13	3.46	2.23	3.03	3.46	4.33	3.79	1.4	2.87	1	2.41	3.40	2.90
INNOC.SCH.	per student	.33	.26	.19	.14	.10	.41	.22	.19	.15	.11	.30	.29	.18	.13	.07
MED.EX.SCH.	per student	2.36	.16	.10	.09	.04	.23	.10	.08	.07	.03	.24	.20	.13	.10	.06
DENT.EX.SCH.	per student	.42	.32	.25	.20	.16	.44	.26	.25	.17	.17	.41	.36	.25	.22	.14

Income Quantile		Malays					Chinese					Indians				
		I	II	III	IV	V	I	II	III	IV	V	I	II	III	IV	V
#OPVIS	per household	7.94	8.34	7.27	8.87	9.99	11.42	14.48	15.03	13.42	9.76	13.57	16.44	12.09	14.31	9.55
#OPVISGV	per household	7.37	7.33	6.34	6.49	5.89	8.08	7.37	8.75	7.71	3.91	12.45	13.81	6.59	11.88	5.86
#OPVISPR	per household	.56	1.01	.93	2.38	4.10	3.33	7.11	6.29	5.71	5.85	1.14	2.63	5.50	2.44	3.68
PRENAT.VIS	per household	.47	.42	.68	.77	.56	.46	.67	.44	.54	.28	.85	.59	.88	.69	.68
TRADUSE	per household	.25	.25	.25	.21	.13	.25	.20	.56	.49	.32	.10	.17	.03	.16	.18
INNOC.SCH.	per household	.68	.48	.36	.28	.14	.21	.22	.21	.16	.11	.57	.49	.47	.03	.09
MED.EX.SCH.	per household	.49	.33	.18	.15	.08	.29	.07	.24	.13	.03	.24	.22	.16	.03	.05
DENT.EX.SCH.	per household	.90	.60	.44	.37	.18	.42	.43	.48	.24	.19	.24	.37	.50	.19	.14
IPSTAY	per household	.18	.15	.14	.30	.17	.29	.26	.21	.25	.12	.86	.68	.28	.31	.55
#HOUSEHOLDS		206	177	183	134	147	24	54	63	128	184	21	41	32	32	22
NCASH.INC.	per capita	6.08	9.16	10.11	11.41	13.37	3.29	2.96	6.17	8.12	19.07	1.60	1.24	2.34	4.93	26.77
CASH.INC.	per capita	18.16	32.87	48.45	76.75	198.17	17.83	36.03	51.61	79.68	219.86	21.65	35.24	51.05	76.58	354.19
#OPVIS	per capita	1.21	1.54	1.43	1.75	2.12	1.64	1.76	2.03	2.0	1.96	1.83	2.26	1.86	2.81	2.56
#OPVISGV	per capita	1.12	1.35	1.13	1.28	1.25	1.16	.90	1.18	1.14	.79	1.68	1.90	1.01	2.32	1.57
#OPVISPR	per capita	.09	.19	.30	.47	.87	.48	.86	.85	.86	1.17	.15	.36	.85	.49	.99
IPSTAY		.03	.03	.02	.06	.04	.04	.03	.03	.04	.02	.12	.09	.04	.06	.15
PRENAT.VIS	per birth	2.85	2.87	4.80	4.13	6.4	1.56	3.27	2.77	4.56	7.44	4.47	3.0	4.86	7.4	4.67
HOMEVIS.BYNURSE	per birth	3.27	3.46	3.23	4.30	3.10	2.58	.73	2.24	2.21	.52	1.0	5.0	3.11	4.41	2.0
INNOC.SCH.	per student	.35	.34	.23	.21	.11	.12	.094	.09	.09	.10	.28	.27	.26	.03	.10
MED.EX.SCH.	per student	.25	.23	.11	.11	.06	.17	.031	.10	.07	.02	.12	.12	.09	.03	.05
DENT.EX.SCH.	per student	.47	.42	.28	.28	.14	.24	.18	.20	.14	.17	.12	.20	.28	.18	.15

a) per month in Malaysian dollars.

utilization of medical resources. Specifically, an increase in the rate of illness (i) reduces the likelihood a household will seek outpatient care, (ii) has a statistically significant negative impact on the demand for modern outpatient services, and (iii) increases the likelihood of inpatient care, and of recourse to a traditional medical practitioner. The INFMRT appears to reflect the socioeconomic correlates of higher morbidity households; their lower income and socioeconomic status lead to lower demand for outpatient care, despite the higher "medical need" (which may not be perceived as such).

Yet when the INFMRT variable is differentiated by ethnic groups, one finds striking differences in the "response" to illness. The Chinese respond by a higher consumption of outpatient and inpatient services relative to the Malays and Indians. This is surprising because the mean and variance of the Chinese infant mortality rate across districts is the lowest of the three groups. This suggests that in communities with higher morbidity, the effect of morbidity on outpatient demand lessens and even becomes perversely negative. This is particularly true for the Malays. Since the Chinese have experienced the sharpest post-war decline in infant mortality,[1] it is possible that the implications of higher morbidity are clearer to them, and their response greater. In other words, it may not be the level of the illness rate that is relevant, but the level relative to some perceived norm. If a high rate of illness is not perceived as unusual, it may not induce differentially higher utilization of services. Only for inpatient care, where there is a significant nondiscretionary component to demand, do we find the positive effect of morbidity. It is also possible that the observed distribution of demand across medical services by ethnic group may be strengthened by the urban concentration of both the Chinese population and inpatient facilities.

