Health-care facility choice and the phenomenon of bypassing

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Health policy-makers in developing countries are often disturbed and to a degree surprised by the phenomenon of the ill travelling past a free or subsidized local public clinic (or other public facility) to get to an alternative source of care at which they often pay a considerable amount for health care. That a person bypasses a facility is almost certainly indicative either of significant problems with the quality of care at the bypassed facility or of significantly better care at the alternative source of care chosen. When it is a poor person choosing to bypass a free public facility and pay for care further away, such action is especially bothersome to public policy-makers.

This paper uses a unique data set, with a health facility survey in which all health facilities are identified, surveyed, and located geographically; and a household survey in which a sample of households from the same health district is also both surveyed and located geographically. The data are analyzed to examine patterns of health care choice related to the characteristics and locations of both the facilities and actual and potential clients. Rather than using the distance travelled or some other general choice of type of care variable as the dependent variable, we are able actually to analyze which specific facilities are bypassed and which chosen.

The findings are instructive. That bypassing behaviour is not very different across income groups is certainly noteworthy, as is the fact that the more severely ill tend to bypass and to travel further for care than do the less severely ill. In multivariate analysis almost all characteristics of both providers and facilities are found to have the *a priori* expected relationships to facility choice. Prices tend to deter use, and improved quality of services to increase the likelihood of a facility being chosen. The answer to the bypassing dilemma seems to be for providers to provide as good quality care relative to the money charged (if any), as other, often further away, providers.

1. Introduction

An important policy question much debated in the literature on health economics for developing countries relates to whether charging prices (using cost sharing or cost recovery) at public health facilities will cause ill individuals, especially the poor, not to seek needed care. Much of the analysis undertaken to answer the question has attempted to estimate the demand for the care of public and private providers, with emphasis on whether the price effect on usage turns out to be negative, large and statistically significant. The reasoning has more or less been that if potential users of care, especially the poor, are very sensitive to price (i.e. have a large price elasticity of demand) charging fees at public clinics will deter important usage. Previous papers in the literature have examined which types of health care facilities are chosen by ill individuals, with the price variable results given special scrutiny.

This paper takes a different approach to understanding how price and other factors affect the behaviour of individuals, especially the poor and the severely ill, by examining the characteristics of individuals who choose not to use public health facilities and in fact travel further distances to use other providers, often who charge for the services; in a nation,

Sri Lanka, where the public facilities have a good reputation, are widely available geographically, and by law charge no fees for care. If the conventional wisdom of charges for health care deterring usage holds, we would expect rarely to observe the poor choosing to bypass a free public provider in order to pay for care at a private facility which is further away. In those cases where the poor do bypass the public providers we would expect that the public provider is perceived by the poor patient to be significantly inferior, and that this bypassing of inferior facilities would be more likely to occur when the patient suffered a more severe illness, so that obtaining good care would be especially important.

The plan of the paper is straightforward: first we examine the characteristics in general of facilities that tend to be bypassed and of the people who tend to bypass. Then we examine the policy important cases of the poor and the severely ill, those for whom it is most desirable that they not be deterred from use of health care, in order to see whether the patterns of usage lend support to the hypotheses that the poor will be unable or unwilling to pay for care and that many of the poor who do choose to pay will be severely ill. If many poor choose to bypass the public providers in order to use private and costly care, especially if many of them are not severely ill, it

will be suggestive of the need for significant improvement in the quality of care being provided in the public sector. If many not severely ill are observed to bypass lower level public (free) facilities to go directly to higher level and more costly public (also free) providers, it will be evidence that the referral system is performing poorly and that referral policy initiatives are called for.

This work is based heavily on previous research which demonstrated a strong negative relationship between the choice of facility and the distance from the ill individual to the facility (see for example, Akin et al. 1995; Mwabu 1989). Greater distances imply a higher time price of travelling to facilities and hence a lower likelihood of choosing those facilities. Ill individuals, *ceteris paribus,* will choose closer facilities over facilities that are further away because of the lower time price. However, it is often the case that ill individuals do not choose the facility with the lowest time price, instead visiting one further away. This is a phenomenon we call 'bypassing'.

By examining characteristics of bypassed facilities, it is possible to provide information of relevance to policy-makers. An individual going to a facility that is further away is indicating that the further away facility is preferable to closer ones. Are these facilities which, in spite of their proximity to ill individuals, are not open long enough hours, are too crowded, are under-staffed, charge fees for care that are too high, or are missing vital equipment and medical supplies? Ministry of Health officials and other policy-makers in developing countries are intensely interested in the reasons that an ill person, especially a poor one or one severely ill and in need of care, would bypass a government health facility, not only to go further to a private provider but often also to pay for the care rather than receive it free of charge at the closer facility. The objective of this paper is to examine bypassed facilities in comparison to the chosen option in order to examine patterns in an attempt to decipher some of the reasons for bypassing.

The following analysis looks at the characteristics of health care facilities that are bypassed by individuals who report being ill in the past four weeks in Matale district of Sri Lanka. It is based on data from the 1992 Health Strategy and Financing Study conducted by the Government of Sri Lanka and funded by IDA/World Bank. The data are different from most available sets because they include both demand-side factors from a household survey and supply-side factors from a health-care facility survey. Using this data, it is possible to examine specific individual respondent characteristics, such as age, income and location of residence, as well as facility characteristics, such as price, distance, size and quality of services, that influence which facilities are chosen by ill individuals and which not. In addition, both households and facilities are located geographically on grid maps, permitting a straightforward geometric calculation of the time costs, based on distance, for households when choosing providers.

Perhaps the most important contribution of this work is that it presents a complete market for health care, using data on all suppliers and a sample of potential demanders. Because surveys were conducted of every health care facility in the

district of Matale, the data are almost a complete representation of the actual choice set faced by each ill individual. The last section of the paper links every household to every health facility in the district of Matale and then examines the characteristics of individuals and facilities that cause individuals to bypass certain facilities and to choose others.

2. Data

2.1 Survey of health facilities

Data were collected from 314 health care facilities in the Matale district of Sri Lanka by the Department of the Census and Statistics for the Ministry of Health and Women's Affairs. Data on levels of staffing, hours of operation, fees, services offered, and costs were collected.

