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A Health Sector Analysis of Peru Technical Report

The Demand for Health Care in Peru: Lima and the Urban Sierra, 1984

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FOREWORD

This is one of nine reports prepared for the Health Sector Analysis of Peru (see back cover). The authors are faculty members in the Departments of Economics at Stony Brook. They worked closely with Peruvian health professionals and social scientists in the research for this report. Their Peruvian collaborators have been Drs. Julio Castaneda Costa, Cesar Penaranda Castaneda, Walter Torres, and Juan Fernando Vega. The research and writing of this report has benefited greatly from the active participation of Dr. Philip Musgrove, Regional Advisor in Health Economics, Pan American Health Organization. The final version of this report has been edited by Prof. Homer Goldberg of the Department of English at Stony Brook.

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I.

INTRODUCTION

This report outlines the method and presents some results of a study of health care demand in Lima and the urban Sierra in 1984. The study applies a statistical behavioral model to data gathered in the 1984 National Nutrition and Health Survey (ENNSA) to analyze the determinants of individual patient choices of whether and where to seek medical aid for an illness or injury. In the light of this analysis it considers the consequences of some policy alternatives for influencing health care demand available to the Peruvian government.

Since it is not possible in a report of this length to explore all policy alternatives nor to anticipate all questions covering the quantitative effects of various conceivable policies, we have devised an interactive planning tool which can answer questions as they arise. In addition to a detailed statistical analysis of the demand data found in ENNSA, this report includes two computer programs and databases for Lima and the urban Sierra which allow policy-makers to use our statistical results to examine questions of interest to them. These programs and the databases should not be considered mere supplements; they are important components of the report itself. The programs themselves are self-explanatory. Most of the tables of results which we discuss here have been generated with those programs. Policy-makers can duplicate the results we present first or just go on to answer their own questions. A user's manual is included below (section 5).

In the work we are about to describe, we have tried to avoid the

more obvious statistical and conceptual traps of researching medical services in developing countries. This report represents the state of our understanding as of May, 1984. Our more recent research has disclosed no basic inconsistencies with the broad findings in this report. Nevertheless, until the literature on demand becomes more thoroughly tested, we advise that recommendations based on our research be implemented carefully.

II.

THE COMPLEXITY OF ASSESSING HEALTH CARE DEMAND

Why should policy makers and others concerned with providing health care be interested in demand? For what kinds of practical problems can the concept of demand and demand studies provide assistance? Suppose there is interest in raising revenue by charging people for some services that are now provided free of charge by the financially-overburdened Ministry of Health (MOH). If the Ministry were actually to introduce those charges, how much would use of health facilities change, and in what direction? Demand studies can help answer this. Demand analysis can also help sort out the relative importance to consumers of monetary costs of health services versus other types of costs (e.g., travel time). Understanding how these determinants of use interact with one another can help policy-makers with key decisions not only about fees, but also about the location of facilities and staff, or the effects of road improvements or increased public transportation. Demand analysis can also disclose which providers and facilities consumers perceive to be of highest quality. Moreover, demand analysis can provide information about the health care-seeking behavior of people with different levels of education and income, and this information can help policy-makers understand the effects of existing and contemplated health care delivery systems on various segments of the society.

The study of demand for health care is made more difficult by the different meanings that economists and the medical profession assign to the term <u>demand</u>. Among non-economists demand is often used when

what is really meant is "medical need". A person has a "need" for medical care when such care can help prevent, alleviate, improve, or correct some condition that can be medically diagnosed. A person with influenza, for example, is in need of medical care. But that need may or may not be perceived by the patient. Hence, among economists, demand refers to the amount of health care, at a given level of quality, that a person wishes to purchase given his perceived need, the price of that care, his income, and his costs of traveling, waiting, and so forth. Consequently, demand is not a simple number, but rather the expression of a relationship between the amount a consumer will purchase and those factors that determine that amount. Demand will depend on the consumer's perception, but will not necessarily coincide with it. Thus the person with influenza may not satisfy his medical need by seeking the care suited to his condition if he thinks the total costs to him will exceed the benefits. The decision to seek or forego such care is not immutable, but may change with the circumstances. The lower the cost (in money, time and effort) of the "necessary" medical care, the more likely a consumer is to seek such care. The distinction between need and demand underscores another important reason why policy makers should be concerned about demand. Policy makers seek to supply sufficient health care services to meet the community's medical needs; but unless the consumer translates his or her need into use of the available facilities, resources will be wasted and policy objectives unmet.

Since demand for health care is a relationship, it is not directly observable. What can be observed is actual use. The process by which demand and supply interact may vary according to country, region, institution, and even type of care, but it always involves a

rationing mechanism that sets limits on demand, such as money prices, travel time, or waiting time. Bartlett (1983) divides factors affecting demand into five categories: 1) demographic factors, such as age and sex; 2) biological factors, including incidence of diseases and severity of illness; 3) cultural factors which might include perception of illness and sociocultural attitudes affecting acceptability of various types of services; 4) service-related factors: availability of different types of services and their accessibility (travel time and transportation costs); 5) economic factors such as service prices, alternative uses of the time and money spent on health care, ancillary costs, the availability of insurance, and disposable income.

Since some factors -- the incidence of diseases, the level of farm income, seasonal patterns of farm labor -- vary across years and within a single year, any short-term demand survey must be corrected for such fluctuations. The survey on which this report is based -- the Encuesta Nacional de Nutricion y Salud 84 (ENNSA) -- was made from April through November, 1984, a period of considerable labor problems in the public sector. This means that behavior may be different across months of the survey even in regions where seasonal effects are small. This period was also characterized by rapidly rising nominal prices and falling real incomes; such hyperinflation not only affects the prices of various commodities differently but has an uneven impact on individual incomes. These distortions must be corrected when estimating the sensitivity of health care expenditures to prices and income, if people's willingness and ability to pay for health services is not to be inaccurately measured.

Nor is understanding the factors that affect demand for health

care services in itself sufficient. Since we do not observe demand, but use, which is the result of the interaction of demand with supply, the observed values of the factors that help equate supply and demand (such as money prices and travel and waiting times) reflect not only their relationship with demand, but also with supply. Consider as an example the money price of health services. Suppose that the number of doctors and the availability of medical facilities is the same in two regions. Let us assume, however, that the people in one region, because they are more educated or for some other reason, are more health conscious. In this more health conscious region the demand for care would be greater, and it is reasonable to suppose that doctors there, finding themselves always very busy, would charge more. Thus limitations of supply would produce a situation in which the demand for health care would be higher in the region where the price of health care is higher. If one did not take supply into account, one might conclude that people are not sensitive to the price of medical care, or that they seek more care where its price is higher because they judge quality by price.

Consider another example. If there is a disruption in the provision of health services in the government sector (a strike of health care workers or difficulty in obtaining medical supplies), people might respond by relying less on public and more on private health facilities. This increased demand for private health care could drive up the price of those services. Again if one did not take the altered supply situation into account, it would appear that there is a simple and direct positive relation between price and demand. If employed to determine policy, such inadequate analyses could have harmful consequences. If, on the mistaken premise that price and

demand are simply positively related, the government were to increase the price of medical care as a way of increasing revenue without presumably discouraging people from seeking medical help, it would eventually discover the fallacy of this assumption, but at some cost to the public welfare.

The demand for health care is difficult to analyze precisely because the observed relations between use and the factors that affect it do not simply reflect the relationships that exist between those factors and demand. Consequently, if we wish to obtain results which are strong enough to bear the weight of policy, there is simply no substitute for the study of the demand for health care within the framework of a carefully articulated behavioral model.[1]

III.

A MODEL OF THE DEMAND FOR HEALTH CARE

This section delineates a model for empirically investigating the demand for acute health care. The aim is to determine why and where individuals seek medical care. (In this study, medical care excludes maternity and preventive care as well as hospitalization). Of specific interest are determinants that can be influenced by government policy such as price, travel time, and quality of care.

A person seeks medical care in response to an illness or injury. The care he or she receives depends upon the type and severity of illness, where care is sought (e.g., hospital emergency room, clinic, pharmacy), and who provides it (e.g., doctor, nurse, pharmacist). Hence medical care is a heterogeneous service which differs according to the characteristics of patients and providers. In this study we confine ourselves to medical care provided at hospitals, health centers and health posts, or private clinics. Omitted from consideration are pharmacists, home care, and traditional practitioners, which together comprise a small proportion of the total health care in the areas studied.[2]

The demand for care reflects a choice among a small number of clear-cut alternatives. The model defines this choice as one between four distinct alternatives: 1) not seeking any care, 2) going to a hospital, 3) going to a health center or post, 4) or going to a private clinic. It assumes the person evaluates each of these four choices and chooses the alternative which provides him or her with the greatest value (utility). Obviously, treatment has utility because it may improve one's health. However, that benefit must be weighed

against the monetary and time costs of treatment which require the patient to forego other goods and services.[3] This weighing is affected by factors other than the cost of care, such as the person's initial health status, his or her income, and the type and severity of illness. Someone who is healthier to begin with may expect less benefit from treatment than a person with a severe illness. Similarly, persons with higher incomes may not value what must be foregone for the sake of treatment as much as poorer people, for whom time away from work, for example, might be an unaffordable cost.

The statistical model is constructed so as to take into account this process of evaluation and choice. We break down the factors affecting these valuations into three categories: 1) money price of care; 2) travel time to the health provider; and 3) all other costs (including waiting time) plus the quality of care at the particular provider. We would have liked to break down this third category, distinguishing quality of care from other costs, but our data do not provide reliable measures of these other costs. Nevertheless this third category is still of some interest as an indicator of what might be called "overall quality". (As readers of this report may confirm from their own experience, waiting time can be a significant consideration in assessing the overall quality of medical care.)

In principle this model also allows us to measure medical need, as defined above: i.e., the demand which would result if costs were reduced to zero. In practice, this cannot be done precisely, but we have made a reasonable first approximation. Readers interested in general technical aspects of the model's construction should consult Appendix 1. For specifications of elements of the model and intermediate results underlying the following simulations, see

Appendices 2 and 3.

IV.

POLICY QUESTIONS WE ANSWER

We have generated a number of forecasts from our aggregate planning models for Lima and for the urban Sierra, areas of particular interest to policy-makers. This report presents only a fraction of the models' potential forecasts. The accompanying diskettes allow policy-makers to ask their own questions, and test the full power of the aggregate planning models.