Our model also hypothesized that the degree of medical need would be related to the age structure of the household. The coefficient of the age bracket variables measure the marginal effect on demand of an additional household member in that bracket. As above, the effect of differences in morbidity across age groups is more apparent in explaining the pattern of inpatient rather than outpatient demand. The effect of an additional child in the 0-4 age group

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[1] Heller (1976).

on the probability of hospitalization is .46. It falls to zero for the 5-15 age group, then rises for the 16-45 age group to .14, and then to .21 for the over-45 age group. This pattern is roughly confirmed for each of the three ethnic groups (Table 2 eqns. 5 and 6). The Malays in the 0-4 and over-45 age groups under-utilize inpatient services relative to the Chinese and Indians; Malays in the 16-45 age group over-utilize them.

The pattern of outpatient demand across age groups is inconsistent with our expectations. It is precisely the dependent, high morbidity groups in the 0-4 and over-45 age groups that consume the smallest level of outpatient care (Table 3, eqn. 5). Only the coefficients of the 5-15 and 16-45 age groups enter with positive coefficients. The pattern is less clear-cut by ethnic groups. The Malays conform to this pattern, with clear relative discrimination in consumption against all but the 15-45 age groups. The dependent populations in particular have decisively lower marginal consumption levels. Both Chinese and Indians appear to discriminate against the 0-4 groups, whereas the 5-15, and over-45 age groups have a clearly positive marginal consumption rate.

Thus, only to the extent that the dependent age groups are more likely to be ill with severe illnesses requiring hospitalization will morbidity be reflected in the pattern of medical demand. In these instances, families may perceive few other options and in fact, the options may be taken out of their hands by clinic physicians. Yet the results imply that the household chooses to treat a significant fraction of illness for the dependent age groups within the home; it will not be translated into outpatient demand. It is school children and the household members in the working age-group that are more likely to consume outpatient services, despite their presumably lower relative morbidity rate. As with our results on the INFMRT variable, only the Chinese deviate from this pattern, excepting the 0-4 age groups. If the goal of the Malaysian health and medical system is strictly to attend to the volume of illness (rather than some weighted set of epidemiological and economic goals), the results indicate the system may be operating inefficiently.

Two other points emerge from the results. First, it is the age groups 5-15 and over-45 that are most likely to use traditional sources of medical

care. The latter result is not surprising; the older age groups are more likely to have confidence in such forms of treatment and be less interested in time-saving modern medical treatments. Traditional practitioners may absorb a significant share of the illness - induced demand within this age group. The former result is less easily explained. Second, there is the interesting result that households provide a smaller level of outpatient care to boys, aged 0-4 than girls (Table 3, eqns. 7 and 9). This may indicate that girls are less healthy, perhaps as a consequence of receiving a smaller level of resources within the family. For serious illnesses warranting hospitalization, the probability that a toddler or infant will be hospitalized is independent of sex.

Finally, we argued that a household's risk of illness is likely to be exacerbated in an unhygienic environment. Econometically, this relationship may be blurred by the correlation between environmental quality and the household's socioeconomic status. This possibly explains the mixed results obtained in the model. Specifically, families with hygienic water supplies have a higher (lower) probability of usage of modern (traditional) outpatient services. Similarly, despite higher rates of illness in rural areas, families from a rural district will consume approximately two government outpatient visits less than a family from a metropolitan district, though this effect is not picked up in the total outpatient visit equation. Environmental factors do not influence the probability of hospitalization. Among environmental variables only the coefficient on our measure of access to sanitary modes of waste disposal is consistent with the hypothesized fall in usage with improved environmental conditions. Again, these results suggest that families with greater medical need are less likely to be the principal consumers of outpatient services in W. Malaysia.

(6) Ethnic Differences in the Demand for Medical Care: We have already indicated some of the differences that exist in the pattern of demand of the three ethnic groups. Several other points are of interest. Ranked simply by the relative volume of outpatient visits or inpatient stays per household, the Indians clearly dominate the other groups with the Chinese next in order (Table 5). Yet if one adjusts for demographic and socioeconomic

factors as in our econometric model, the ethnic intercept terms suggest a different ranking in the level of outpatient consumption by the three groups. In the equations without multiplicative dummies, (Table 2, eqn. 5, Table 3, eqn. 1, 5) the Chinese dominate the rank ordering of the intercept terms for outpatient visits, followed by the Malays; the Indians dominate the demand for hospitalization followed by the Chinese. Yet if one adjusts for the differences across ethnic groups in their response to morbidity as well (Table 2 eqn. 6, Table 3, eqns. 2,3, and 6) the Malays have the highest intercept term for both outpatient and inpatient demand. This may reflect multicollinearity between the intercept terms and some of the age-related multiplicative dummies.

The Chinese clearly dominate in the demand for revealed traditional practitioner usage. In Table 2, eqn. 3 the Chinese intercept term is the highest. Since the Chinese in Malaysia are highly urbanized, this may also explain why the probability of usage is highest in the urbanized areas.

School Health Services: The results in Table 4 suggest the factors which underlie the receipt of school health services. The results suggest an emphasis on providing services among the poor, i.e., to children of parents engaged in low-income occupations (rubber tappers, non-landholding agricultural laborers, fishermen). Routine medical examinations to primary school children are more frequent in the rural areas. The emphasis on the poor is also apparent from Table 5. The mean level of school health services received per student falls for successively higher income quintiles.

V

Who is Subsidized by Public Provision of Medical Care in W. Malaysia?

There is no question but that public medical services in W. Malaysia are heavily subsidized. For example, it costs the public sector at least M$2.25 per outpatient visit at a Main or Subhealth Center, M$1.08 at a Mobile Medical Clinic, M$5.80 at a District Hospital and M$7.09 at a General Hospital Outpatient Clinic. Its expenditure per inpatient day is M$37.27 at a General Hospital and M$32.06 at a District Hospital.[1] Yet the average household cash outlays per public sector outpatient visit and per day of inpatient care are only M$.40 and M$8.62, respectively (Table 1). In 1973, total recurrent expenditure alone equalled M$196.2 million or approximately M$17.50 per capita.