Health facilities are classified into four types: Base (Public Western) Hospital, Minor Public Western, Private Western, and Ayurvedic. There is only one Base Hospital in Matale district. It is distinguished from the other Public Western facilities because it is substantially larger than the others and provides a much wider range of services. Further, it accounts for nearly one-fifth of all health care facility visits. Minor Public Western facilities consist of rural hospitals, peripheral units, district hospitals, central dispensaries, maternity homes, joint central dispensaries and maternity homes, and other public western facilities with only outpatient facilities. Private Western facilities are not similarly divided into major and minor. Public (10) and private (202) Ayurvedic facilities are combined into one category. Ayurvedic facilities are mainly residences (159) or dispensaries (43).

The most numerous facilities in Matale are the Ayurvedic facilities. These account for 212 (67.5%) of the 314 facilities. Private Western facilities are the next most numerous (57; 18.2%), followed by Minor Public Western facilities (44; 14.0%).

The Base Hospital is open the full 168 possible hours each week (see Appendix I for means and standard deviations of facility characteristics). Minor Public Western facilities are open an average of 90 hours per week, as compared with only 46 hours for Private Westerns and 107 hours for Ayurvedics. The Base Hospital serves the largest number of people, an average of 17 007 patients per month. Ayurvedic facilities average 5055 patients, Minor Public Westerns 4782 patients, and Private Western facilities, the fewest, 947 patients. The Base Hospital is 116 years old, considerably older than the average for the other types.

The public facilities offer care free of service charges, while the Private Western facilities charge the highest money prices, followed by the Ayurvedic facilities.

The Base Hospital has 32 Western doctors and no Ayurvedic doctors. Nearly 80% of the Minor Public Western facilities have Western doctors, with an average of just more than one Western doctor. Only one Minor Public Western facility reports having any Ayurvedic doctors. The Private Western facilities generally have at least one Western doctor, but only

Table 1. Mean distances (km) to facilities for the 1567 ill individuals[1]

Income quartile			Base Hospital	Minor Public Western	Private Western	Ayurvedic	Closest (any type)
H_0	Lowest	Mean	17.99	1.61	2.10	0.56	0.4521
	(N = 392)	SD	15.09	1.77	2.75	1.21	0.9856
H_1	Highest	Mean	16.04	1.07	1.19	0.37	0.27746
	(N = 391)	SD	16.51	1.57	2.18	1.00	0.8138
T-statistic	$H_0 \neq H_1$		6.87	5.79	8.12	2.57	2.58
Total		Mean	18.19	1.50	1.92	0.50	0.39
		SD	15.86	1.77	2.78	1.14	0.94

[1] For simplicity, results for only the lowest and highest income quartiles are presented. The complete results are available from the authors.

four of 57 (7.0%) Private Western facilities report having any Ayurvedic doctors. Nearly all Ayurvedic facilities report having an Ayurvedic doctor.

The Base Hospital has 101 non-medical personnel. The Minor Public Western facilities have four non-medical personnel on average. Both the Private Western and Ayurvedic facilities tend to have no non-medical personnel.

Using an index of availability of major drugs[1], such as penicillin and insulin, reveals that the Base Hospital is most likely to have better supplies of drugs, followed by Minor Public Western facilities, Private Western facilities and Ayurvedic facilities.

The Base Hospital has 539 beds. Only 41% of Minor Public Western facilities have beds, and very few Private Western and Ayurvedic facilities have any inpatient services.

The Base Hospital has maternal and child health (MCH), paediatric, medical and outpatient services, as well as a pharmacy. Eighty-nine percent of Minor Public Western facilities also have MCH facilities, as compared with only 26% and 25% of Private Western and Ayurvedic facilities, respectively.

Individuals on average are closest to the Ayurvedic facilities (Table 1). The mean distance to the closest Ayurvedic provider is only 0.50 km. The closest Minor Public Western facility is approximately 1.50 km on average. The closest Private Western facility is only slightly further, 1.92 km. The average distance of sample members to the only Base Hospital in Matale is 18.2 km.

Individuals in the lowest income quartile are further from all types of facilities than individuals in the highest income quartile. On average, the closest facility to those in the lowest income quartile is 0.45 km, as compared with only 0.28 km for those in the highest income quartile.

2.2 Household survey[2]

The household survey consisted of 1672 households containing 8404 individuals. About 54% of the sample were living in urban areas, with an average age of 27.7 years. The sample divided fairly evenly between males (48.8%) and females (51.2%). The predominant ethnic group was Sinhalese (67.5%), followed by Sri Lanka Moor (18.2%). The mode of level of education was 'Passed Grade 0–4'.

The mean income per family member was 585 Rupees. Average incomes were higher in urban areas (697 Rupees) than rural areas (455 Rupees). The most common professions were service workers (25.4%) and skilled agricultural/fisheries workers (25.9%).

2.3 Illness

Individuals reported whether they had experienced any of 31 different symptoms in the 30 days prior to the survey. Approximately 29% of the sample reported having experienced some symptoms. Individuals in the youngest and oldest age groups had the highest prevalence of illness (Table 2).

Based on the reported symptoms, individuals were classified as moderately ill, severely ill and 'other', where the latter category refers to a reported symptom that is not enumerated in the survey and therefore unspecified.[3] Of respondents reporting an illness, 70.03% (1701) are classified as moderately ill, 17.7% (430) as severely ill, and the remaining 12.27% (298) classified as 'other'. For simplicity, relationships of important variables with the category 'other' are omitted from the descriptive statistics presented in the paper. They are available from the authors.

3. Results

3.1 Choosing a health-care facility

Ill individuals can choose to combat an ailment either by going to a health facility or by choosing self-care. The basis

Table 2. Illness prevalence by age group

Age group	Number ill	% of age group
0–1	122	50.0%
2–5	224	38.8%
6–15	502	25.7%
16–59	1231	24.9%
60–99	350	50.8%
Total	2429	28.9%

for classifying an individual's chosen treatment strategy is the question 'What did you do about the symptoms?' Of the 2429 people reporting a symptom or an injury, 82 (3.38%) did nothing, 464 (19.10%) chose self-medication and 1883 (77.52%) sought outside assistance. People whose illnesses were categorized as 'severe' were more likely to seek care than those categorized as 'moderately ill' or 'other'.