These models allow us to measure what we call "perceived need" and "perceived quality" and to ascertain how close to meeting "perceived need" we could get under various governmental policies. We define "perceived need" to be the quantity of visits to hospitals, health centers or posts, or private clinics which people who were ill or injured would make if medical care were free and very accessible. In the context of our formal statistical model, this means that the prices of hospital care, health center and post care, and private doctor care are all set to zero. In addition, the definition of "perceived quality" assumes that facilities of each sort are located so that no individual is more than an hour away from each of the three types. While this is not exactly free medical care (there is still some travel cost involved in obtaining treatment), it is the closest we could come to that concept given the data in the ENSSA.

"Perceived need", in essence, is the number of visits that people would demand if medical care were free. We judge "perceived quality" from the distribution of patients among treatment places if care were free and accessible. If hospitals, health centers and posts, and private clinics were all perceived to provide the same quality of

care, then, with care free and accessible, we would expect that about one-third of all visits would be made to each sort of provider. If private clinics were perceived to be of the highest quality for every kind of medical care, then when care was free and accessible, we would expect that everyone would go to private doctors because there would be no reason to go elsewhere.

Government policies may be of three sorts. The government might reduce costs and travel times so as to make the number of visits closer to "perceived need"; it might improve the quality of low-quality providers and thus induce more people to use those providers, and it might enlarge "perceived need" itself through educational programs. While all three strategies are important, in this study the available data limit our focus to the first of these alternatives.

Results of our analysis are set forth in tables 1 through 4. Table 1 shows a comparison of results for the entire population of Lima and the urban Sierra. In tables, 2, 3 and 4, we look behind the aggregate figures to consider the demand for medical care for the elderly, for children through the age of five, and for residents of two subregions of special interest -- the South Cone of Lima and the southern urban Sierra.

All these tables have a common format. The first column tabulates "perceived need" as measured in millions of visits per month which people in Lima and the urban Sierra would have demanded if medical care were free and accessible. The first horizontal section, "perceived quality", shows in percentages how those visits would have been distributed over hospitals, health centers and posts, and private clinics.

The next section of each table represents the situation when ENSSA was carried out. The data provided there include the ratio of the number of visits to "perceived needs", the distribution of visits to the three sorts of providers considered here and total government revenues from hospitals, health centers and health posts in hundreds of thousands of April or May, 1984 Soles.

The four remaining sections outline the consequences of experimentally altering the established situation in various ways. The first traces the effects on the number and distribution of visits and on public revenues of increasing the hospital, health center and health post fees from 1,000 Soles to 3,000 Soles. The next represents the consequences of increasing that fee to 6,000 Soles. The final two sections contemplate the possibility of the government shifting demand from hospitals to health centers, first by raising the user fee at hospitals to 3,000 Soles while leaving the user fee at health centers and posts at 1,000 Soles, then by making health centers and health posts more accessible.[4]

For all sections of the tables after the first ("perceived quality"), the calculations assume that the economic conditions remain unchanged at their April, 1984 level for Lima and at their May, 1984 level for the urban Sierra. These are the first months for which there are sufficient ENSSA data for us to begin our analysis. We believe that it was preferable to standardize the economic conditions to this early part of 1984 because inflation was somewhat lower then and April and May were not as disrupted by strike activity as were later months. However, we have not adjusted the individual's health status comparably; that is kept as reported at the time he or she happened to be surveyed.

Let us now consider the results of our forecasts. The first section of Table 1 shows that quality perceptions are generally very similar in the two regions. In both, private clinics are perceived to be of the highest quality, followed by hospitals and then by health centers and health posts. The figures show that if health care were free and accessible only seven percent of all visits in Lima and only eight percent in the urban Sierra would be to health centers and posts. In Lima, people given free and accessible health care would seek care 85 percent of the time at private clinics and only eight percent of the time in hospitals. Hospitals are perceived to be of somewhat higher quality in the urban Sierra (the figures are 76 percent and 16 percent respectively), but otherwise the two populations perceive quality similarly.

In contrast, the difference in the ratio of visits to the perceived need in the two areas (II A) is striking. In Lima the number of visits for April was 67 percent of "perceived need" while in the urban Sierra, the number of visits for May was a remarkable 87 percent of "perceived need". While this finding may mean that the urban Sierra is better served with the kinds of medical facilities that people want, it may also be that people's "perceived needs" are low relative to the types of health care facilities available. This hypothesis would be consistent with an unusual finding of the ENNSA. According to the cross-tabulation of the ENNSA data by the Instituto Nacional de Estadistica, despite its poor economic conditions the urban Sierra reports the lowest frequency of perceived symptoms of any region of Peru. It may be a healthier place to live because of climatic conditions, or local differences in health care organization may account for this result, but it is also possible that the people

of the urban Sierra have a higher threshold of perceived need, i.e., they ignore symptoms that others might take seriously as evidence of the need for medical care. In any event, however, our analysis shows that there is less scope to increase the demand for medical care substantially in the urban Sierra through manipulation of price or accessibility. Even in the extremely unlikely event that medical care were totally free and accessible, the increase in the ratio of visits to needs could only be from 87 to 100 percent. If other studies disclose high illness and death rates in the urban Sierra, indicating that people there do indeed perceive their need for care to be less than in fact it is, these results suggest that the government should concentrate on improving the quality of care in that region and educating the public to increase its awareness of health needs.

In Lima, on the other hand, there is still much scope for increasing the demand for medical care through policies which make health care less expensive and more accessible. If the ratio of visits to needs in Lima were at the same level as in the urban Sierra, there would be 340,000 more visits <u>per month</u> in Lima.

The distribution of care by types of provider also differs markedly between Lima and the urban Sierra. In the urban Sierra 62 percent of the visits were to private clinics, while in Lima only 37 percent of visits were to such facilities. This difference cannot result from differences in the "perceptions of quality" because as noted above the people of Lima (like those in the Sierra) perceive private clinics to be of extremely high quality relative to the other two alternatives. Hence, the high proportion of private clinic visits in the urban Sierra must result from a combination of the price and

availability of private clinics with the demand patterns of individuals.

Another striking feature of Table 1 is that the actual pattern of visits in the urban Sierra is much closer to its pattern of "perceived quality" than is the pattern of visits in Lima to the pattern of "perceived quality".

Turning from the situation described in ENSSA to the first of our experimental projections, we find that raising the user fee at hospitals, health centers, and health posts in Lima to 3,000 (April, 1984) Soles would result in a fall in public sector medical demand from 63 to 59 percent of all visits. The number of visits would only fall from 67 to 66 percent of "perceived need". In the urban Sierra, the changes are even smaller: the quantity of public sector demand decreases from 38 to 37 percent of all care, and the ratio of visits to needs remains unchanged to two decimal places. Thus although the people of Lima are slightly more responsive to price changes than are the people of the urban Sierra, in neither place is their use of health care very sensitive to this change in price. In both places, a tripling of the public price of health care services would result in almost a tripling in public sector revenues.

The same inelasticity of demand to price can be seen in our next set of experiments, where we increase the price of public health care services from 1,000 Soles to 6,000 Soles. In Lima, the share of the public sector in the total number of visits declines from 63 to 54 percent, while in the urban Sierra the decline is from 38 to 35 percent. In Lima, the ratio of visits to needs would decline from 67 to 62 percent and in the urban Sierra that ratio would decline from 87 to 86 percent. At the same time, public revenues in the two regions

would increase more than five-fold. Health sector planners must decide whether this projected increase in revenues would warrant reducing the number of people who could afford to seek care.

The next two sets of figures in Table 1 explore the possibility of increasing the demand for services at health centers and health posts through government pricing and accessibility policies. In our first experiment in this group, we increase the user fee charged at hospitals from 1,000 Soles to 3,000 Soles, while the fee at health centers and health posts remains at 1,000 Soles. This policy would result in almost no change in the number of visits relative to needs, but it would change the distribution of those visits, particularly in Lima. In Lima, visits to health centers and health posts would increase from 30 to 37 percent. The increase in the price of hospital care would increase visits to private clinics from 37 to 40 percent. Clearly, the increase in the hospital price shifts more people to health centers than to private clinics. If it is a policy goal to shift demand somewhat from hospitals to health centers and posts, an increase in the price of hospital care would be appropriate in Lima. In the urban Sierra, the same price increase would have much less effect and therefore should not be recommended as a policy for changing the <u>distribution</u> of demand.

People may also be induced to go to health centers and health posts instead of hospitals by making the health centers and posts more accessible. In this experiment, we asked what would happen if enough health centers and posts were built so that there would be a center or post within one hour of everyone in Lima and the urban Sierra. This is not a large increase in accessibility because about 85 percent of

the people of Lima and the urban Sierra already have a health center or post within an hour's travel of their homes. Still, even in Lima, increasing the accessibility of health centers and posts would increase the fraction of visits to those facilities by more than 10 percent from 30 to 34 percent of all visits. In the urban Sierra the effect is more significant, doubling the fraction of visits to those facilities from 13 to 26 percent. Clearly, in the urban Sierra people are very sensitive to the accessibility of health care facilities. Accordingly, increasing availability of health centers or posts in the urban Sierra by improving transportation or building more of them would effectively reallocate demand from hospitals to these facilities. People there would use these facilities if more of them were available.

Going beyond the aggregate figures to consider specific segments of the population, we first consider whether the advantage of the urban Sierra over Lima in the ratio of visits to "perceived needs" holds for the three population groups in tables 2, 3, and 4. In all three the ratio of visits in April/May, 1984 to "perceived need" remains higher in the urban Sierra than in Lima. Thus this would seem to be a general advantage of one area over the other, not traceable to a particular group's higher ratio of visits to needs.

If we compare the ratio of visits to needs in Tables 2 and 3 with those in Table 1, we find it does not vary much across the three populations. Still for both Lima and the urban Sierra, children are the best served while the elderly fall slightly below the average for the total population. In the urban Sierra, the ratio for children barely exceeds that for the whole population by 88 to 87 percent. In Lima, a more significant effort seems to have been made to provide

care for children; there the children's ratio is 73 percent as against 67 percent for the general population. On the other hand, although the elderly are more vulnerable than the general population to illness, their ratio of visits to needs is very slightly below the population averages. One possible explanation may be the elderly's low opinion of the quality of medical care. In both areas the health centers and health posts are perceived by the elderly to be of such low quality that they would virtually never seek help from them even if care were free and accessible. If policy-makers envisage these facilities serving the needs of the elderly, they are apparently in need of some modification or reform.

Turning to the finer geographic analysis (Table 4), we find that people who live in the South Cone of Lima are served about as well as are the people of Lima as a whole. The ratio of visits to needs in the South Cone is 66 percent as compared to 67 percent for the entire population of Lima. Similarly, the people of the southern urban Sierra are served about as well as the people of the urban Sierra as a whole. The ratio of visits to needs for them is 86 percent as compared to 87 percent for the urban Sierra as a whole.