Our results have shown that as income falls, households obtain a higher fraction of their total medical consumption, particularly outpatient care, from the public medical sector. Yet in many developing countries, it is commonly observed that upper income groups tend to have disproportionate access to those public medical services which are of higher quality and also of higher cost. Specifically, the poor frequently use primary outpatient clinics, but it is the rich who are the principal users of specialists and expensive specialty inpatient capacity. By combining our survey data results with an earlier analysis of the cost of medical care in W. Malaysia, we can determine how the public subsidy to medical care is actually distributed across income groups.

Initially, we shall focus on the income status of the consumers of curative and maternal child health (MCH) services. Our survey data allows us to estimate the average number of medical services consumed by a typical household within an income quintile, from each kind of health facility. We can also infer the share of a typical facility's output provided to the members of each income quintile. By further stratification of the data, similar estimates may be made by income quintile, ethnic group and location of residence, though at the cost

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[1]The level of cost across outpatient institutions reflects differences in the capital infrastructure and skill mix of medical personnel involved in the delivery of care. The estimates of cost are inclusive of the capital service cost (amortization and foregone earnings on capital). [Heller (1975a)]

Table 6

DISTRIBUTION OF MEDICAL SERVICE CONSUMPTION ACROSS OUTPATIENT AND INPATIENT FACILITIES: BY PER CAPITA INCOME QUINTILE

INCOME QUINTILE [a]	I	II	III	IV	V	I	II	III	IV	V	TOT.	Approximate Cost of Production per Unit Service [c]
OUTPATIENT VISITS												
General Hospital Outpatient Visit	18	24	29	36	58	13	17	19	22	30	100%	M$7.09
District Hospital Outpatient Visit	35	28	35	22	18	27	22	25	15	10	100%	M$5.80
Main Health Center	10	13	5	8	3	27	35	13	19	6	100%	M$2.19 [d]
Sub Health Center	19	14	15	18	7	28	20	20	24	7	100%	M$2.28 [d]
Midwife cum-quarters	7	5	7	3	4	30	20	26	12	12	100%	M$ .67
Maternal Child Health Center	1	3	1	7	5	6	21	6	42	24	100%	M$2.57
Static Dispensary	3	5	2	2	4	21	38	10	10	21	100%	n.a.
Travelling Dispensary	7	8	7	4	1	25	30	25	14	5	100%	M$1.08
TOTAL	100%	100%	100%	100%	100%							
INPATIENT STAYS						20	21	15	26	18	100%	
General Hospital	69	53	71	80	70	20	16	15	31	18	100%	$340
District Hospital	31	47	39	20	30	20	32	14	17	17	100%	$219
TOTAL	100%	100%	100%	100%	100%							
FRACTION OF POPULATION IN EACH QUINTILE						20%	20%	20%	20%	20%		

[a] mean household per capita incomes for each quintile are M$238, M$428.6, M$621.72, M$967.20, M$3046.

n.a. not available

[c] drawn from Heller (1975).

[d] for curative outpatient clinics

Table 7

DISTRIBUTION OF MEDICAL SERVICE CONSUMPTION ACROSS OUTPATIENT AND INPATIENT FACILITIES:. BY PER CAPITA INCOME QUINTILE AND ETHNIC GROUP:1974

Income Quintile a/	Malays					Chinese					Indians				
	I	II	III	IV	V	I	II	III	IV	V	I	II	III	IV	V
OUTPATIENT VISITS															
General Hospital Outpatient Visit	13	26	24	24	61	44	30	34	44	50	27	10	38	48	60
District Hospital Outpatient Visit	39	18	32	20	20	8	40	47	29	17	36	41	13	16	17
Main Health Center	9	14	6	12	2	16	6	4	3	0	9	21	4	4	13
Sub-Health Center	22	18	18	26	9	12	8	3	11	5	0	8	38	12	7
Midwife cum-quarters	8	7	12	1	3	0	2	0	8	5	5	0	0	0	3
Maternal Child Health Center		3	1	9	3	4	6	1	2	10	0	0	0	12	0
Static Dispensary		5	1	1	0	0	0	0	0	10	23	13	8	8	0
Travelling Dispensary	6	8	7	6	2	16	8	10	3	3	0	8	0	0	0
TOTAL	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
INPATIENT STAYS															
General Hospital	71	50	67	80	83	67	50	75	84	58	38	41	77	67	67
District Hospital	29	50	33	20	17	33	50	25	16	42	62	59	23	33	33
TOTAL	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

	Malays						Chinese						Indians					
	I	II	III	IV	V	TOT.	I	II	III	IV	V	TOT.	I	II	III	IV	V	TOT.
OUTPATIENT VISITS																		
General Hospital Outpatient Visit	15	23	17	17	27	100%	10	14	22	26	28	100%	12	8	18	24	37	100%
District Hospital Outpatient Visit	42	15	22	13	8	100%	2	24	39	22	12	100%	22	44	8	11	14	100%
Main Health Center	29	33	12	24	2	100%	33	25	25	17	0	100%	13	50	6	6	25	100%
Sub-Health Center	34	21	17	23	5	100%	16	21	11	37	16	100%	0	18	53	18	12	100%
Midwife cum-quarters	36	23	33	3	5	100%	0	11	0	56	33	100%	50	0	0	0	50	100%
Maternal Child Health Center	6	24	6	53	12	100%	8	25	8	8	50	100%	0	0	0	100	0	100%
Static Dispensary	11	67	11	11	0	100%	0	0	0	0	100	100%	36	36	14	14	0	100%
Travelling Dispensary	29	29	21	18	3	100%	21	21	37	11	11	100%	0	100	0	0	0	100%
INPATIENT STAYS																		
General Hospital	16	19	18	30	12	100%	7	17	18	38	23	100%	25	27	14	14	19	100%
District Hospital	16	14	17	34	20	100%	7	12	16	46	19	100%	18	20	20	18	24	100%
Fraction of Population in each Quintile	15	33	21	21	10	100%	8	28	12	20	32	100%	34	34	7	10	14	100%
	29	20	22	14	15	100%	6	16	16	20	32	100%	17	33	23	18	9	100%