For Matale district, it is possible to link every individual in the survey with every facility in the district and to calculate the distance from each individual to each facility.[4] Of the 1833 people who sought care at a medical facility, 1567 (85.49%) could be linked by facility identification numbers to the exact facility they attended. The remainder went to a facility outside the district or could not identify the facility attended (survey encoding did not distinguish between these two categories). If the sample for analysis of bypassing behaviour contains only those who report illness within the last 30 days and go to an identifiable facility, this would cause a sample selectivity problem if the objective were unconditional estimation of the factors affecting choice of facility, including the important factor of becoming or perceiving oneself ill. Dealing with this problem is in fact the subject of a related paper (Akin et al. 1998). Individuals either choosing to go to a facility outside the district or not able to identify the type of facility attended also may be characteristically different from the rest of the sample or may have chosen facilities based on different criteria than the remaining sample. Because our objective is the less statistically complex one of discerning the patterns of bypassing for those who do believe themselves ill and as a result either bypass or do not bypass particular facilities, it is logical that our sample only contains people who go to a facility. The policy question being addressed is why do some people who use a facility travel past certain facilities to go to others, not the more complex question of why do people perceive themselves to be ill and how do they choose whether to attend a facility and which facility to attend if ill. An estimation of the factors associated with being in the sample of people who can be linked to a specific facility is included in the Appendix, however.

Individuals are assumed to make decisions about visiting or not visiting each facility based on a range of facility characteristics: the distance to the facility; the price of a medical consultation (a proxy for the general facility-specific price level of medical services); the number of hours open; whether or not the facility has Western or Ayurvedic doctors and the number of each type working at the facility; an index of availability of 16 major drugs; dummy variables reflecting range of services (presence of maternal and child health services, paediatric care or preventive care); whether or not the facility has inpatient services; the number of beds (a proxy for size); the number of non-medical personnel; an index of availability of standard medical equipment (electricity, piped water, deep freezer, etc.); and variable interacting whether a facility has maternal and child health services with whether the ill individual is a mother. It is believed that these represent a diverse range of indicators of quality of medical care and the true costs to the individual. Perhaps more importantly, since these variables are taken from the facility survey,

they represent a set of characteristics that are exogenous to the chooser of care (see Akin et al. 1995).

It was theorized that individual and household characteristics also affect choice of care and, in effect, the decision of whether to go to the closest facility. Total household income per person, level of assets, education level and severity of illness are the personal characteristics included to represent the range of individual level factors affecting choice of treatment strategy.

The choices made here reflect the first action taken by the individual to combat the illness. As such, they do not reflect referrals from lower level facilities. Other survey questions examine the second course of action, if any, following treatment at this particular facility. No questions were asked about whether the subsequent action was a referral or whether it was specifically the individual's decision.

Even though there is only one Base Hospital in the entire district of Matale, it is chosen by over one-fifth of those seeking care (Table 3, column 2). The most commonly chosen type of facility is Minor Public Western, constituting 41% of health facility visits. Private Western facilities account for 25% of facility visits, while Ayurvedic facilities, which constitute 67% of the total number of facilities, receive only 13% of total visits.

A 'bypassed' facility is defined here as one that is closer in distance to an ill individual than the one that the ill individual chose for treatment. In short, in order to visit the chosen facility, the ill individual had to travel a further distance than if he or she had gone to the 'bypassed' facility.

In addition to the characteristics of the facility and ill individuals, the likelihood that a certain type of facility will be bypassed is also determined by the number of them that exist and hence the density of these facilities throughout the geographical area. The number of facilities of a certain type is a reflection of a properly functioning referral structure – a few tertiary, higher-cost hospitals supported by a network of many more secondary and primary level, lower-cost health units. The consequences of this for bypassing are that the greater the density of a certain type of facility, the more likely

Table 3. Frequencies of overall, chosen and bypassed facilities

Type of facility	Frequency		
	Overall	Chosen	Bypassed
Base Hospital	1	331	97
	0.3%	21.1%	0.2%
Minor Public Western	44	640	4548
	14.0%	40.8%	11.3%
Private Western	57	395	12 213
	18.2%	25.2%	30.4%
Ayurvedic	212	201	23 296
	67.5%	12.8%	58.0%
Total	314	1567	40 154
	100.0%	100.0%	100.0%

it is to be bypassed. For instance, because there is only one Base Hospital, even if an ill individual makes the decision not to go to the Base Hospital, it is unlikely that the person will bypass the Base Hospital because it is generally quite far (18 km on average) and a facility of all other types is generally closer. On the other hand, if an ill individual chooses to go to the Base Hospital, it is likely that he or she will have to bypass at least one of every other type, simply because they are more numerous and closer on average.

For the sample of ill people going to facilities, 33.5% do not bypass a facility. In other words, they go to the closest facility available. The remainder of the people bypass at least one facility to get to their chosen facility.

Given the emphasis in the Sri Lankan health system on the Minor Public Western facilities as the preferred starting point for patients into the referral system, that Minor Public Western facilities are more likely to be bypassed than chosen is most certainly of interest to policy-makers. However, all other types of facilities except the Base Hospital are also bypassed many more times than they are chosen. It should be noted that in the above chart, the bypassing numbers do not necessarily indicate that bypassed facilities were the closest facility of that type to the individual, rather that the facility chosen was further away. Also, it does not mean that 4548 individuals bypassed Minor Public Western facilities. It is simply the number of times Minor Public Western facilities were bypassed; often, the same person bypassed more than one Minor Public Western facility.

If all facilities were equal, they would be chosen in roughly the same percentages as their frequency. To examine why a facility is bypassed is simply to examine the reverse situation of why a facility is chosen, i.e. what are the factors that cause people to chose a facility versus what are the factors that cause a facility not to be chosen, particularly if that facility is closer than other facilities.