While the quality perceptions of people who live in the South Cone of Lima are also virtually identical to those of the people of Lima as a whole, people who live in the southern urban Sierra perceive quality quite differently from the people of the urban Sierra as a whole. The southern urban Sierra populace have a considerably more positive view of the relative quality of hospitals and health centers. Indeed, the "perceived quality" of hospitals, health centers, and health posts in the southern urban Sierra is the highest of all the

groups considered in tables 1 through 4.

We do not know why hospitals and health centers are viewed as having such high relative quality in the southern urban Sierra. People there may regard these facilities as better or they may think the private clinics are worse than in other areas. Still, if there is interest among government policy-makers in improving the quality of hospitals and health centers and posts, it might well be worthwhile to follow up our results on quality perceptions among the residents of the urban Sierra.

In the southern urban Sierra, the distribution of visits is more or less in line with the perception of quality (although hospitals are chosen somewhat more and private doctors somewhat less often than the quality perception would imply). This is generally consistent with the pattern for all the urban Sierra population groups in our tables. On the other hand, in all four Lima populations these two sets of figures differ much more widely, with the visits to private clinics substantially less than half what they would be if all three kinds of care were uniformly free and accessible. In the South Cone, hospitals are relied on more than three times and health care centers and posts almost six times as often as they would be under these ideal circumstances, with two-thirds of all visits made to the public facilities which only sixteen percent of patients would patronize under these circumstances. Forty percent of visits are to the facilities that people clearly think provide the poorest care: health centers and posts. Thus in Lima as a whole, but even more so in the South Cone and among the elderly, people's choices of facility are determined by such things as price and accessibility at the cost of what they perceive to be quality.

If we compare the various population segments, we find that raising the prices of hospitals, health centers and health posts has the same effects for the elderly, children and the residents of the South Cone of Lima and the southern urban Sierra as we saw for Lima and the urban Sierra as a whole. Demand for every group is insensitive to price changes, particularly in the urban Sierra, and in all four categories the people of the urban Sierra are more sensitive to changes in accessibility than are the people of Lima.

Two broad conclusions of considerable policy significance emerge from these comparisons. The first highlights the inelasticity of demand for health care: increasing public providers' prices does not significantly deter people from seeking medical care, although it does significantly affect their choice of type of facility. The second conclusion concerns the importance of accessibility. Although it is not directly visible in the tables, whether people seek medical care and what care they seek are affected by the accessibility of that care. However, there is a major difference in people's sensitivity to this factor among areas. In some urban areas where facilities are already fairly close, improvement in accessibility will only make a marginal difference in their demand for care. On the other hand, our results suggest that where care is now at some distance, improved accessibility would significantly increase people's demand for health care.

This concludes our presentation of results, but only begins the study of policy implications of our research. The next step is for the policy-makers to ask their own questions, using the diskettes accompanying this report.

V.

POLICY QUESTIONS WHICH YOU MAY ANSWER

The purpose of this section is to teach interested people how to answer policy questions themselves. Two diskettes, one for Lima and the other for the urban Sierra, are part of this report. The figures in section 4 were calculated using these diskettes. They will allow you to answer any questions within the scope of our model. Each diskette includes both the forecasting model and the data base on which it operates.

The diskettes are written in a programming language called GAUSS. GAUSS is extremely fast at doing the complex sorts of computations that our statistical model requires. Without it the aggregate health care demand models would run so slowly that policy-makers would be discouraged from using them. But GAUSS comes with a disadvantage as well. Users must first install it on their personal computers.[5] To do so, you must follow the directions in the GAUSS manual. You must also read the file named "PROC.DOC" which is on one of the GAUSS diskettes and follow the directions in the section entitled "Loading the Procs into Memory". The installation directions in the GAUSS manual and the directions in "PROC.DOC" are clear, but if you are a novice with PC's it would be helpful to have the assistance of a more experienced hand.

Once GAUSS is installed, running the aggregate health care demand models is easy. The models will run from any disk drive.

<u>Running GAUSS from a hard disk drive</u>

1. Getting into GAUSS: if you have GAUSS on a hard disk, get into drive C. You will see on the screen the symbols C:>. Type GAUSS

and hit the ENTER key. The symbols on the screen will be C>>. You are now in GAUSS.

2. Changing the default disk drive: put the model diskette in drive A and type DOS A: followed by the F4 key on the left side of the keyboard. The screen will now show C>>DOS A:<<.
   - Now hit the ENTER key. Your screen will show A>>.

3. Running the forecasting model: put the diskette of the region you desire in drive A.
   - If you use the Lima diskette, type RUN FORCAST4.LMA.
   - If you use the urban Sierra diskette, type RUN FORCAST4.SRA
   - After either command type F4, then ENTER. The model will now run and automatically access the right database and statistical information.

<u>Running GAUSS on a PC with two floppy disk drives</u>

1. Put the GAUSS diskette in disk drive A. You will see A:> on the screen.
2. Type GAUSS and hit the ENTER key. You will see A>> on the screen.
3. Type DOS B: followed by the F4 key and the ENTER key. The screen will now read B>>.
4. Put the desired regional diskette into drive B and type either RUN FORCAST4.LMA or RUN FORCAST5.SRA followed by the F4 and the ENTER key. The model is now at your disposal.

Beginning on page 33, we have provided the sequence of screens exactly as they appear when you run the model. Before you run the model for the first time, you may want to read through the discussion of the screens provided here. After your first time through, you will

probably not need to refer to this explanation. The screens were generated using the Lima model. The urban Sierra screens differ only in a few minor details. If at any point you want to print what is on the screen, simply hold down the SHIFT key and press the key labelled PrtSc (shorthand for "print what is on the screen"). This is especially pertinent to screens 10 and 18.

Screens 3 through 8 allow you to define the characteristics of the particular population you wish to study. Screen 10 presents the estimated demands and expenditures resulting from specifications of that population. Screens 12 through 17 allow you to choose pricing and accessibility policies for hospitals, health centers and posts, and private doctors. Screen 18 presents the results of the choices you have made. In taking you through the screens, we will construct an example of how to use the program, indicating our choices as we go.

The first screen is an introduction to the model. After you have read it, just press the ENTER key. The second screen describes what the model does. After you have finished reading it, again press the ENTER key.

The third screen asks you the first of a series of questions: "what population you would like to use as the basis of the Lima demand analysis?" If you enter 0 (i.e., type 0 followed by the ENTER key), the model uses the population of Lima in 1984. If you would like to increase or decrease the population base just enter 1. The program will then ask you what size population you would like to use. You answer by entering that number. In Screen 3, we answered the question with 0, so that the demand figures on Screens 10 and 18 use the population of Lima in 1984 as a base. (Hereafter the symbol in the lower left corner of the screen indicates the choice made in our

example.)

Screen 4 asks whether you want to take a random sample of the database or whether you want to use the entire sample. One pass through the database for the entire population of Lima takes about 7 minutes on an IBM AT. One pass through half the database takes about 3.5 minutes. For the entire population of Lima, you can get very accurate results even with a 20 percent sample. Our recommendation is to do the analysis of the entire population of Lima first at the 20 percent level. To do this, enter .2 in response to the question on Screen 4. When you see how fast your machine runs, you can adjust the sampling fraction up or down. When you analyze a specific subgroup such as the elderly or the residents of the South Cone, we recommend that you use the entire subgroup. Usually, the program will run quite fast for subgroups in the population without taking a sample. To use everyone in the database, just answer the question on Screen 4 by entering 1.

Screen 5 allows you to analyze the health care demand behavior of people of various ages. If you respond to the question on Screen 5 with a 1, the program will consider everyone in the database regardless of age. If you respond with a 2, 3, 4, or 5 the program will consider only the health care demands of people in the age group you have designated.

On Screen 6 the question is whether individuals covered by the social security health insurance system should continue to pay nothing for health care at social security hospitals or should be required to pay the same prices other people do. If you wish to continue to allow people covered by social security to have free health care at social

security hospitals, enter 0. If you want people in social security hospitals to pay the same amount for hospital care as everyone else, enter 1. We have answered the question on Screen 6 with 0, so the results on Screens 10 and 18 will incorporate the fact that people with social security coverage pay nothing for health care at social security hospitals.

For technical reasons, there is no Screen 6 in the model for the urban Sierra. Essentially this means that the social security hospitals and Ministry of Health hospitals in the urban Sierra have been treated as identical from the standpoint of the statistical analysis. Since only a very small percentage of the observations from the urban Sierra were of people with social security coverage living in a city with a social security hospital, our treatment of social security in the urban Sierra cannot have much impact on our results.

The question on Screen 7 allows you to study the health care demand behavior of people with various levels of wealth. If you answer the question on Screen 7 with a 1, the analysis will include everyone from the database regardless of wealth. If you answer the question with a 2 (for poor families), the computations will include only families with 3 or fewer rooms in their homes and whose heads have 6 or fewer years of education. If you answer the question with a 3 (for middle-class families), only families with 4 or 5 rooms in their home whose heads have 7 to 11 years of education will be included. If you answer the question with a 4 (for wealthy families), only families with 5 or more rooms in their homes, heads with 12 or more years of education, and automobiles will be included. The categories are not designed to be exhaustive. We wanted the "wealthy" category to include only families that were quite wealthy and the

"poor" category to include only those families that really were poor, even by Peruvian standards. Our intention here is to encourage policy-makers to look not only at the average effects of their decisions, but at their effects on families in various economic circumstances as well.

The question on Screen 8 allows you to specify which region of Lima you would like to consider. You have the choice of all of Lima, the North Cone, the South Cone, or the central portion of Lima. After you have answered the question on Screen 8, the computation of health care demands for the people you have specified in Screens 3-8 begins. Screen 9 appears while the demands are being calculated.

Screen 10 presents the results of the preceding exemplary analysis. The first row of numbers on Screen 10 shows that our statistical model predicts that there would have been 436,410 visits to private clinics in April, 1984 and that this would have been 38 percent of all medical visits. The remaining 62 percent of all visits (718,160) were to public health facilities, as shown in the second row. Next we break down the demand for public health care into visits to different kinds of facilities. (Together these latter percentages slightly exceed the percentage for public health care because of rounding off).

The next set of figures shows that out of a total expenditure on health care of more than four billion soles, nearly three and one half billion would have been spent in the private sector. Thus even though private health care accounted for only 38 percent of all visits, it accounted for 83.5 percent of all expenditures. The explanation

appears in the next set of figures: the average price of a visit to private doctor was 7,930 soles, whereas hospitals and health center charged a uniform user fee of just one thousand soles. The averag price at a hospital was lowered to only 870 soles because about 1 percent of hospital patients were covered by social security an therefore paid nothing.