a/ The income cutoff points per quintile are those used to allocate 20% of the total population of West Malaysia to each quintile (Table 6).

Table 8

DISTRIBUTION OF MEDICAL SERVICE CONSUMPTION ACROSS OUTPATIENT AND INPATIENT FACILITIES:

BY PER CAPITA INCOME QUINTILE AND URBAN-RURAL AREA

Income Quintile[a]	Urban					Rural				
	I	II	III	IV	V	I	II	III	IV	V
OUTPATIENT VISITS										
General Hospital Outpatient Visit	22	33	45	48	68	17	19	16	26	38
District Hospital Outpatient Visit	44	43	33	22	14	32	19	36	22	25
Main Health Center	9	13	6	2	1	10	13	5	12	7
Sub-Health Center	17	4	8	10	1	20	20	21	25	18
Midwife cum-quarters	6	4	1	5	4	7	5	11	2	4
Maternal Child Health Center	2	0	1	11	7	1	5	1	5	2
Static Dispensary	0	0	2	0	5	4	8	1	3	2
Travelling Dispensary	0	5	5	2	0	9	10	9	6	5
TOTAL	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
INPATIENT STAYS										
General Hospital	88	56	89	76	73	64	51	47	83	65
District Hospital	12	44	11	24	27	36	49	53	17	35
TOTAL	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

	Urban						Rural					
	I	II	III	IV	V	TOT.	I	II	III	IV	V	TOT.
OUTPATIENT VISITS												
General Hospital Outpatient Visit	7	14	21	21	37	100%	21	22	15	24	18	100%
District Hospital Outpatient Visit	23	28	24	15	11	100%	31	17	27	16	9	100%
Main Health Center	25	42	21	8	4	100%	27	33	9	24	7	100%
Sub-Health Center	37	10	23	27	3	100%	26	23	20	23	9	100%
Midwife cum-quarters	25	19	6	25	25	100%	32	21	35	6	6	100%
Maternal Child Health Center	6	0	6	50	39	100%	7	47	7	33	7	100%
Static Dispensary	0	0	29	0	71	100%	27	50	5	14	5	100%
Travelling Dispensary	0	40	40	20	0	100%	30	28	22	13	7	100%
INPATIENT STAYS												
General Hospital	12	19	20	25	25	100%	26	23	11	28	12	100%
District Hospital	14	14	23	25	24	100%	26	18	8	36	11	100%
Fraction of Population in each Quintile	6	33	9	24	27	100%	26	32	17	13	12	100%
	13	17	18	22	30		26	22	22	18	12	100%

[a] the income cutoff points per quintile are those used to allocate 20% of the total population of West Malaysia to each quintile (as in Table 6).

of higher sampling error.[1] These estimates are provided in Tables 6 through 8.

Outpatient Care: The highest subsidies from the public provision of all forms of outpatient and MCH care are to the users of the clinics of District and General Hospitals. Unlike the clinics at rural health centers, physicians are involved in the provision of all primary diagnostic examinations at hospital outpatient clinics. The cost difference also reflects the provision of specialty outpatient services in hospitals, particularly General Hospitals.[2] The average cost of a primary outpatient clinic visit is approximately 55% of that for a specialty clinic visit. Ideally, one would want to distinguish the users of specialty and primary hospital outpatient clinics. Since our data do not permit this, we assume that the distribution of users for each type of clinic, for a given class of hospitals, is identical to the distribution of total outpatient demand for those hospitals.

Several conclusions may be drawn. First, if one excludes the highest income quintile (V), there is no discernible pattern across income quintiles in the fraction of outpatient visits made at a hospital rather than a health center. Households in quintile V not only make the smallest use of public sector clinics (Table 5), but also almost exclusively use hospitals. Location, not ethnic group or income, is the principal factor which seems to distinguish the users of hospitals and health centers. Since hospitals are almost entirely found in the urban centers of any region, it is not surprising that the fraction of hospital to total outpatient visits is highest in the urban areas, regardless of the income quintile of the household. The finding that the Chinese make greater use of hospitals than health centers may simply reflect their predominantly urban concentration. These results suggest an inevitable bias in the distribution of the public subsidy of outpatient care toward urban residents.

Second, the fraction of hospital outpatient visits at General Hospitals, and thus the average hospital outpatient clinic subsidy per household, rises

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[1] Sampling error is particularly a problem for our statistics on the distribution of inpatient consumption by income quintile, ethnic group and residence. However, a separate survey by the author provides additional evidence on the socioeconomic characteristics of the users of Malaysian inpatient facilities (Heller, 1975a). It tends to corroborate the findings of the household survey. For example, it found that 20.9%, 34.8% and 24.3% of the inpatients were from the M$0-M$25, M$25-M$50, and M$50-M$100 monthly per capita income brackets, respectively. In the household survey, the income range for quintile I is M$0-M$29; for II and III together is M$29-M$52; for quintile IV is M$52-M$103. The fraction of inpatients observed from our household survey that were from quintile I is 20%, from quintiles II and III is 36% and from quintile IV is 26%. The correspondence between the results of the two surveys when the sample is delineated into rural and urban groups is equally strong.