Overall, there are 40 154 instances in which a closer facility was 'bypassed', i.e. a further facility was chosen. Of those, the most likely to be bypassed are Ayurvedic facilities, as would be expected because of their greater numbers (Table 3, column 3). Even so, they are bypassed in lesser proportion

than their overall frequency in the sample of facilities (58.0% v. 67.5%). Private Western facilities are bypassed in considerably greater proportion than their overall frequency (30.4% v. 18.2%). Both the Base Hospital and Minor Public Western facilities were bypassed roughly in proportion to their overal frequency. Given the numbers of all types of facilities bypassed, it is obvious that it is something more than simply the category of facility that leads to the choice of which to visit when ill. Every type of facility often has people bypass it to go further to another type.

3.2 Income

We first examine income to attempt to discern whether it is the rich, the poor or a mix of income groups who are bypassing specific types of providers. A widely accepted view is that the rich can afford to bypass the free public facilities but the poor cannot. It is in effect hypothesized that individuals in lower income quartiles are more sensitive to price than individuals in upper income quartiles. They are expected therefore to be less likely to choose the non-free options, the Private Western and Ayurvedic facilities, than individuals in upper income quartiles and more likely to choose the free options, the Base Hospital and Minor Public Western facilities. This, in fact, appears to be the case, at least for the Private Western facilities.

Comparing income quartiles, people in the highest income quartile choose a non-free facility (Private Western or Ayurvedic) over 54% of the time as compared to only 32% of those in the lowest income quartile [$\chi^2(1) = 39.82$; Pr = 0.00] (Table 4). They are more than twice as likely to choose a Private Western facility than those in the lowest income quartile (42.5% v. 18.1%).

Income and bypassing

Because individuals in lower income quartiles are less likely to choose non-free options, it is hypothesized that they will be more likely to bypass the non-free Private Western and Ayurvedic facilities. In fact, people in the lowest income quartile bypass a Private Western facility 14% more often and bypass an Ayurvedic facility 22% more often than people in the highest income quartile (Table 5). On the other hand,

Table 4. Choice of facility for lowest and highest income quartiles

Type of facility	Lowest	Highest	Total	$\chi^2(1)$	Pr
Base Hospital	87	76	331	0.902;	Pr = 0.342
%	*22.2%*	*19.4%*	*21.1%*		
Minor Public Western	180	103	640	32.501;	Pr = 0.00
%	*45.9%*	*26.3%*	*40.8%*		
Private Western	71	166	395	54.958;	Pr = 0.00
%	*18.1%*	*42.5%*	*25.2%*		
Ayurvedic	54	46	201	0.710;	Pr = 0.399
%	*13.8%*	*11.8%*	*12.8%*		
Total	392	391	1567		
%	100%	100%	100%		

Pearson chi-squared statistic = 60.4119; Pr = 0.0000.

Table 5. Percentage of people in highest and lowest quartile bypassing each type of facility

Income quartile	Base Hospital	Minor Public Western	Private Western	Ayurvedic
Lowest (N = 392)	5.36%	55.61%	55.61%	74.74%
Highest (N = 391)	7.67%	43.22%	41.94%	52.17%
Average	6.19%	49.78%	49.59%	65.73%
Pearson χ^2	1.72	69.46	45.70	369.45
Pr	0.189	0	0	0

individuals in the lowest income quartile are less likely to bypass the Base Hospital, offering free care, than individuals in the highest income quartile (5.36% v. 7.67%).

It is not clear why individuals in the lowest income quartile are also more likely to bypass Minor Public Western facilities than individuals in the highest income quartile. Obviously something about the lower level public facilities makes them much less attractive to many poor people than other alternatives. One possible explanation is that the Base Hospital is also free, so people often prefer to choose it and its higher level equipment and facilities, even if they have to travel further to reach it. If this hypothesis is correct, it suggests that some mechanism is needed to effectively prevent the jumping of levels in the public referral system; perhaps either charging a fee to those who go directly to the hospital or putting into effect strict referral controls that prevent access to those who do not start at the lower levels of the referral system. Without some such effective controls, the quality of services at the Base Hospital will tend to dominate the proximity of the clinics and dispensaries, and lead to overuse of the high level facility by individuals who could be appropriately treated at low level facilities. When all public facilities are free of service charges, the higher level ones tend to be overused.

It is believed by many in the health policy community that the principal reason individuals would bypass a non-free facility option is to go to a free alternative. Table 6 shows the ultimate choice of facility by income quartile for those who bypass a Private Western facility. Individuals in the lowest income quartile choose a free facility 77.9% of the time if they bypass

a Private Western facility. This is in comparison to all individuals in the lowest income quartile (both bypassers and non-bypassers) who choose free facilities only 68.1% of the time $[\chi^2(1) = 6.72; Pr = 0.01]$. It is also in comparison to individuals in the highest quartile, who choose a free facility only 71.9% of the time if they bypass a Private Western $[\chi^2(1) = 1.83; Pr = 0.18]$.

Similarly, individuals in the lowest income quartile who bypass a Private Western facility are less likely to go to a different non-free option (22.0%) than those in the highest income quartile (28.1%). Individuals in the lowest income quartile who bypass a Private Western facility are also less likely to choose non-free options than all individuals in the lowest income quartile (22.0% v. 31.89%). This pattern provides evidence that ability to pay is one factor in the bypass decision.

A similar analysis which helps to understand the impact of income on choice involves the ultimate choice of facility for those who bypass the most common free option, a Minor Public Western facility (Table 7). Of these bypassers, individuals in the lowest income quartile are only slightly less likely to choose a non-free option (30.3%) than individuals in the highest income quartile (33.2%). They are also more likely, but again only slightly, to choose a different free option (69.7%) than individuals in the highest income quartile (66.9%). In fact, in both of these cases, the percentages are so similar as to be considered not different. It appears that the lowest and highest income individuals who bypass the Minor Public Western facilities behave essentially identically in their choice of free versus non-free options. This finding would seem to be indirect evidence not supporting the inability-to-pay assumptions. In fact, that the percentages in each income group who bypass Minor Public Western facilities choosing each other type are so similar[5] is striking.