The next set of figures shows that relatively few citizens o Lima had to travel more than an hour to any sort of medical facility 74 percent travelled less than an hour to a hospital, 87 percent to a private clinic and 94 percent to a health center or post. The last row of figures recapitulates choices we have made previously. The data on Screen 10 show that we selected age group 1 (all ages) or Screen 5; income group 1 (all income levels) on Screen 7; location 1 (all of Lima) on Screen 8; and 0 (to allow social security participants free hospital care) on Screen 6.

Now that you have seen the situation predicted as of April, 1984, you may go on to ask how the demand for health care would have been altered if prices and accessibilities of facilities had been different. To do so, simply enter si as an answer to the question at the bottom of Screen 10.

On Screen 11 you are given two choices: to analyze the demand behav. of the group you defined in your answers to the questions on Screens 3 through 8, or to return to Screen 3 and begin the process anew. You should type 1 if you are interested in the effects of government policies on the demand for health care for the group you have defined, or in their perceptions of the need for and quality of care. If you wish to change any of the specifications you chose in response to Screens 3 through 8 (for example, changing the sampling

fraction, or shifting from elderly to children) press 2. Since we are interested in looking at the "perceived need" for care and the "perceived qualities" of care at the three types of medical facilities, we have answered the question on Screen 11 with a 1.

Screens 12, 13, and 14 allow you to manipulate the prices charged by each of the three classes of medical facilities. The first choice on each of these screens is whether to leave prices as they were in April, 1984 or to change them. The three screens allow you complete flexibility to change whatever prices or combination of prices you wish. If you do not want to change the prices at hospital or health centers/posts, enter 1 to the questions on Screens 12 and 13 and the aggregate demand model will assume that the prices at hospitals will remain at their April, 1984 level of 1,000 soles (except for social security participants receiving free care in social security hospitals). In this event, you need not enter a price and you may go on to the next screen. If you want to change the prices at hospitals or health centers/posts, answer the question on Screen 12 or 13 by typing 2. Now the program will ask you what price you would like to set for care in hospitals or in health centers and posts.

If you wish to determine the sensitivity of demand to changes in prices of hospitals and health centers/posts, you should enter here the pricing alternatives you want to consider. Since we are interested in "perceived need" and "perceived quality", we wish to set all prices to zero, so we first tell the program that we would like to change prices by entering a 2 and then that we want prices to be zero by entering 0.

Screen 14, which provides two options for changing prices charged

by private physicians, differs slightly from the previous two screens. The first option, obtained by entering 1, allows you to change all physician prices by a constant percentage or to leave them unchanged at their April, 1984 level. If you choose this option, the program will then ask you for the number by which you wish to multiply all April, 1984 prices. If you want prices to remain unchanged, simply enter 1 again. If you wish to increase prices by 20 percent, enter 1.2, if by 15 percent, 1.15, and so forth. The second option, indicated by entering 2 in response to the first decision on Screen 14, requires everyone to pay a uniform fixed fee to visit a private clinic. If you select this option, the program will ask you what you would like the fixed fee to be, as explained at the bottom of the screen. Since we are interested in "perceived need" and "perceived quality", we have required everyone to pay a fixed fee to physicians by entering a 2 and then specified the fixed fee to be zero by entering 0.

We have now completed specification of the prices to be charged at the three types of health care facilities. Our interest in this example is how people would behave if health care were free, so we set all the prices to zero. You may be interested in other questions such as how poor people would react to a doubling in the price of hospital care, or how the choice of children's care would be affected by making hospitals free and requiring a uniform fee for private clinics. Screens 12, 13, and 14 enable you to explore the full range of such questions.

Screen 15, 16, and 17 employ identical formats to investigate government policies affecting accessibility of the three types of health care facility. For each, the respective screen asks whether

you wish to keep accessibility as it was in April, 1984 (if so, you enter 1), or to change it (enter 2). If you enter 2, the program will ask you to stipulate the probability of finding a health care facility of the given type within an hour's journey from the patient's home. If you want 50 percent of the population to have the given type of health care facility within an hour's journey of their homes, enter 0.5; if you want everyone to have this degree of accessibility, enter 1.0; and so forth.

There are many interesting questions you may wish to ask concerning the accessibility of health care. You might be interested in what would happen to health care demand if the government stopped building new hospitals and health centers/posts, so that as urban populations grew, hospitals and health centers/posts would become less accessible. You could investigate what this would mean for the residents of the North and South Cones of Lima, for the wealthy and for the poor, and for children and the elderly. In our example, we are interested in the patterns of demand which would occur if health care were free and very accessible. In the framework of our model, the most accessible we can make health care facilities is to insure that there is a health care facility of each type within an hour's journey of each person's home. This is what we do on Screens 15, 16, and 17, first by entering 2 to change the accessibilities, and then by entering 1 to indicate that 100 percent of the population has each type of health care facility within an hour's journey from their homes.

When you have answered the last question on Screen 17, the program calculates the health care demands. This normally will take a

few minutes.

Screen 18 shows the pattern of health care demands under the new prices and travel times that you have entered. In this example, the screen shows the pattern of health care demand for everyone in Lima which would exist if all medical care were free and all health care facilities were quite accessible. There would have been 1,712,970 visits in April, 1984 as compared to the 1,154,570 visits which would have occurred given the observed prices and accesssibilities as displayed on Screen 10. Moreover, Screen 18 shows that if health care were free and accessible in Lima, 85 percent of all medical visits would have been to private clinics, and only eight and seven percent, respectively, to hospitals and health centers or posts.

If you want Screen 18 printed, hold down the SHIFT key and press the PrtSc key. At this point, you may continue your analysis by returning to any of the earlier questions (Screens 3 to 8 and 11 to 17) and changing your choices. When you are done with your analysis, just type Adios Amigos or anything else except SI and the program will terminate.

If you have any comments on the diskettes, please convey them to us. They will enable us to produce even more useful diskettes in the future. Our names and addresses can be found on Screen 1.

SCREEN 1

A FORECASTING MODEL OF AGGREGATE HEALTH CARE DEMAND IN LIMA, PERU

by

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This program is an interactive simulation model of health care demand in Lima, Peru for IBM P.C. or P.C. compatibles. It is written in a programming language called GAUSS, which can be purchased from Applied Technical Systems, Kent, Washington, U.S.A. This forecasting model is based on an econometric model of health care demand estimated using the ENSSA data set. A technical document detailing the econometric model will be made available upon request. Both this forecasting model and the supporting econometric model are preliminary, and should not be quoted or reproduced without permission of the authors. The authors gratefully acknowledge the financial support of USAID/Peru under Cooperative Agreement No. 527-0167-CA-00-5054-00 in the preparation of both models.

To begin, hit the RETURN (ENTER) key.

SCREEN 2

This model predicts the aggregate demands and total expenditures (revenues) for three different types of health care. Specifically, it predicts for

(1) Hospital Care;
(2) Health Center/Post Care;
(3) Private Doctor Care (in private offices & clinics).

Further, it predicts how the demands and expenditures (revenues) will change in response to changes in government policy. The policy tools available are accessibility to the various types of health care institutions, measured by the travel time from the individual's home to the source of care, and the prices charged by these institutions.

This program allows you to specify both the demographic characteristics of various populations and the government's access and pricing policies. It works by asking you to answer questions about

(1) the characteristics of the target population;
(2) the policies of the government.

We begin by creating the target population. When you are ready, hit the RETURN (ENTER) key.

SCREEN 3

Some of the results produced by this program are based on the size of the population of Lima in 1984. We assume that Lima had 5,171,000 people in 1984. Would you like to make projections based on a different population size? If yes, type 1 and then ENTER. If no, type 0 and then ENTER.
0

SCREEN 4

This program allows you to choose a random sample of any proportion of the database.

This is particularly useful if you wish to do policy simulations for all of Lima. A run for all of Lima could take up to 10 minutes with the entire sample. If you choose a sample of 1/10th of the population, the run will take only about one minute.

Please enter the sampling fraction you desire. A sampling fraction of 1 gives you the entire database; a sampling fraction of 0.5 gives you half the database, and so forth.
1.00

SCREEN 5

Which age group do you want to consider?

(1) All
(2) Elderly (age 60 and over)
(3) Children (age 6 and below)
(4) Youth (age 7 to 17)
(5) Adults (age 18 to 59)

Choose the category by typing the associated number, and hit the RETURN (ENTER) key.
1.00

SCREEN 6

Should the individuals with social security be forced to pay the same hospital prices as others? If yes type 1, if no, type 0.
0.00

SCREEN 7

Which income class do you want to consider?

(1) All
(2) Poor
(3) Middle Class
(4) Wealthy

Choose a class by typing the associated number, then hitting the RETURN (ENTER) key.
1.00

SCREEN 8

Which geographic area do you want to consider?

Enter (1) All of Lima
(2) North Cone
(3) South Cone
(4) Lima Center

Choose the area by typing the associated number, then hitting th RETURN (ENTER) key.
1.00

SCREEN 9

The predicted demands and expenditures (revenues) are now bein computed for April 1984 prices and travel times. This computatio will take several minutes depending on the size of the targe population.

After this is completed, you will be able to analyze the predicte effects of changes in government travel time and pricing policies.

computing.....

SCREEN 10

```
DEMAND FOR HEALTH CARE IN THOUSANDS OF VISITS:  APRIL, 1984

DEMAND FOR PRIVATE HEALTH CARE       =     436.41     (0.38)
DEMAND FOR PUBLIC HEALTH CARE        =     718.16     (0.62)
 DEMAND FOR HOSPITAL CARE            =     375.35     (0.33)
 DEMAND FOR HEALTH CENTER/POST CARE  =     342.81     (0.30)
TOTAL DEMAND FOR HEALTH CARE IN LIMA  =   1154.57     (1.00)

EXPENDITURES IN MILLIONS OF APRIL, 1984 SOLES

PRIVATE EXPENDITURES              =        3448.31
PUBLIC EXPENDITURES               =         681.05
 HOSPITAL EXPENDITURES            =         338.24
 HEALTH CENTER/POST EXPENDITURES=           342.81
TOTAL HEALTH CARE EXPENDITURES    =        4129.36

AVERAGE PRICE IN THOUSANDS OF APRIL, 1984 SOLES
      PRIVATE= 7.93 HOSP= 0.87 HCEN/POST= 1.00

AVERAGE PROBABILITIES OF TRAVELING LESS THAN AN HOUR
      PRIVATE= 0.87 HOSP= 0.74 HCEN/POST= 0.94
age group= 1.00 income group= 1.00 location = 1.00 socsec = 0.00
Do you want to continue? If so, type si.  If not, type adios amigos.
SI
```

SCREEN 11

Now you may

(1) continue with the already chosen target population and analyze the effects of changes in prices and/or travel times by typing 1; or

(2) construct a new target population to analyze by typing 2;
then hit the RETURN (ENTER) key.