[2] Since such hospitals are the highest referral points for any region's health system, this concentration of specialty outpatient care is not surprising and is probably economically rational.

with income. This pattern is insensitive to ethnic group or location, suggesting that the wealthy groups in the rural areas are more likely to travel to the major urban center of the region when in need of hospital outpatient care.

Third, the distribution of users of particular facilities across income quintiles further mirrors the above results. Among outpatients at General Hospitals, 52% are from the upper two quintiles, 30% from the lower two. Conversely, 49% of the users of District Hospitals are from the lower two quintiles, 25% from the upper two. With the exception of the urban-based Maternal-Child Health centers, the poor are the principal users of the Health center system. This pattern is apparent, independent of ethnic group or location. Only the Chinese diverse from this pattern. Among the Chinese, the poor (quintile I) are overrepresented among General hospital outpatients and underrepresented relative to the middle income quintiles (II and III) among Chinese outpatients at District Hospitals. Wealthy Chinese are underrepresented in consuming outpatient services at both kinds of hospital clinic. Unlike the upper income Malays and Indians, they clearly rely on private medical care for a substantial fraction of their medical needs.

Inpatient Care: Contrary to the conventional wisdom, the lowest income quintile households are not underrepresented among inpatients in either the District or General Hospitals. Twenty percent of inpatients are from quintile I. Similarly, 26% of rural households are in quintile I; 26% of those inpatients in General and District Hospitals from rural areas are in quintile I. Conversely, the richest households are slightly underrepresented, constituting only 17-18% of total inpatients; this is particularly the case among the urban rich. It is among the middle income groups that one observes significant variation from the norm level of representation. Quintile IV is overrepresented; quintiles II and III underrepresented among General Hospital inpatients; quintile II households are the principal users of District Hospital inpatient facilities.

This pattern is not uniform across racial groups. The Malay poor consume significantly less inpatient care than their weight in the population might infer; the Indians and the Chinese consume substantially more. Similarly, it is only the Chinese and Malay upper income groups which are underrepresented among inpatients.

Distribution of the Subsidy: In Table 9, we present estimates of how the public sector subsidy to medical care is distributed across income quintiles.

Table 9

Distribution and Value of the Public Sector Expenditure Subsidy to Curative and Maternal-Child Health Services: By Income Quintile, Ethnic Group and Rural-Urban Areas: W. Malaysia, 1973

Source of Subsidy \ Income Quintile	I	II	III	IV	V	TOTAL	Urban I	Urban II	Urban III	Urban IV	Urban V	Rural I	Rural II	Rural III	Rural IV	Rural V	TOTAL
							Distribution of Subsidy Across Income Quintiles										
Outpatient Care: Curative	20.3	20.1	21.3	19.5	19.4	100%	6.85	9.59	11.02	9.41	13.08	13.15	10.43	10.20	10.14	6.11	100%
Outpatient Care: Maternal-Child Health	20.2	22.8	15.9	28.9	12.1	100%	6.56	4.15	6.24	13.3	7.36	13.5	18.75	9.59	15.46	5.10	100%
Inpatient Care:	20.0	21.7	14.6	26.0	17.6	100%	5.07	8.52	8.23	10.76	10.84	14.79	13.50	6.65	15.14	6.49	100%
TOTAL	20.0	21.3	16.4	24.4	17.9	100%	5.61	8.63	8.89	10.51	11.29	14.31	12.90	7.70	13.83	6.34	100%
Fraction of Population in Quintile	20.	20.	20.	20.	20.	100%	5.68	7.43	7.87	9.62	13.1	14.63	12.38	12.38	10.13	6.75	100%
Fraction of Births in Quintile	23.1	22.6	21.6	21.6	11.1	100%	7.96	6.97	7.96	9.95	5.97	14.93	15.42	13.43	11.44	5.47	100%
Subsidy Per Capita (in Malaysian dollars)	$15.28	$16.25	$12.51	$18.56	$13.62		$15.01	$17.66	$17.18	$16.61	$13.11	$14.87	$15.84	$ 9.46	$20.76	$14.27	
Subsidy as Percentage of Per Capita Income	7.8%	3.7%	2.0%	1.9%	.5%		6.48%	4.11%	2.75%	1.69%	.40%	9.05%	3.70%	1.53%	2.17%	.70%	
Distribution of Subsidy by Care:							Distribution of Subsidy within each Quintile										
Outpatient:																	
Curative	26.47	24.69	33.93	20.89	28.48		32.32	29.41	32.78	23.68	30.64	24.30	21.38	35.0	19.39	25.50	
Preventive	4.02	4.27	3.87	4.73	2.69		1.17	1.93	2.81	5.1	2.62	3.78	5.83	4.99	4.48	3.23	
Inpatient Care	69.51	71.03	62.23	74.37	68.83		62.99	68.65	64.41	71.23	66.74	71.93	72.79	59.99	76.13	71.27	
TOTAL	100%	100%	100%	100%	100%		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	