Perhaps the most notable fact emerging from Table 7 is one consistent with our earlier hypothesis of a poorly working referral system; irrespective of income class, about 40% of all who bypass the Minor Public Western facilities go instead to the high level (and high cost) public hospital. Of the richest class, in fact, 43% bypass the first level public facility to go directly to the hospital. The richest group do to a degree look different in that the percentage who bypass one Minor Public

Table 6. Facility chosen if bypassing a Private Western facility by income quartile

Income quartile	Base Hospital	Minor Public Western	Private Western	Ayurvedic	Total
Lowest	38.5%	39.4%	11.0%	11.0%	100.0%
	84	86	24	24	218
Highest	43.9%	28.0%	11.0%	17.1%	100.0%
	72	46	18	28	164
Total	39.1%	38.5%	10.0%	12.4%	100.0%
	304	299	78	96	777
Pearson χ^2	1.12	5.38	0.0001	2.93	
Pr	0.291	0.020	0.992	0.087	

(add chi-squared)

Table 7. Facility chosen if bypassing a Minor Public Western facility by income quartile

Income quartile	Base Hospital	Minor Public Western	Private Western	Ayurvedic	Total
Lowest	39.9%	29.8%	14.7%	15.6%	100.0%
	87	65	32	34	218
Highest	43.2%	23.7%	16.6%	16.6%	100.0%
	73	40	28	28	169
Total	40.3%	30.6%	14.1%	15.0%	100.0%
	314	239	110	117	780
Pearson χ^2	0.42	1.82	0.26	0.07	
Pr	0.52	0.18	0.61	0.80	

(add chi-squared)

Western facility for another is much smaller than for any other income group. It may be in this pattern of 'going to a charging facility rather than searching for a better free facility' that the richest differ most from the other groups.

Also notable is that about 14% of each income group choose a Private Western facility when they bypass a Minor Public Western facility, with the second largest percentage showing this pattern being the lowest income group. Many of the poorest do in fact choose not only to pay for care when free care is available but even to travel further in order to go to the charging facility. This is evidence that, at least for these individuals, the Private Western facilities are perceived to provide significantly better care.

3.3 Severity[6]

The analysis so far suggests that bypassing is prevalent and that some differences in chosen facility are probably explained by income or ability to pay, but that the differences in choices by the rich and poor often are very similar. The next obvious factor to consider is whether the bypassing behaviour can be explained to a degree as a rational response of the ill to the severity of their illness. For example, it may be the case that the poor (and the rich) tend to use the nearest free facility when they have a minor ailment but bypass it for a higher level facility when the illness is more severe. If this were the case, the poor (and other groups) would exhibit less sensitivity to price when they are more severely ill than when they are less severely ill.

Just as individuals of different income quartiles appear to have different price elasticities for care, it is hypothesized that

individuals of different severity of illness may be differentially affected by price. Additionally, it may also be true that severely ill individuals are willing to incur higher monetary prices but less willing to incur higher travel time prices in order to obtain care than are mildly ill individuals, because time spent reaching care is much more to be avoided when one is painfully ill.

Somewhat contrary to the hypothesis of severity leading to the choice of more advanced levels of care, Table 8 shows that more severely ill individuals are in fact more likely to choose Ayurvedic and Minor Public Western facilities and less likely to choose Private Western facilities than mildly ill individuals. One explanation could be that in spite of higher monetary price, Ayurvedic facilities are more likely to be chosen by severely ill individuals because of their relatively low travel time cost (since they are generally closer than other facilities). On the other hand, that Private Western facilities are less likely to be chosen by severely ill individuals, perhaps because of both higher time and money prices, is somewhat puzzling given the similarity of choice by income groups when bypassing Minor Public Western facilities noted above. Perhaps examination of other factors can help to explain this apparent anomaly.

Examination of the time cost possibility is somewhat enlightening. Referring to Table 9, we note that for all choices of care except Minor Public Western facilities, severely ill individuals actually travel further on average than mildly ill individuals. Estimated travel time costs are also higher for severely ill individuals going to the Base Hospital and Ayurvedic facilities but lower for severely ill individuals going to Minor Public and Private Western facilities. In the former case, the

Table 8. Choice of facility by severity of illness

Illness severity	Base Hospital	Minor Public Western	Private Western	Ayurvedic	Total
Mild	232	446	290	132	1100
%	21.09%	40.55%	26.36%	12.00%	100.00%
Severe	64	131	62	43	300
%	21.33%	43.67%	20.67%	14.33%	100.00%
Total	331	640	395	201	1567
%	21.12%	40.84%	25.21%	12.83%	100.00%

Pearson $\chi^2(3)$ statistic = 4.63; Pr = 0.201

Table 9. Distance and travel time by severity of illness and choice of facility

		Base Hospital	Minor Public Western	Private Western	Ayurvedic	Total
Time						
Mild	Mean	45.25	38.11	20.97	28.27	33.84
	SD	136.31	122.52	38.19	31.75	104.06
	N	238	457	330	75	1100
Severe	Mean	72.79	27.23	19.34	32.76	35.56
	SD	245.03	23.17	18.36	36.09	116.96
	N	65	134	76	25	300
t-statistic	µtime, mild ≠ µtime, severe	−13.22	16.38	2.73	−3.29	−2.47
Distance						
Mild	Mean	4.96	3.91	2.9	4.38	3.92
	SD	7.5	4.34	5.8	7.33	5.93
	N	232	446	290	132	1100
Severe	Mean	6.23	3.65	3.51	7.23	4.69
	SD	8.37	2.95	7.75	8.78	6.62
	N	64	131	62	43	300
t-statistic	µdistance, mild ≠ µdistance, severe	−3.14	1.45	−1.60	−5.59	−4.65

only cost incurred by the individual is the time cost of care, since care at Minor Public Western facilities is free. Since severely ill individuals are more likely to choose Minor Public Western facilities and have lower travel time costs to these facilities on average than mildly ill individuals, it appears that time costs may play a role for severely ill individuals in choosing the Minor Public Western facility that the less severely ill seem to be more willing to bypass.

Overall, severely ill individuals travel further on average (4.69 km v. 3.92 km) and spend more time travelling (35.56 minutes v. 33.84 minutes) than mildly ill individuals.