1.00

SCREEN 12

****
POSSIBLE GOVERNMENT PRICING POLICIES: HOSPITALS
****

IN THE MODEL, PEOPLE WHO HAVE SOCIAL SECURITY PAY NOTHING (0) AT HOSPITALS. THIS WAS THE SITUATION IN 1984 WHEN THE ENNSA WAS TAKEN. PEOPLE WITHOUT SOCIAL SECURITY PAY A FIXED USER FEE OF 1,000 SOLES.

IF YOU WISH, YOU MAY ALTER THE PRICES PAID AT PUBLIC HOSPITALS.

TYPE (1) TO LEAVE THE PRICES THE WAY THEY WERE IN APRIL 1984;
(2) TO CHANGE THE PRICES PEOPLE PAY AT HOSPITALS.

PLEASE CHOOSE WHICH OF THESE YOU WANT FOR HOSPITALS BY TYPING THE ASSOCIATED NUMBER AND THEN HITTING THE RETURN (ENTER) KEY.
2.00

ENTER THE FIXED PRICE YOU WANT EVERYONE TO BE CHARGED FOR HOSPITAL CARE IN THOUSANDS OF SOLES. FOR EXAMPLE, IF EVERYONE IS TO PAY 2 THOUSAND (APRIL,1984) SOLES FOR HOSPITAL CARE ENTER 2.0
0.00

SCREEN 13

****
POSSIBLE GOVERNMENT PRICING POLICIES: HEALTH CENTERS/POSTS
****

IN THE MODEL PEOPLE PAY A FIXED USER FEE OF 1,000 SOLES FOR TREATMENT IN A HEALTH CENTER. THIS WAS THE FEE IN PLACE DURING THE PERIOD OF THE ENNSA.

YOU MAY ALTER THE PRICES PAID AT HEALTH CENTERS/POSTS IF YOU WISH TO.

TYPE (1) TO LEAVE THE PRICES THE WAY THEY WERE IN APRIL 1984;
(2) TO CHANGE THE PRICES PEOPLE PAY AT HEALTH CENTERS.

PLEASE CHOOSE WHICH POLICY YOU WANT FOR HEALTH CENTERS/POSTS BY TYPING THE ASSOCIATED NUMBER AND THEN HITTING THE RETURN (ENTER) KEY.
2.00

ENTER THE FIXED PRICE YOU WANT EVERYONE TO BE CHARGED FOR HEALTH CENTER/POST CARE IN THOUSANDS OF SOLES. FOR EXAMPLE, IF EVERYONE IS TO PAY 2 THOUSAND (APRIL,1984) SOLES FOR HEALTH CENTER/POST CARE ENTER 2.0
0.00

SCREEN 14

****
PRICING POLICIES: PRIVATE DOCTORS AND CLINICS
****

DOCTORS IN LIMA CHARGE PATIENTS DIFFERENT AMOUNTS DEPENDING UPON THEIR AGES AND SYMPTOMS.

YOU HAVE TWO WAYS OF ALTERING PRICES CHARGED BY PRIVATE DOCTORS:

(1) CHANGE ALL THE PRICES BY A FIXED PERCENTAGE OR LEAVE THEM AT THEIR APRIL, 1984 LEVEL;

(2) MAKE EVERYONE PAY THE SAME PRICE.

PLEASE CHOOSE WHICH POLICY YOU WANT BY TYPING THE ASSOCIATED NUMBER AND THEN HITTING THE RETURN (ENTER) KEY.
2.00

ENTER THE FIXED PRICE YOU WANT EVERYONE TO BE CHARGED FOR PRIVATE DOCTOR CARE IN THOUSANDS OF APRIL, 1984 SOLES. FOR EXAMPLE, IF EVERYONE IS TO PAY 2 THOUSAND (APRIL, 1984) SOLES FOR PRIVATE DOCTOR CARE, ENTER 2.0.
0.00

SCREEN 15

****
POSSIBLE GOVERNMENT ACCESSIBILITY POLICIES: HOSPITALS
****

ACCESSIBILITY IS MEASURED BY THE PROBABILITY THAT PEOPLE HAVE A HEALTH CARE INSTITUTION OF A GIVEN KIND WITHIN A ONE HOUR TRIP FROM THEIR HOME

YOU HAVE TWO OPTIONS, SEPARATELY FOR EACH INSTITUTION:

(1) KEEP ACCESSIBILITY AS IT WAS OBSERVED FOR PEOPLE IN 1984;
(2) CHANGE THE ACCESSIBILITY PROBABILITY.

PLEASE CHOOSE WHICH OF THESE YOU WANT FOR HOSPITALS BY TYPING THE ASSOCIATED NUMBER AND THEN HITTING THE RETURN (ENTER) KEY.
2.00

ENTER THE DESIRED PROBABILITY OF FINDING A HOSPITAL WITHIN ONE HOUR'S TRAVEL TIME. FOR EXAMPLE, IF THE PROBABILITY OF EVERYONE FINDING A HOSPITAL WITHIN ONE HOUR IS 50 PERCENT, ENTER 0.5. NOTE THAT YOUR ENTRY MUST BE BETWEEN 0 AND 1.
1.00

SCREEN 16

```
*****************************************************************
  POSSIBLE GOVERNMENT ACCESSIBILITY POLICIES:  HEALTH CENTERS/POSTS
*****************************************************************

 YOU HAVE TWO OPTIONS FOR HEALTH CENTERS/POSTS:

    (1) KEEP ACCESSIBILITY AS IT WAS OBSERVED FOR PEOPLE IN 1984;
    (2) CHANGE THE ACCESSIBILITY PROBABILITY.

PLEASE  CHOOSE WHICH OF THESE YOU WANT BY TYPING THE ASSOCIATED NUMBER
AND THEN HITTING THE RETURN (ENTER) KEY.
2.00

ENTER  THE  DESIRED  PROBABILITY OF FINDING A CENTER/POST  WITHIN  ONE
HOUR'S  TRAVEL  TIME.   FOR EXAMPLE,  IF THE PROBABILITY  OF  EVERYONE
FINDING A CENTER/POST WITHIN ONE HOUR IS 50 PERCENT,  ENTER 0.5.  NOTE
THAT YOUR ENTRY MUST BE BETWEEN 0 AND 1.
1.00
```

SCREEN 17

```
*****************************************************************
POSSIBLE ACCESSIBILITY POLICIES:  PRIVATE DOCTORS AND CLINICS
*****************************************************************

YOU HAVE TWO OPTIONS FOR PRIVATE DOCTORS:

    (1) KEEP ACCESSIBILITY AS IT WAS OBSERVED FOR PEOPLE IN 1984;
    (2) CHANGE THE ACCESSIBILITY PROBABILITY.

PLEASE CHOOSE WHICH OF THESE YOU WANT BY TYPING THE ASSOCIATED  NUMBER
AND THEN HITTING THE RETURN (ENTER) KEY.
2.00

ENTER  THE DESIRED PROBABILITY OF FINDING A PRIVATE CLINIC WITHIN  ONE
HOUR'S  TRAVEL  TIME.   FOR EXAMPLE,  IF THE PROBABILITY  OF  EVERYONE
FINDING  A  PRIVATE CLINIC WITHIN ONE HOUR IN 50 PERCENT,  ENTER  0.5.
NOTE THAT YOUR ENTRY MUST BE BETWEEN 0 AND 1
```

SCREEN 18

```
DEMAND FOR HEALTH CARE IN THOUSANDS OF VISITS:  APRIL, 1984

DEMAND FOR PRIVATE HEALTH CARE        =   1462.60     (0.85)
DEMAND FOR PUBLIC HEALTH CARE         =    250.36     (0.15)
 DEMAND FOR HOSPITAL CARE             =    136.33     (0.08)
 DEMAND FOR HEALTH CENTER/POST CARE =      114.03     (0.07)
TOTAL DEMAND FOR HEALTH CARE IN LIMA  = 1712.97      (1.00)

EXPENDITURES IN MILLIONS OF APRIL, 1984 SOLES

PRIVATE EXPENDITURES              =     0.00
PUBLIC EXPENDITURES               =     0.00
 HOSPITAL EXPENDITURES            =     0.00
 HEALTH CENTER/POST EXPENDITURES=        0.00
TOTAL HEALTH CARE EXPENDITURES    =     0.00

AVERAGE PRICE IN THOUSANDS OF APRIL 1984 SOLES
     PRIVATE= 0.00 HOSP= 0.00 HCEN/POST= 0.00

AVERAGE PROBABILITIES OF TRAVELING LESS THAN AN HOUR
     PRIVATE= 1.00 HOSP= 1.00 HCEN/POST= 1.00
age group= 1.00 income group= 1.00 location = 1.00 socsec = 0.00
Do you want to continue? If so, type si.  If not, type adios amigos.
ADIOS AMIGOS
```

Appendix 1.

STATISTICAL METHODOLOGY OF THE EMPIRICAL MODEL

The most general type of computationally convenient model currently available to analyze discrete choice problems (such as that of selecting health care providers) is that class called generalized extreme value (GEV) models. We specify such a generalized extreme value model in this section. General discussions of the GEV models and their estimation can be found in McFadden (1981), Maddala (1983), Ben-Akiva and Lerman (1985), and Train (1986).

Let us restate the underlying behavioral assumptions. At the beginning of the process the individual experiences an illness or injury. In response, he or she must decide whether to seek care, and who should provide the care. The person has some idea how sick he is, he knows his income, whether he is insured, and the travel time to the various treatment locations, and he has some expectation of the price and quality of medical care from each provider. Using this information, he evaluates the various options and assesses their relative utility. We assume the individual acts so as to maximize utility as defined by his information set, choosing the option that yields the highest expected utility.

The model we proposed above, and which we estimate, has three stages. To simplify the exposition, we present it here as a two stage model. In the first stage, the choices designated by the subscript i are whether to seek care (i=1) or not (i=2). In the the second stage, indicated by subscript j, the choices are whether to go to a public facility (j=1) or a private one (j=2). The third stage (conditional on going to a public facility) -- whether to go to a health

center/post or to a hospital -- is ignored here. Extending the model to include it only requires repeating a procedure.