Source of Subsidy \ Income Quintile	Malays I	Malays II	Malays III	Malays IV	Malays V	Chinese I	Chinese II	Chinese III	Chinese IV	Chinese V	Indian I	Indian II	Indian III	Indian IV	Indian V	TOTAL
						Distribution of Subsidy Across Income Quintiles										
Outpatient Care: Curative	18.12	11.96	11.58	9.79	8.66	2.41	4.61	7.02	6.67	6.03	1.80	2.75	2.29	2.53	3.77	100%
Outpatient Care: Maternal-Child Health	16.90	15.72	9.52	19.38	5.10	2.92	4.47	2.77	4.46	6.51	.52	3.5	2.84	4.16	1.19	100%
Inpatient Care	7.48	9.53	8.71	14.26	8.04	2.14	5.04	4.30	10.95	6.80	5.89	6.13	3.12	3.22	4.36	100%
TOTAL	10.63	10.4	9.49	13.30	8.08	2.24	4.91	4.95	9.57	6.59	4.61	5.14	2.89	3.08	4.08	100%
Fraction of Population in Quintile	16.1	11.1	12.2	7.8	8.3	2.0	5.4	5.4	10.1	10.8	1.8	3.5	2.5	1.9	1.0	100%
Fraction of Births in Quintile	17.34	13.27	13.27	12.76	6.63	3.57	5.61	5.10	7.65	3.57	2.04	4.08	3.06	1.52	.51	100%
Subsidy Per Capita (in Malaysian dollars)	$10.07	$14.29	$11.86	$25.98	$14.84	$17.09	$13.85	$13.97	$14.45	$ 9.30	$39.00	$22.40	$17.62	$24.68	$62.29	
Subsidy as Percentage of Per Capita Income	4.33%	3.36%	1.92%	2.70%	.61%	7.55%	3.17%	2.21%	1.48%	.34%	14.83%	5.26%	2.85%	2.64%	1.44%	
						Distribution of Subsidy within each Quintile										
Outpatient Care:																
Curative	44.58	30.00	31.92	19.27	28.02	28.09	24.56	37.10	18.25	23.95	10.19	14.0	20.70	21.49	24.15	
Preventive	6.27	5.96	3.96	5.75	2.48	5.14	3.59	2.21	1.83	3.90	.45	2.69	3.88	5.34	1.15	
Inpatient Care	49.15	63.98	64.12	74.98	69.49	66.77	71.85	60.70	79.91	72.15	89.36	83.31	75.43	73.16	74.70	
TOTAL	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	

It is important to state precisely what this does and does not measure. Estimates were made of the average net cost to the government of the following services:[1] (i) outpatient visits at Main health centers, Subhealth centers, Mobile or (traveling) dispensaries, General hospitals and District hospitals; (ii) maternal-child health clinic visits at Main and Subhealth centers, Maternal-child health centers and Midwife clinics; (iii) visits by a health center nurse to the homes of pregnant women and new mothers; and (iv) inpatient stays at General and District Hospitals. Given statistics on the total volume of each kind of visit or inpatient stay made in 1973, a total level of expenditure on each kind of service could be estimated and distributed across income quintiles according to our survey findings.

In Table 9, we present (1) the distribution across income quintiles of the total subsidy from public provision of curative outpatient services, maternal-child health outpatient services ((ii) and (iii) above) and of inpatient-care, (2) the level of the per capita subsidy, and (3) the ratio of this subsidy to the per capita income level of each quintile. The results are presented for the entire sample, for urban and rural households and by ethnic group.

In presenting the results of this analysis, we shall use two criteria for evaluating the degree of "equity" in the distribution of medical services and expenditure subsidy across income quintiles: (i) the degree of equality in consumption on a per capita basis, and (ii) whether the ratio of the expenditure subsidy to income falls as income rises. The welfare significance of satisfying the former criterion should not be overstated. To argue that the expenditure distribution is equitable if the rich and poor consume an equal level of public medical services per capita or receive equivalent absolute subsidies is reasonable only if their degree of medical need is comparable. If the poor are significantly less healthy, one might want the system to provide a higher level of per capita services to them. Consequently, the progressive[2] expenditure implications of equality by the first criterion--the poor receiving a higher subsidy relative to their income--may still be inadequate. Lacking a scheme to weight the different income quintiles according to their relative medical need, we simply present the fraction of the total population in each

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[1]The cost estimates are drawn from Heller (1975a). Estimates on the volume of medical services consumed in 1973 are derived from unpublished statistics of the Ministry of Health Government of Malaysia.

[2]Note that the term "progressive" means that a program or policy has the effect of promoting greater equality in the income distribution.

stratification of the sample. In Table 9, the fraction of the population and of total births in each quintile are indicated to facilitate comparison with our equity criterion.[1]

Although our analysis accounts for the allocation of M$172 million, this does not correspond to the total level of recurrent expenditure by the government in 1973. In part, this reflects our inclusion of imputed capital service costs in our unit cost estimates. Equally important, we could not allocate many types of expenditure to different income quintiles, both due to a lack of data on the unit cost of these services and/or to a lack of an obvious criterion for distributing their consumption across households in different income quintiles. Specifically, this included expenditure on (i) administration, (ii) research and training, (iii) environmental health, communicable diseases, health education, dental health, (iv) specific disease control campaigns, i.e., against malaria, leprosy, yaws and filariasis, and (v) special psychiatric,tuberculosis and leprosy hospitals.

Subject to these limitations, the egalitarian character of the Malaysian public health system is apparent. Slightly more than 41% of the estimated subsidy goes to the 40% of the population in the lowest income households and only 18% goes to the 20% of the population in the highest income groups. These results are independent of whether the household lives in urban or rural areas. By ethnic group, the Malays appear to receive a less than proportionate level of subsidization, with the Malays in the lowest income quintile particularly disadvantaged.

This implies that the level of subsidy relative to per capita income is strongly progressive.[2] The value of medical subsidies to the lowest income quintile households equals 7.8% of their income, as contrasted with only .5% for the highest income quintile. This ratio is highest for the rural rather than the urban poor, but only because their incomes are lower. The absolute subsidy per capita is generally higher for urban households. By ethnic group, the Indians receive the greatest subsidy, and the Malays the lowest, regardless of the criterion chosen. The subsidy to the Indian poor is equivalent to 14.8% of their income; to the Malay poor, only 4.33%. This is primarily a consequence of the underrepresentation of Malays relative to Indians in the use of

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[1] Presumably, the share of a group's consumption of maternal-child health services should at least correspond to its share of total births.