Severity of illness and bypassing

The relationship between severity of illness and bypassing facilities seems likely to be tied simply to the fact that more severely ill individuals are more willing to travel greater distances than mildly ill individuals in order to get what they perceive as quality care. As a result, they are also more likely to bypass facilities. Specifically, more severely ill people are more likely to bypass all options except the Base Hospital than individuals reporting 'mild' illness. Obviously the geographic structure of the health system helps to show that individuals will travel further if ill to get to the high level facility. If the geographic layout were such that everyone lived nearer the highest level facility, we would not be able to identify the fact that people who are severely ill travel further to get to this type of care. The message from this finding seems to be that, when people are very ill, they tend to go directly to the high level facility. Having lower level facilities nearby is not likely to affect this behaviour for many patients. On the other hand, the less severely ill seem to be more willing to save travel time by using perceived lower quality care (Table 10).

Table 11 reproduces Table 5 for severely ill individuals only. As before, individuals in the lowest income quartile are more

Table 10. Severity of illness and percentage of ill individuals bypassing different types of facilities

Illness severity	Bypass the Base Hospital	Bypass a Minor Public Western	Bypass a Private Western	Bypass an Ayurvedic
Mild	70	539	544	711
%	6.4%	49.0%	49.5%	64.6%
Severe	18	157	158	214
%	6.0%	52.3%	52.7%	71.3%
Total	97	780	777	1030
%	6.2%	49.8%	49.6%	65.7%
Pearson χ^2	0.05	1.05	0.97	4.72
Pr	0.82	0.31	0.32	0.03

Table 11. Percentage of severely ill individuals bypassing each type of facility – lowest and highest income quartiles

Income quartile	Base Hospital	Minor Public Western	Private Western	Ayurvedic
Lowest	7	50	54	66
%	8.8%	62.5%	67.5%	82.5%
Highest	3	34	34	44
%	3.9%	44.2%	44.2%	57.1%
Total	18	157	158	214
%	6.0%	52.3%	52.7%	71.3%
Pearson χ^2	1.55	5.30	8.68	12.02
Pr	0.21	0.02	0.00	0.00

likely to bypass all types of care than individuals in the highest income quartile. Individuals in the lowest income quartile are also much more likely to bypass all types of care if they are severely ill than if they are mildly ill.

Table 12. Choice of facility by income quartile for *severely* ill individuals who bypass a Minor Public Western

Income quartile	Base Hospital	Minor Public Western	Private Western	Ayurvedic	Total
Lowest	25	10	6	9	50
%	50.0%	20.0%	12.0%	18.0%	100.0%
Highest	10	12	5	7	34
%	29.4%	35.3%	14.7%	20.6%	100.0%
Total	59	51	17	30	157
%	37.6%	32.5%	10.8%	19.1%	100.0%
Pearson χ^2	3.53	2.45	0.13	0.09	
Pr	0.06	0.12	0.72	0.77	

Table 13. Choice of facility by income quartile for *mildly* ill individuals who bypass a Minor Public Western

Income quartile	Base Hospital	Minor Public Western	Private Western	Ayurvedic	Total
Lowest	55	48	22	20	145
%	37.9%	33.1%	15.2%	13.8%	100.0%
Highest	55	27	21	18	121
%	45.5%	22.3%	17.4%	14.9%	100.0%
Total	222	161	81	75	539
%	41.2%	29.9%	15.0%	13.9%	100.0%
Pearson χ^2	1.54	3.79	0.23	0.06	
Pr	0.22	0.05	0.63	0.80	

Table 14. Mean distance travelled by level of illness severity

Severity	Mean	SD	Frequency
Mild	3.92	4.93	1100
Severe	4.69	6.62	300
Total	4.16	6.30	1567

t-statistic = −4.65.

Table 15. Distance travelled by severity of illness and income quartile

			H_a Mild	H_b Severe	Total	T-statistic that $H_a \neq H_b$
H_0	Lowest	Mean	4.55	5.14	4.71	−1.83
		SD	6.02	6.55	6.35	
		N	270	80	392	
H_1	Highest	Mean	3.12	4.18	3.35	−3.12
		SD	6.12	7.21	6.57	
		N	277	77	391	
	Total	Mean	3.92	4.69		−4.65
		SD	5.93	6.62		
		N	1100	300		
		t-statistic that $H_0 \neq H_1$	6.79	2.29	7.49	

Severely ill individuals in the lowest income quartile who bypass a Minor Public Western choose the Base Hospital 50% of the time (Table 12). On the other hand, mildly ill individuals in the lowest income quartile who bypass a Minor Public Western facility choose the Base Hospital only 37.93% of the time [$\chi^2(1) = 2.238$; Pr = 0.12] (Table 13). This is also consistent with the hypothesis that those who bypass are looking for higher level care when they are more severely ill.

The data suggest that severely ill individuals travel further on average than mildly ill individuals, thereby being more likely to bypass facilities. On average, severely ill individuals travel 4.69 km as compared with mildly ill individuals, who travel 3.92 km (Table 14).

Table 15 expands on Table 14 to look at the distances travelled by level of severity and income quartile. For all levels of severity, individuals in the lowest income quartile travel further than individuals in the highest income quartile. For almost all income quartiles, severely ill individuals travel further than mildly ill individuals. These results are of interest and continue the emergence of an obvious pattern. Those who are more severely ill tend to search more widely for a source of care, but perhaps more interestingly, the poor tend to travel further for care than the less poor, perhaps because they often need to go further to find good quality care at a price they are willing to pay. It looks as if the poor on average are rational, and having less money to spend, substitute time and travel to find better care.

3.4 Comparing bypassed facilities with chosen facilities

The previous two sections have examined how two characteristics of individuals, level of household income and severity of illness, affect the choice of facility. This section examines how characteristics of facilities themselves affect whether they are chosen or bypassed.

Table 16 looks at characteristics of facilities from two different scenarios: (1) when a Minor Public Western facility is bypassed in favour of a Private Western facility and (2) when a Private Western facility is bypassed in favour of a Minor Public Western facility.

Table 16. Relative differences in characteristics between chosen facilities and bypassed facilities (full results in Appendix IV)

Facility characterisitic	Chosen Private Western relative to bypassed Minor Public Western	Chosen Minor Public Western relative to bypassed Private Western
Beds:		
Have?	+	+
Number	+	+
Western doctors:		
Have?	+	+
Number	+	+
Ayurvedic doctors:		
Have?		−
Number	+	−
Non-medical personnel	−	+
Drugs	+	+
Price	+	−
Hours open/week	−	+
Index of units		+
Services:		
MCH	−	+
Medical	+	
OPD		+
Paediatric		+
Pharmacy		
Surgical		+
Appearance		
Excellent	+	−
Good	+	+
Fair	−	
Poor		

+ denotes more likely to have characteristic or has more of a characteristic at a significance level of 1%.
− denotes less likely to have characteristic or has less of a characteristic at a significance level of 1%.