Formally, we may define an individual's expected utility from choice ij by the following equation:

$$(1) \qquad U_{ij} = V_{ij} + e_{ij}, \text{ where}$$

V_{ij} represents observed systematic determinants of utility and e_{ij} represents random and unobserved determinants. By "observed" determinants we mean observed by us, the investigators (i.e., included in our database) -- such variables as income, education, age, etc. The e_{ij} includes factors that we cannot observe, such as an individual with a brother who is a medical doctor, assuring him special attention. For this person e_{12} would be high. The model assumes such unobservable factors are random.

We may further specify the utility function, as expressed in another equation:

$$(2) \qquad V_{ij} = X_{ij} b + Ya_{ij} + Zr_i .$$

Here X_{ij} is a vector of factors that vary by choice ij. An example would be the price of a consultation at a private clinic (i=1,j=2). The symbol b represents a vector of unknown parameters that must be estimated. If a particular element of b is positive, it means that as its corresponding factor increases, so does the utility of that alternative. Continuing the previous example of price, the parameter corresponding to price should be negative, since the more expensive the alternative, the less attractive it should be. Y and Z are characteristics of the individual, such as level of education. These

do not in themselves vary by choice, but their effects may be different for each choice. That is why their corresponding parameter vectors, a_{ij} and r_i, vary by choice. Y and Z may share some or all of the same variables. The difference is that the a_{ij}'s measure the relative effect of Y across alternatives j within the category i, while the r_i's measure the effect across the i categories.

Whereas the utility of each alternative cannot be directly observed, we do observe which choices individuals actually made. These observations reveal the actual order of preference among the available alternatives. Therefore, we can analyze the determinants of a particular preference pattern, or more simply, the probability that individuals will choose specific alternatives.

The probability that an individual chooses ij conditional on the characteristic vectors X_{ij}, Z, and Y may be formulated in our third equation:

$$(3) \qquad P_{ij} = \text{Prob}\,(U_{ij} > U_{mn}, \text{ for all m and n}).$$

This probability can be decomposed as follows:

$$(4) \qquad P_{ij} = P_{j:i}\, P_i,$$

where P_i is the probability that an individual chooses i (if i=1 he seeks care, if i=2 he does not), and $P_{j:i}$ is the conditional probability that individual chooses, j, given that he has already decided whether or not to seek care. For example, the probability that an individual chooses to seek care at a public institution, given that he has chosen to seek care, is $P_{1:1}$.

If we assume that the errors are generated by a type I extreme value distribution, we can use McFadden's (1978) conclusions that the components of (4) can be written as

$$(5) \qquad P_{j|i} = \exp(X_{ij} b + Ya_{ij}) / \sum_m \exp(X_{im} b + Ya_{ij}),$$

and

$$(6) \qquad P_i = \exp(Z_i r + sJ_i) / \sum_i \exp(Z_i r + sJ_i),$$

where

$$(7) \qquad J_i = \ln \sum_j \exp(X_{ij} b + Ya_{ij}).$$

New equations (5) through (7) comprise the GEV model. Equations (5) and (6) each represent one decision level. Notice that the probability of seeking care, P_i, is affected by the lower stage variables, X_{ij} and Y, only through variable J_i. It summarizes the information in the later level that is important for earlier decisions. Hence we call J: the "inclusive value" of category i. This structure significantly reduces the parameterization of the model.

If the coefficient on the inclusive value, s, is equal to 1, the model reduces to the multinomial logit which is commonly used in the literature. The multinomial logit is derived under the assumption that error terms in (1) are independently distributed, while the GEV allows for correlation within classes (across j for given i). For our problem at hand, this implies that we allow the error terms for hospital and health center/post to be correlated, but each is independent of the error term for private clinic. We believe this more general formulation is more reasonable for our problem. Consider

once again what factors are represented in the error term. For all alternatives the error terms include unobservable individual idiosyncracies. For the two public alternatives they also should include the quality of the local public facilities. With several health regions and many hospital areas in the Sierra, there should be considerable variation. Perhaps there also is much variation in Lima. If those areas with better than average hospital health care also have better than average health centers and health posts, a positive correlation between the error terms for hospitals and health center/posts should exist. This means that we should find that the coefficient on the inclusive value for the lowest stage should be less than one for the Sierra, and possibly also for Lima.

As can be seen in (2) the coefficient of X_{ij}, b, is not allowed to vary by i. The X_{ij}'s basically include prices and travel times. Restricting b to be the same across alternatives means, for example, that the probability of going to a hospital (the demand for hospital care) is as sensitive to the price and travel time of health center/post as to the price and travel time of private clinic. This restrictive assumption is the common one in the literature. We relax it for travel time, but maintain it for price. The reason we maintain it for price is that we do not believe that there is enough variation in the prices of public health care to identify a separate coefficient. We discuss this more in Appendix 2.

McFadden (1981), provides a test to determine if the specification used here is consistent with utility maximizations based on the coefficient on the inclusive value. Specifically, if that coefficient is between zero and one, the model is consistent with utility maximization.

The choice probability equations (5) and (6) are a recursive system. The model is estimated using a sequential procedure described in McFadden (1981). Very briefly the procedure is as follows. First equation (5) is estimated. The estimated parameters b and a_{ij} are then used to construct the inclusive value in (7). The estimated J_i is then used to estimate (6). The results of the estimation are presented in Appendix 3.

Appendix 2.

ESTIMATING PRICES AND TRAVEL TIMES

The theory presented in the previous appendix implies that we need information on the variables that determine the value to consumers of each alternative. For most variables this is not a major problem, since they are simply individual characteristics recorded by the survey which do not depend on the choice made. This is not the case for prices and travel times.

If an individual did not seek care in the 90 days prior to the survey, no prices or travel times for him will be recorded. If he did seek care, only the price and travel time corresponding to the consultation he chose will be recorded, and not those of all the alternatives available. The problem is what prices and travel times to impute to each individual for the alternatives he did not choose. The procedure we have used is the following. For each alternative (hospital, health center/post, private clinic), we use the data on prices and travel times for those individuals who have such data (and who report paying something), to estimate price and travel time functions (more precisely, we estimate the probability of traveling less than one hour). These functions apply to individual characteristics such as age and symptoms (but not income or education variables, for reasons explained below), and characteristics of the community such as type of roads and number of providers. These estimated functions allow us to predict prices and travel times for each individual and each alternative. It is these predicted prices and times that are used in estimating the choice model. However, in constructing this component of the model, we have encountered some serious difficulties. We state these below together with the best

responses we can currently provide.

1. Insufficient price variation in the public sector.

We find that even after excluding individuals with socia security, over 40 percent of patients report paying nothing for thei hospital visit. A comparable percent report paying 1,000 soles Extremely few individuals report paying more than 2,000 soles, an some of those are almost certainly miscodes. The distribution i similar for health centers and health posts, and for Lima and the Sierra.

We had two options to deal with this problem. One approach would be to estimate what little variation there is, or in this case the probability of paying something positive (1,000 soles). However, we do not know the determinants of that probability. To ascertain them we need either better understanding of the pricing mechanism that gave rise to the observed distribution of prices, something which has puzzled even knowledgeable Peruvians, or additional information (beyond ENNSA) about price differences between hospitals and health center/posts from April to November of 1984. Without a good understanding of the pricing mechanism, we could well end up estimating a meaningless relationship, simply introducing noise into the model. The alternative approach is not to differentiate the effect of money prices in the choice between hospital and health center/posts as compared with that effect in the choice of private clinics. This is the route we have chosen. If we assume hospital and health center/post prices were fixed at 1,000 soles per consultation, variation in the private clinic price will then identify the coefficient on money price.

2. Self-selection in reported prices.

The set of individuals who report paying something for medical consultations may not be representative of all individuals. To illustrate, severity of illness, an unobserved factor included in the error term e_{ij} (Appendix 1), obviously may be an important determinant of who seeks health care. If the more severely ill are more likely to seek care, and also more likely to pay more, and we use price data on those who actually sought care, our price estimates would then be biased upwards.

Correcting for this sort of selection is especially difficult in this setting, because we must know the probabilities of choosing each of the alternative facilities to correct the price estimates, which themselves are determinants of the choice probabilities. For now we have ignored these selection problems, leaving their solution for future work.

3. Prices as indicators of quality.

One possible predicter of prices actually paid is the patient's family income. However, higher income people may be obtaining higher quality care (better doctors, faster treatment, better stocked and serviced facilities, etc.) for the higher prices they pay rather than paying more for the same thing. To avoid this problem we have not included any income or education variables in the price and travel time equations.

4. Difficulties with travel times.

Similar problems apply to the estimation of travel times as to the estimation of prices. Around 90% of respondents say that they travelled less than an hour for care, the smallest time interval on

the questionnaire. Despite this lack of variation we seem to have been successful in identifying travel time differences across alternatives, especially for the Sierra, as can be seen in Appendix 3.

Appendix 3.

ESTIMATION OF THE MODEL

Definitions of the variables used in the estimation appear in table 5. Several of the variables are defined so that they can only take values 0 or 1. An example of such a variable is AGE1, which takes on the value 1 if an individul is less than 6 years of age, and 0 in any of several other age groups (see table 1). The estimation requires that we designate any one group as excluded. For the tables of results that follow the excluded age group is AGE3 (17 through 59), the excluded symptom group OTHER1 or OTHER2, the excluded region is metropolitan Lima or the central urban Sierra, and the excluded month is APRIL in Lima and NOV in the Sierra.[6] The estimated coefficients are then interpreted as the effect of being in a given category relative to being in the excluded group. The significance of most variables is probably clear, but a few require further explanation. We used ROOMS and NFAM to represent family wealth, because so many households reported no income. Slightly different groupings of symptoms were used for Lima and the urban Sierra, an inconsistency that will be corrected in future work. Month of survey, a variable which can be easily identified by its name in the tables, was considered potentially important in capturing the effects of (i) rapid inflation and falling real incomes over the period of the survey, (ii) possible seasonal variation in the demand for health care, and (iii) considerable labor problems in the public sector.

Results for both Lima and the urban Sierra are presented in tables 6 through 8. A positive coefficient means that an increase in the corresponding variable increases the probability being considered (see heading of each table). The standard error measures how precise

the coefficient is estimated. We have labeled those coefficients that are statistically significantly different from zero at the ten, five, and one percent confidence levels. With these explanations the tables should be self-explanatory, but we will point out some of the principal results.

Table 6 presents estimates of the coefficients of the probability of going to a hospital (as opposed to a health center or post) for the individual choosing a public sector facility. In both regions the coefficient of the probability of travelling less than one hour (DTRAV) is positive as expected, and it is very large and significant for the Sierra. People are more likely to go to hospitals the closer they are relative to health center/posts. In Lima the young tend to go more to health center/posts, and the elderly to hospitals, than do the middle age group. Age differences in the Sierra appear to be less important, with only the 6 to 16 group (AGE2) being significantly less likely to go to hospitals than the middle age group. The more educated are more likely to go to hospitals in both regions, but the effect is very small and statistically insignificant in the Sierra.