[2] Obviously, we are only examining the benefits from the health sector in isolation from the expenditure incidence of other government programs and from the incidence of the current tax structure.

inpatient facilities.

The fraction of the total subsidy for any income quintile that is derived from inpatient care is generally more than 60%. Thus, the extent of redistribution through a medical or health program is largely dominated by the operating characteristics of the medical referral system for inpatient care. Regardless of the innovative character of, or emphasis placed on the primary care delivery system, it is inevitable that expenditure on inpatient care looms large in the total budget. If certain groups of the population cannot be easily referred for hospitalization, they will not share equally in the receipt of public sector medical subsidies. For the Malay poor, this is the case despite the fact that they receive more subsidization than the Indian poor from the provision of maternal-child health and outpatient services.

VI. Conclusion

Several conclusions emerge from this study. First, total medical demand, as measured by the absolute volume of outpatient and inpatient consumption, appears highly inelastic to cash price, income or time cost. Yet consumers are clearly responsive in their choice among alternative sources of medical care to their relative prices. Cross-price elasticities prove significant, not only to cash price but to the relative travel time necessary for the consumption of medical care. Similarly, as income rises, households shift their demand away from traditional practitioners toward modern medical sources of care. Private physicians' clinics appear to be preferred to public clinics with further increases in income.

Second, our results suggest the importance of distinguishing the way the time required for utilization of medical services is spent. The negative effect of travel time provides support for the conventional wisdom concerning the deterrent effect of distance on utilization. However, our results do not support the argument that the queueing that characterizes government outpatient clinics drives patients to private clinics.

Fourth, the results indicate significant variability across households in their response to morbidity. Among ethnic groups, only the Chinese clearly respond to morbidity by demanding outpatient services. Similarly,

the pattern of demand by age group does not correspond to the hypothesized U-shaped relationship between morbidity and age. Since the demand for inpatient care appears to be correlated with morbidity, it appears that a household exercises considerable latitude in responding to morbidity that is neither severe nor clearly urgent. The consequence of allowing this morbidity to remain untreated is an important policy question. If it proves a matter of policy concern, particularly for the 0-4 age groups, it may suggest the need for other programs complementary to the present self-referral system for curative care.

Finally, we have elsewhere argued that Malaysia has successfully elaborated an innovative medical system embodying the use of paramedical workers, mobile medical teams, a referral mechanism and a network of health centers (Heller,1975a). The most important finding of this study is that this delivery system has been extremely effective in reaching out to provide medical and preventive health services to the most disadvantaged groups in the society. Neither income nor time cost appears a significant barrier to access or to the utilization of medical care. This finding holds across ethnic groups, in both urban and rural areas. Equally important, the share of lower income groups in the value of the total expenditure subsidy implicit in the public sector's provision of medical care is proportional to their share in the population. This implies that the value of these subsidies relative to income is highly progressive; they are equivalent to an increase of 7.8% in the real income of the households in the lowest per capita income quintiles, compared to an increase of only .5% for the highest quintile households. Its suggests that the Malaysian model of health delivery may constitute an effective instrument for redistributing income in developing countries.

APPENDIX

Our model assumes that households maximize the Lagrangian expression

$$L = U(k,x,m') + [(y+wt)-(\pi_1+wt)k - (\pi_2+ws)(g(x,k)+m')-(\pi_3+wv)x], \quad ..(1)$$

where we assume:

U_{xx}, $U_{m'm'}$ and $U_{kk} < 0$, U_x, U_k, $U_m > 0$, U_{xk}, $U_{km'}$, $U_{xm'}$, > 0,

$g_x, g_k < 0$, $g_{xx}, g_{kk} > 0$ and $g_{xk} < 0$.

The first order conditions are:

$$L_x = U_x - \lambda[(\pi_3+wv)+(\pi_2+ws)g_x] = 0. \quad ..(2)$$

$$L_k = U_k - \lambda[(\pi_1+wt)+(\pi_2+ws)g_k] = 0.$$

$$L_{m'} = U_{m'} - \lambda[\pi_2+ws) = 0.$$

$$L_\lambda = (y+wt)-(\pi_1+wt)k - (\pi_2+ws)(g(x,k)+m')-(\pi_3+wv)x = 0.$$

For equilibrium, we assume that the levels of x and k chosen are such that

$$[(\pi_3+wv)+(\pi_2+ws)g_x] \text{ and } [(\pi_1+wt)+(\pi_2+ws)g_k] > 0.$$

Totally differentiating the F.O. conditions, one obtains the following equation system: ..(3)

$$\begin{bmatrix} [U_{xx} - \lambda g_{xx}(\pi_2+ws)] & [U_{xk} - \lambda g_{xk}(\pi_2+ws)] & U_{xm'} & -[(\pi_2+ws)g_x+(\pi_3+wv)] \\ [U_{kx} - \lambda g_{xk}(\pi_2+ws)] & [U_{kk} - \lambda g_{kk}(\pi_2+ws)] & U_{km'} & -[(\pi_1+wt)+(\pi_2+ws)g_k] \\ U_{m'x} & U_{m'k} & U_{m'm'} & -(\pi_2+ws) \\ -[\pi_2+ws)g_x+(\pi_3+wv)] & -[(\pi_1+wt)+(\pi_2+ws)g_k] & -(\pi_2+ws) & 0 \end{bmatrix} \begin{bmatrix} dx \\ dk \\ dm' \\ d\lambda \end{bmatrix}$$

$$= \begin{bmatrix} 0 & \lambda g_x & \lambda & \lambda(v+sg_x) & \lambda g_x w & 0 & \lambda w & 0 \\ \lambda & \lambda g_k & 0 & \lambda(t+sg_k) & \lambda g_k w & \lambda w & 0 & 0 \\ 0 & \lambda & 0 & \lambda s & \lambda w & 0 & 0 & 0 \\ k & (g+m') & x & [kt+s(g+m')+xv-T] & w(g+m) & kw & wx & -1 \end{bmatrix} \begin{bmatrix} d\pi_1 \\ d\pi_2 \\ d\pi_3 \\ dw \\ ds \\ dt \\ dv \\ dy \end{bmatrix}$$