In both cases, the chosen facility is more likely to have Western doctors and to have more of them than the bypassed facilities. In neither case does the chosen facility have Ayurvedic doctors. In both cases, the bypassed facilities do.

On average, the chosen facility has more drugs available. Appearance is also important in choice of facility. In both cases, the chosen facility is more likely to be reported in excellent or good condition (100% of Private Western facilities and 88.6% of Minor Public Western facilities) than the bypassed facility (73.0% of Minor Public Western facilities and 85.3% of Private Western facilities).

Differences:

- When the Minor Public Western is chosen, it appears to be chosen for size and convenience. When the Private Western is chosen, it appears to be chosen for higher quality and more extensive inputs.
- For example, when the Minor Public Western is chosen, it is open many more hours per week (155) than when it is bypassed (89 hours per week). The chosen Minor Public Western is more likely to have beds (90% of chosen MPWs have beds whereas only 39% of bypassed MPWs have beds) and to have far more beds on average (63) when it is chosen than when it is bypassed (33).
- When the Private Western facility is chosen, it has more Western doctors and more non-medical personnel on average than when it is bypassed. The chosen Private Western facility most often does not have inpatient facilities. It is also less likely to have MCH and paediatric services than the bypassed Minor Public Western facilities. However, there is little difference in the price of bypassed Private Western facilities and chosen Private Western facilities.

4. Estimations

4.1 Multivariate estimation of factors affecting bypassing

In order to more systematically examine the impact of all individual and facility characteristics on bypassing decisions, it is necessary to do multivariate estimation so that the effect of each factor can be examined with all other factors statistically controlled. A random effects probit estimation was undertaken (Table 17) to examine the relationship between individual and facility characteristics and whether or not individual i (i = 1 . . . 1,567) bypassed facility j (j = 1 . . . 314).

The results up until now have shown the following:

1. Income: The poor are more likely to bypass facilities than the rich. The poor are more likely to choose a free option if they bypass a non-free Private Western facility than the rich. However, if they bypass a Minor Public (free) facility, they are just as likely as the rich to choose a non-free option.

Table 17. Random effect probit results

Variable	Age 0–17		Variable	Age 18–65	
	Coef.	Z		Coef.	Z
Dummy if age < = 1	0.000	−0.003	Age	0.018*	4.790
			Female	0.285*	3.857
Mother's education	−0.002	−1.885	Education	0.227*	8.961
2nd lowest income quar.	−0.162	−1.538	2nd lowest income quar.	0.128	1.306
2nd highest income quar.	−0.527*	−4.628	2nd highest income quar.	0.078	0.811
Highest income quar.	−0.219**	−2.025	Highest income quar.	−0.077	−0.765
			Base Hospital	0.029	0.125
			Minor Public Western	−0.195*	−11.493
			Ayurvedic facility	−0.263*	−21.356
Number of doctors	−0.014*	−3.721	Number of doctors	−0.077*	−9.091
Index of drugs	−0.007*	−5.115	Index of drugs	−0.010*	−7.482
Hours open per week	−0.001*	−9.557	Hours open per week	0.000	0.783
Price of consultation	0.005*	21.071	Price of consultation	0.003*	11.107
			Appearance of facility	−0.077*	−9.780
			Number of beds	0.002*	4.475
Constant	−1.292*	−14.174	Constant	−2.748*	−13.705

* Significant at 1% level.
** Significant at 5% level.

2. Severity: The more severely ill are more likely to bypass facilities and to travel further than the mildly ill. The poor and severely ill are more likely to bypass all options and to travel further.

Estimation difficulties have led to the exclusion of many variables from the model, including, unfortunately, the indicators of severity. Only two age groups are examined: ages 0–17 and ages 18–65. The results add to our knowledge of the overall set of relationships related to the bypassing decision.

In terms of individual characteristics, income does not appear to play an important role in whether a facility is bypassed by the older age group, but in the younger age group individuals from households in upper income quartiles are less likely to bypass facilities than individuals from households in the lowest income quartile. For the 18–65 age group, older individuals, females, and more educated individuals are more likely to bypass facilities.

Facility characteristics also seem to have important effects on whether a facility is bypassed. The results for specific facility variables are much as expected. As was observed earlier in the univariate results, facilities with more doctors and drugs are less likely to be bypassed by both age groups. For the younger age group, being open more hours per week makes a facility less likely to be bypassed. Higher prices are associated with a facility being more likely to be bypassed, an expected result. But having more beds also increased the likelihood, a result that seems less intuitive. Facilities rated as being in better condition were less likely to be bypassed.

Perhaps the most interesting result from the multivariate estimation is that relative to Private Western facilities, Minor Public Western and Ayurvedic facilities were less likely to be bypassed, controlling for specific facility characteristics. This

result is most important. It shows that even though Minor Public Western and Ayurvedic facilities seem to be very likely to be bypassed based on the several univariate analyses, they are in fact less likely to be bypassed if their characteristics and those of the users are the same. This result, which looks surprising at first, is therefore telling us exactly what the earlier results hinted at. It is not the publicness or being Ayurvedic that cause facilities to be bypassed. In fact, Minor Public Western and Ayurvedic facilities would be favoured over Private Western facilities if conditions were the same. It is the fact that the conditions, controlled by the other factors in the multivariate model are often less positive for the Minor Public Western and Ayurvedic facilities that causes them so often to be bypassed.

5. Conclusion

Government health sector administrators in developing countries are often perplexed by the phenomenon of individuals bypassing a nearby public clinic to go to a public or private hospital or private provider that is further away. In academic papers and policy discussions various theories as to why such 'bypassing' occurs have been presented. In this paper we have analyzed the behaviour of a sample of individuals in a health market in Sri Lanka for which information on virtually all facilities chosen and not chosen and both their location and that of the client are available. Some of the results are surprising. That bypassing behaviour usually is not very different across income groups is certainly noteworthy, as is the fact that the more severely ill tend to bypass and to travel further for care than do the less severely ill. It seems that the poor among the severely ill travel even further, in effect substituting less costly time for money by searching a wider area for care. In the multivariate analysis almost all characteristics of both providers and facilities are found to have the theoretically expected relationships to facility

choice. Higher prices tend to deter use of the facility, while improved quality of services increases the likelihood of that facility being chosen.