Social security (SOCSEC) reflects both quality and price effects. Individuals with social security coverage pay nothing at social security hospitals, which probably also provide higher perceived quality. Given the low prices at public hospitals, the price savings are probably trivial in comparison to perceived quality differences. The results in table 6 confirm this. In Lima, where social security participants normally go to social security hospitals, having this coverage greatly increases the probability of seeking care at a hospital. In those provinces in the Sierra with a social security

hospital, every individual in the sample covered by social security who sought care in the public sector did so at a hospital (none went to health centers or posts). We were able to measure the effect of social security coverage, therefore, only in those provinces that do not contain a social security hospital. In those provinces individuals covered by social security should experience the price reduction of social security coverage, but must attend regular Ministry of Health facilities. The variable SOCSEC should measure, therefore, no quality differences in the Sierra. In fact its coefficient is small and insignificant. Month effects are much larger and oscillate more in the Sierra. In both regions, July was the month of lowest relative attendance at hospitals. Individuals are more likely to go to hospitals in the north, and less likely in the south, than in the central Sierra, but neither effect is statistically significant.

The estimates for the choice between private and public facilities are presented in table 7. These are considerably sharper than the previous results. The inclusive value is of the correct magnitude (it was entered so as to be negative) and is significantly different from zero for both regions. It is also significantly different from one, implying that the multinomial logit assumption that $s=1$ would have been inappropriate. The coefficients of the other variables measure the direct influence of those variables in this stage. Several variables have indirect effects via the inclusive value. The probability of travelling less than an hour to a private clinic has a large effect and is statistically significant in both regions. PRICE has the expected negative sign in both Lima and the Sierra, but is not statistically significantly different from zero at

the ten percent level. Travel time and price results indicate that travel time is a relatively more important rationing mechanism in the the Sierra than in Lima. The more educated, wealthier individuals are more likely to seek private care, while accident victims are less likely to do so. These effects are large and significant. In the Sierra, northerners are more likely, and southerners less likely, than those in the central Sierra to seek private care.

Table 8 presents the estimates of whether or not to seek care. Here the inclusive value was entered so as to have a positive value. It is positive in both regions, between zero and one, and statistically significant. At this stage there are some important age and symptom effects. Individuals aged 6 through 16 are the least likely age group to seek care in either region.[7] The same result holds for respiratory illness among symptom groups. Individuals who suffer accidents are more likely to seek care, but the coefficient on accidents is statistically significant only in Lima. In the Sierra, the more educated and the more wealthy are more likely to seek care. The same variables for Lima have small coefficients or are statistically insignificant. In the Sierra, northerners and southerners are both more likely than the excluded central group to seek care, with the effect being significant only for the latter.

This completes a brief and hurried summary of the results, which are generally what we expected. Prices and travel times work in the direction expected, and the latter is always significant. Money prices seem to be more important in Lima than in the Sierra, while travel time plays a larger role in the Sierra. Income and education also have the expected effects. Higher income and education increase

the attractiveness of hospitals relative to health centers and posts, of the private sector relative to the public sector, and of seeking care relative to not seeking care. The full interactions of all variables is very complicated; to get a feel for their overall effect, we encourage the reader to use the aggregate forecasting software provided.

FOOTNOTES

1. A good recent review of the literature on demand studies appears in Akin et al (1984).

2. Figures for pharmacists' care cannot be reliably estimated because a respiratory patient, for example, may rely on a cough remedy obtained for a previous ailment. Home care is often the response to long-term or chronic ailment for which the original decision about care would have been made earlier rather than a choice in response to a new malady. Reported use of traditional practitioners was too infrequent for statistical analysis.

3. Acton [1975] discusses the role of nonmonetary factors such as travel time in the demand for medical services.

4. In order to save computation time, the analysis for Lima as a whole was run on a 25 percent sample of the Lima dataset. This introduces a small amount of random variation into our results for Lima as a whole. All the other calculations, including those for the elderly of Lima, children in Lima, and the South Cone of Lima were done on the entire relevant databases. In addition, for technical reasons results for the urban Sierra do not include people who have social security coverage or people in families where someone works in the sugar, mining, or petroleum industries. Some fraction of the people in those industries have private health care insurance, but we could not identify who they were. In any event, their numbers are relatively small. There are only two social security hospitals

in the urban Sierra, so many people with social security coverage do not have easy access to them. Time was insufficient to determine which people with social security do and do not have easy access to social security hospitals, so people with social security coverage had to be omitted.

5. GAUSS may be run on IBM personal computers or compatibles which have 8087 numerical coprocessor chips. GAUSS may be purchased from Applied Technical Systems, P.O. Box 6487, Kent, Wa., 98064, USA. GAUSS is a trademark of Applied Technical Systems and IBM is a trademark of IBM Corporation.

6. In Lima lack of observations in November forced us to combine that month with October (OCT-NOV), and for the same reason we combined April with May (APRIL-MAY) in the Sierra.

7. This should be interpreted with caution because these are only the direct effects of age in this stage. One should remember that age also affects the decision whether or not to seek care through the inclusive value of previous stages of the model.

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TABLE 1

PERCEIVED NEED, PERCEIVED QUALITY, AND QUANTITY DEMANDED
LIMA (UPPER LINE) AND THE URBAN SIERRA (LOWER LINE IN PARENTHESIS)

	Perceived Need*	Visits	Visit/ Needs Ratio	Place of Visits Hosp.	Centers/ Posts	Private Clinics	Public Revenue
	(in millions)			(percentage)			(in billio of soles
Perceived Quality**			N.A.	0.08 (0.16)	0.07 (0.08)	0.85 (0.76)	N.A.
Demand Given Conditions of April/May, 1984	1.71 (0.73)	1.15 (0.63)	0.67 (0.87)	0.33 (0.25)	0.30 (0.12)	0.37 (0.62)	0.68 (0.24)
Predicted Demand Under Altered Conditions I: Increase Public Price to 3,000 Soles	1.71 (0.73)	1.13 (0.62)	0.66 (0.87)	0.28 (0.24)	0.31 (0.13)	0.41 (0.63)	2.92 (2.90)
Predicted Demand Under Altered Conditions II: Increase Public Price to 6,000 Soles	1.71 (0.73)	1.06 (0.63)	0.62 (0.86)	0.26 (0.23)	0.26 (0.12)	0.48 (0.65)	5.09 (5.50)
Predicted Demand Under Altered Conditions III: Increase Hospital Price to 3,000 Soles	1.71 (0.73)	1.16 (0.63)	0.68 (0.67)	0.23 (0.23)	0.37 (0.14)	0.40 (0.63)	1.81 (2.22)
Predicted Demand Under Altered Conditions IV: Increase Health Centers/ Posts' Accessibility	1.71 (0.73)	1.18 (0.65)	0.69 (0.89)	0.28 (0.18)	0.34 (0.26)	0.38 (0.56)	1.07 (1.19)

*The number of visits which would have taken place in April 1984 Lima or May 1984 Urban Sierra if the price of all medical care were zero and all types of medical facilities were within an hour travel of everyone's home.

**The percentage of visits to each of the three types of health care facilities which would have occurred if the price of all health centers were zero and all types of medical facilities were within an hour of everyone's home.

TABLE 2

PERCEIVED NEED, PERCEIVED QUALITY, AND QUANTITY DEMANDED
THE ELDERLY
LIMA (UPPER LINE) AND THE URBAN SIERRA (LOWER LINE) (IN PARENTHESIS)

	Perceived Need*	Visits	Visit/ Needs Ratio	Place of Visits Hosp.	Centers/ Posts	Private Clinics	Public Revenue
	(in millions)			(percentage)			(in billions of soles)
Perceived Quality**	N.A.	N.A.	N.A.	0.11	0.01	0.88	N.A.
Demand Given Conditions of April/May, 1984	0.13 (0.09)	0.085 (0.077)	0.66 (0.85)	0.56 (0.17)	0.11 (0.10)	0.33 (0.73)	0.06 (0.02)
Predicted Demand Under Altered Conditions I: Increase Public Price to 3,000 Soles	0.13 (0.09)	0.085 (0.077)	0.65 (0.85)	0.55 (0.16)	0.10 (0.10)	0.35 (0.74)	2.82 (2.89)
Predicted Demand Under Altered Conditions II: Increase Public Price to 6,000 Soles	0.13 (0.09)	0.082 (0.077)	0.63 (0.85)	0.50 (0.16)	0.10 (0.09)	0.40 (0.75)	5.11 (5.45)
Predicted Demand Under Altered Conditions III: Increase Hospital Price to 3,000 Soles	0.13 (0.09)	0.085 (0.077)	0.65 (0.85)	0.51 (0.16)	0.14 (0.10)	0.35 (0.74)	2.45 (2.16)
Predicted Demand Under Altered Conditions IV: Increase Health Centers/ Posts' Accessibility	0.13 [illegible]	0.086 (0.079)	0.66 (0.88)	0.56 (0.12)	0.12 (0.22)	0.32 (0.66)	1.00 (1.28)

*The number of visits which would have taken place in April 1984 Lima or May 1984 Urban Sierra if the price of all medical care were zero and all types of medical facilities were within an hour travel of everyone's home.

**The percentage of visits to each of the three types of health care facilities which would have occurred if the price of all health centers were zero and all types of medical facilities were within an hour of everyone's home.

TABLE 3

PERCEIVED NEED, PERCEIVED QUALITY, AND QUANTITY DEMANDED
CHILDREN
LIMA (UPPER LINE) AND THE URBAN SIERRA (LOWER LINE IN PARENTHESIS)

	Perceived Need*	Visits	Visits/ Needs Ratio	Place of Visits Hosp.	Centers/ Posts	Private Clinics	Public Revenue
	(in millions)			(percentage)			(in billions of soles)
Perceived Quality**	N.A.	N.A.	N.A.	0.19 (0.21)	0.10 (0.08)	0.81 (0.70)	N.A.
Demand Given Conditions of April/May, 1984	0.48 (0.24)	0.25 (0.21)	0.73 (0.88)	0.27 (0.31)	0.31 (0.12)	0.38 (0.58)	0.22 (0.09)
Predicted Demand Under Altered Conditions I: Increase Public Price to 3,000 Soles	0.48 (0.24)	0.34 (0.21)	0.71 (0.88)	0.26 (0.30)	0.33 (0.11)	0.10 (0.61)	2.80 (2.90)
Predicted Demand Under Altered Conditions II: Increase Public Price to 6,000 Soles	0.48 (0.24)	0.33 (0.21)	0.69 (0.88	0.24 (0.28)	0.31 (0.11)	0.45 (0.61)	5.03 (5.51)
Predicted Demand Under Altered Conditions III: Increase Hospital Price to 3,000 Soles	0.48 (0.24)	0.35 (0.21)	0.72 (0.88)	0.20 (0.29)	0.41 (0.12)	0.39 (0.59)	1.60 (2.35)
Predicted Demand Under Altered Conditions IV: Increase Health Centers/ Posts' Accessibility	0.48 (0.24)	0.35 (0.22)	0.73 (0.91)	0.26 (0.23)	0.36 (0.25)	0.38 (0.52)	1.01 (1.15)

*The number of visits which would have taken place in April 1984 Lima or May 1984 Urban Sierra if the price of all medical care were zero and all types of medical facilities were within an hour travel of everyone's home.