Using Cramer's rule, one may derive expressions for the impact of alternative policy parameters on family choice. In what follows, we denote the

determinant of the coefficient matrix on the left-hand side as D and the cofactor of the $i^{\underline{th}}$ row and $j^{\underline{th}}$ column as D_{ij}.

For the household to achieve a maximum utility level, D<0. We shall make two fundamental assumptions in what follows: (i) that k,x and m' are not complements, in the sense that the compensated cross-price substitution effect is non-negative, e.g. $\left(\frac{\partial x}{\partial \pi_1}\right)_{U=\text{constant}}$, $\left(\frac{\partial x}{\partial \pi_2}\right)_{U=\text{constant}}$, $\left(\frac{\partial m'}{\partial \pi_1}\right)_{U=\text{constant}}$, etc. ≥ 0. It should be noted that this is a stronger assumption than that normally made in demand theory. Expansion of D_{ij}, $i \neq j$, includes first and second derivative expressions from the morbidity function g(x,k), some of which would suggest a decrease in consumption of x, for example, with an increase in the cash price of k, π_1. We assume that on balance there is likely to be some substitutability in the relationship between k,m' and x. This assumption implies that D_{12}, D_{13}, $D_{23} \leq 0$. (ii) that k,x and m' are normal goods, such that $\left(\frac{\partial x}{\partial y}\right)_{\pi=\text{constant}}$, $\left(\frac{\partial m'}{\partial y}\right)_{\bar{\pi}=\text{constant}}$, $\left(\frac{\partial k}{\partial y}\right)_{\bar{\pi}=\text{constant}} \geq D_{41}$, D_{42}, $D_{43} \geq 0$. The effect of deviations from either of these assumptions will, however, be clear from the subsequent discussion.

(1) Since D_{11}, D_{22}, D_{33}, can be shown to be positive and the income effects $\frac{-D_{41}}{D}$, $\frac{-D_{42}}{D}$, $\frac{-D_{43}}{D}$ are assumed positive, the own price effects for x,m', and k are clearly negative;

$$\frac{dx}{d\pi_3} = \frac{\lambda D_{11}}{D} + \frac{xD_{41}}{D}$$

$$\frac{dk}{d\pi_1} = \frac{\lambda D_{22}}{D} + \frac{kD_{42}}{D}$$

$$\frac{dm'}{d\pi_2} = \frac{\lambda D_{33}}{D} + \frac{m'D_{43}}{D}$$

(2) The own price effect for m,

$$\frac{dm}{d\pi_2} = (g_x)\frac{dx}{d\pi_2} + (g_k)\frac{dk}{d\pi_2}$$

$$=(g_x)\left[\frac{\lambda g_x D_{11}}{D}+\frac{\lambda D_{31}}{D}+\frac{\lambda g_k D_{21}}{D}+(g+m')\frac{D_{41}}{D}\right]$$
$$+g_k\left[\frac{\lambda g_k D_{22}}{D}+\frac{\lambda D_{32}}{D}+\frac{\lambda g_x D_{12}}{D}+(g+m')\frac{D_{12}}{D}\right]$$

is of ambiguous sign. The first term in the brackets is the direct "price" effect on x or k, arising fron their reduced net cost as a result of an increase in π_2. The effect is to increase consumption of x and k, and thus lower that of m. The second term is the cross-price effect, as consumers shift from π_1 to x or k, again with positive effect on x and k. The third term is the substitution effect toward k(x) and away from x(k) as the price of k(x) fall with the increase in π_2. This reduces consumption of x(k) and increases the need for m, though the net effect is obviously lower. Finally, the income effect of raising π_2 lowers x and k and thus raises morbidity, and the need for m goods.

The own price effect of π_2 on $M=m+m'$, $\frac{dM}{d\pi_2} < \frac{dm}{d\pi_2}$ since $dm'/d\pi_2$ is negative.

(3) Since we have assumed the income effects on k and x to be positive, the income effect on m will be negative and on M indeterminate.

(4) The effect of changes in the own-time requirements of consuming any good, e.g. dx/dv, dk/dt, dm'/ds are equal to the own-price effects, multiplied by a factor of w.

(5) Changes in the wage rate lead to both an increase in income and an increase in the prices of each good, with the relative price changes determined by the time-requirements of consumption, e.g.

$$\frac{dx}{dw}=\frac{\lambda(v+sg_x)D_{11}}{D}+\frac{(t+sg_k)\lambda D_{21}}{D}+\frac{\lambda sD_{31}}{D}+\frac{D_{41}}{D}\,[kt+s(g+m')+xv-T]$$

where only the first term, reflecting the own price effect is negative. If $\frac{dm'}{dw}$, $\frac{dx}{dw}$ and $\frac{dk}{dw}$ prove positive, then $\frac{dm}{dw}$ will be negative. Since again one can only empirically observe (m+m'), the net effect could be positive or negative.

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