**The percentage of visits to each of the three types of health care facilities which would have occurred if the price of all health centers were zero and all types of medical facilities were within [illegible] everyone's home.

TABLE 4

PERCEIVED NEED, PERCEIVED QUALITY, AND QUANTITY DEMANDED
THE SOUTH CONE OF LIMA AND THE SOUTHERN URBAN SIERRA
LIMA (UPPER LINE) AND THE URBAN SIERRA (LOWER LINE IN PARENTHESIS)

	Perceived Need*	Visits	Visit/ Needs Ratio	Place of Visits Hosp.	Centers/ Posts	Private Clinics	Public Revenue
	(in millions)			(percentage)			(in billions of soles)
Perceived Quality**	N.A.	N.A.	N.A.	0.09 (0.25)	0.07 (0.16)	0.84 (0.59)	N.A.
Demand Given Conditions of April/May, 1984	0.24 (0.27)	0.16 (0.23)	0.66 (0.85)	0.29 (76.4)	0.40 (0.33)	0.31 (0.16)	0.11 (0.076)
Predicted Demand Under Altered Conditions I: Increase Public Price to 3,000 Soles	0.24 (0.27)	0.15 (0.23)	0.64 (0.85)	0.28 (0.32)	0.38 (0.16)	0.34 (0.16)	2.82 (2.91)
Predicted Demand Under Altered Conditions II: Increase Public Price to 6,000 Soles	0.24 (0.27)	0.15 (0.23)	0.62 (0.85)	0.27 (0.31)	0.35 (0.15)	0.38 (0.54)	5.19 (5.53)
Predicted Demand Under Altered Conditions III: Increase Hospital Price to 3,000 Soles	0.24 (0.27)	0.16 (0.23)	0.68 (0.86)	0.22 (0.31)	0.46 (0.17)	0.32 (0.52)	1.60 (2.24)
Predicted Demand Under Altered Conditions IV: Increase Health Centers/ Posts' Accessibility	0.24 (0.27)	0.24 0.25	0.66 (0.91)	0.26 (0.19)	0.44 (0.42)	0.30 (0.39)	1.02 (1.31)

*The number of visits which would have taken place in April 1984 Lima or May 1984 Urban Sierra if the price of all medical care were zero and all types of medical facilities were within an hour travel of everyone's home.

**The percentage of visits to each of the three types of health care facilities which would have occurred if the price of all health centers were zero and all types of medical facilities were within an hour of everyone's home.

TABLE 5

DEFINITION OF VARIABLES USED IN ESTIMATION

Money Prices and Travel Times

PRICE - Money price of private clinic or office.

TRAVEL - Probability of traveling an hour or less to a private clinic of office.

DTRAV - Difference between the probability of traveling an hour or less to a hospital and the probability of traveling an hour or less to a health center or post.

Income, Education, and Insurance

SOCSEC - 1 if individual is covered by social security.

ROOMS - Number of rooms in home. This is a proxy for income or wealth.

NFAM - Number of family members living in the household. Along with above it provides a measure of per capita wealth.

EDUC - Years of schooling for the individual if he is above 16 years of age, otherwise years of schooling of the head of the household.

Age Groups

AGE1 - 1 if individual is less than 6 years of age, 0 otherwise.

AGE2 - 1 if individual is between 6 and 16 years of age, inclusive, 0 otherwise.

AGE3 - 1 if individual is between 17 and 59 years of age, inclusive, 0 otherwise.

AGE4 - 1 if individual is 60 years of age or more, 0 otherwise.

Symptoms

ACC - 1 if the individual experienced an accident, 0 otherwise.

TABLE 5 (Continued)

RESP	- 1 if the individual experienced respiratory problems, 0 otherwise.
DIGES	- 1 if the individual experienced digestive problems, 0 otherwise.
SYM3	- 1 if the individual experienced tuberculosis, headaches, blood pressure problems, or nervous disoders, 0 otherwise.
SYM4	- 1 if the individual experienced problems with the major digestive organs, whooping cough, tifoid, or urinary problems, 0 otherwise.
SYM5	- 1 if the individual experienced problems with parasites, skin problems, or general fever, 0 otherwise.
OTHER1	- 1 if none of the above, 0 otherwise.
ACUTE	- 1 if individual experienced measles, rubela, etc., whooping cough, or tifoid, 0 otherwise.
OTHER2	- 1 if neither RESP, DIGES, or ACUTE above, 0 otherwise.

Regions

NORTH	- 1 if in North Sierra, 0 otherwise.
SOUTH	- 1 if in South Sierra, 0 otherwise.

Inclusive Values

INCLU1	- Inclusive value entering second stage (private-public).
INCLU2	- Inclusive value entering third stage (go-not go).

TABLE 6

PROBABILITY OF GOING TO A HOSPITAL CONDITONAL
ON GOING TO THE PUBLIC SECTOR

	Lima			Sierra		
Variable	Coefficient		St. Error	Coefficient		St. Error
CONSTANT	0.086		0.674	0.223		0.572
DTRAV	1.886		1.432	9.777	***	2.884
AGE1	-0.225		0.258	0.162		0.342
AGE2	-0.494	*	0.288	-0.704	*	0.368
AGE4	1.944	***	0.650	0.082		0.486
ACC	0.247		0.363	-0.503		0.636
RESP	-0.445	*	0.235	-0.354		0.268
DIGES	-0.233		0.238	0.168		0.301
SYM3	0.049		0.375			
SYM4	0.736		0.463			
SYM5	-0.402		0.355			
ACUTE				-0.219		0.532
EDUC	0.042	*	0.022	0.004		0.027
ROOMS	0.193	***	0.067	0.005		0.062
NFAM	-0.023		0.042	0.139	***	0.051
SOSSEC	2.160	***	0.438	0.098		0.428
NORTH				0.370		0.336
SOUTH				-0.083		0.351
APRIL/MAY				-0.307		0.478
MAY	-0.059		0.529			
JUNE	-0.337		0.531	0.208		0.451
JULY	-0.268		0.520	-0.784	*	0.451
AUG	0.309		0.528	-0.453		0.431
SEPT	-0.091		0.526	-0.175		0.475
OCT				1.667	***	0.425
OCT/NOV	-0.160		0.516			
Observations:	546			395		
-Log Likelihood:	307.59			213.535		

* Significant at the 10% level
** Significant at the 5% level
*** Significant at the 1% level

TABLE 7

PROBABILITY OF GOING TO A PRIVATE CLINIC
CONDITIONAL ON SEEKING MEDICAL CARE

Variable	Lima Coefficient		Lima St. Error	Sierra Coefficient		Sierra St. Error
CONSTANT	-1.911		2.107	-3.792	**	1.746
INCLU1	-0.250	**	0.099	-0.539	**	0.243
TRAVEL	3.893	**	1.672	9.772	***	4.019
PRICE	-0.269		0.174	-0.054		0.038
AGE1	-0.433		0.412	-1.630		0.236
AGE2	-0.409		0.261	0.110		0.261
AGE4	0.332		0.359	0.642	**	0.308
ACC	-1.534	***	0.574	-2.507	***	0.861
RESP	0.112		0.218	-0.253		0.200
DIGES	-0.536	**	0.253	-0.216		0.218
SYM3	-0.502		0.400			
SYM4	0.903		0.583			
SYM5	0.242		0.216			
ACUTE				-0.361		0.370
EDUC	0.059	***	0.015	0.045	***	0.017
ROOMS	0.292	***	0.037	0.122	***	0.039
NFAM	-0.081	***	0.024	0.056		0.038
NORTH				0.822	**	0.354
SOUTH				-0.812	***	0.272
APRIL/MAY				0.140		0.446
MAY	0.330		0.428			
JUNE	1.441	*	0.860	0.409		0.325
JULY	0.470		0.481	0.244		0.367
AUG	0.801		0.548	0.224		0.317
SEPT	0.863	*	0.470	0.495		0.360
OCT				0.825	**	0.408
OCT/NOV	0.399		0.362			
Observations:	1432			656		
-Log Likelihood:	867.55			423.03		

* Significant at the 10% level
** Significant at the 5% level
*** Significant at the 1% level

TABLE 8

PROBABILITY OF SEEKING MEDICAL CARE
CONDITIONAL ON HAVING SYMPTOMS OR ACCIDENT

Variable	Lima Coefficient		Lima St. Error	Sierra Coefficient		Sierra St. Error
CONSTANT	-1.254	***	0.255	-3.255	***	0.653
INCLU2	0.359	*	0.220	0.211	**	0.108
AGE1	0.337	***	0.083	-0.077		0.117
AGE2	-0.221	**	0.093	-0.316	***	0.120
AGE4	0.203		0.136	0.120		0.171
ACC	0.479	***	0.139	0.221		0.213
RESP	-0.440	***	0.082	-0.533	***	0.100
DIGES	0.112		0.091	0.156		0.116
SYM3	-0.216	*	0.113			
SYM4	0.604	***	0.162			
SYM5	0.344	***	0.124			
ACUTE				1.344	***	0.252
EDUC	0.017	*	0.010	0.049	***	0.009
ROOMS	-0.007		0.038	0.040		0.022
NFAM	-0.021		0.015	.000		0.017
NORTH				0.220	*	0.114
SOUTH				0.383	***	0.134
APRIL/MAY						
MAY	-0.052		0.191	0.458	**	0.187
JUNE	-0.094		0.185	0.499	***	0.161
JULY	-0.120		0.180	0.016		0.168
AUG	-0.286		0.181	0.290	*	0.159
SEPT	0.029		0.182	0.199		0.180
OCT				0.082		0.148
OCT/NOV	0.025		0.182			
Observations:	5489			3221.000		
-Log Likelihood:	3079.84			1618.485		

* Significant at the 10% level
** Significant at the 5% level
*** Significant at the 1% level