The answer to the bypassing dilemma, simple in concept yet complex in practice, seems to be for providers to provide as good quality care as other, often further away, providers. The results suggest that when service quality is equal, users will frequent the nearby clinic, but when quality of the services offered is appreciably lower, even care provided free of money cost and in close proximity will not be sufficient to attract many of the potential users. Significant numbers of the poor and the rich, the severely ill and the less severely ill simply will not patronize health providers who do not provide quality above some level of perceived necessary quality. That this is the case should cause many planners of health systems to pause. Providing facilities near the people and charging little or nothing for the care may be of small value unless the health system has or can raise the revenues necessary to provide sufficient service quality at each of those 'free and convenient' facilities.

Endnotes

[1] The index of drugs was calculated using the answer to the question 'Is the drug/supply available in stock?' for a list of 13 major drugs: anti-allergics, antibiotics (penicillin/amphicillin), analgesics, anti-helmintics, anti-asthmatics, anti-filarials, anti-malarials, anti-venoms, activated charcoal/fullers earth, atropine, insulin, ORT and dextrose. The closest equivalent drug was used in calculating the index for Ayurvedic facilities. The index took on values from 0 (if none of the drugs were available) to 13 (if all of the drugs were available).

[2] Summary statistics appear in Appendix II.

[3] Individuals were permitted to list up to four symptoms. If any of the four listed were the following, individuals were classified as severely ill: vomiting; diarrhoea; rash or other skin problems; lumps and growths; passing blood (per rectum, nose, vomiting); vaginal bleeding; vaginal discharge; enlarged lymph nodes; swelling of feet; burn; bites or stings; poisoning; fracture; dislocation, sprains, etc; injury due to assault; or injury due to accident. If individuals listed any of the following symptoms but none of those considered to be severe, they were categorized as moderately ill: cough; sneezing; fever; stomach ache; weakness; headache; sore throat; eye problem; ear problem; worms; muscle aches and pains; joint pains; giddiness; breathlessness; urinary problems; fits; losing consciousness; or mental problems. If individuals merely responded with 'other symptoms' but did not include any of the above symptoms, they were categorized as 'other'. Early models attempted to classify 'other' as either moderate or severe but were inconclusive. The categorization of symptoms was determined by Dr Daya Samarasinghe of the Sri Lanka Ministry of Health. See footnote 6 for further discussion of this approach to the categorization of severity levels.

[4] On grid maps of the survey areas every household and every health facility were located. The locations were coded by the equivalent of longitude and latitude measures laid out on the maps. The algorithm then determined the distance between every facility and every household using the Pythagorean theorem.

[5] Note the similarity of the percentages by income groups for each type of provider by reading down each column.

[6] Measurement of severity for purposes of analysis of how it affects behaviour is problematic. Health status is multidimensional and difficult to measure, even if physical examinations of the interviewees are undertaken. The most common health status measure is probably mortality (see Sammartino 1987 for a useful survey) but many important illnesses are not fatal and healthy people can die suddenly from various causes including accidents. Types of morbidity are also often used indicators of specific types of poor health status, but self-reported morbidity information suffers from various flaws, one of which is that those who go to a health professional and receive a diagnosis are more able to identify their specific morbidity. Much work has been done on the evaluation of self-reported health as the health status measure in analysis (see Sammartino, 1987). Butler et al. (1987) find high correlation between self-reported measures and objectively diagnosed symptoms, and conclude that the bias introduced by use of self-reports cannot be major. We cannot in this paper solve all the problems of measurement of health status, but we do have to use a measure of severity in which we have a reasonable level of confidence. We choose to use self-reported symptoms (not illness categories, but relatively objective reports of such symptoms as stomach pains and fever!) as the basis for our classification, and to use the advice of a medical doctor from Sri Lanka in deciding which individual and combinations of symptoms tend to indicate relative degrees of severity of illness in the Sri Lankan environment. Obviously the classification is idiosyncratic to this study, but we believe it serves well to sort out those individuals who have symptoms perceived of as indicating different levels of severity in the culture.

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Biographies

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Appendix I. Characteristics of facilities

Characteristic	Base Hospital (N = 1)		Minor Public Western (N = 44)		Private Western (N = 57)		Ayurvedic (N = 212)		Total (N = 314)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Age	116	.	32.49	21.48	29.07	22.33	34.91	71.05	33.77	59.93
Index of drugs	11.94	.	6.47	2.57	4.73	3.45	3.94	3.14	4.46	3.26
Beds									6.47	114.67
Have?	100%	.	40.9%	49.7%	1.8%	13.2%	0.4%	6.9%	6.68%	25.0%
Number	539	.	15.52	29.63	0.25	1.85	0.17	2.40	4.05	32.72
Price	0.00	.	0.00	0.00	26.21	19.43	12.54	15.03	13.23	16.61
Hours open/week	168.00	.	90.45	62.72	46.02	29.41	107.21	56.87	93.95	58.59
Western doctors										
Have?	100%	.	79.5%	40.8%	89.5%	31.0%	1.4%	11.8%	28.7%	45.3%
Number	32	.	1.23	1.26	1.44	1.28	0.01	11.8	0.54	2.02
Ayurvedic doctors										
Have?	0%	.	2.2%	15.0%	7.0%	25.8%	98.1%	13.6%	67.8%	46.8%
Number	0	.	0.02	0.15	0.09	0.34	1.42	5.50	0.98	4.56
No. of non-medical personnel	101	.	4.20	5.11	0.86	1.47	0.15	0.42	1.17	6.16
Monthly patients	17007	.	4782	14872	947	1887	5055	5114	4309	7185
Services	8.00	.	3.86	1.73	1.74	1.41	0.75	0.64	1.39	1.53
Units	5.00	.	3.91	1.46	3.44	1.38	1.51	1.00	2.21	1.53
Services offered	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Consultation	100%	.	97.7%	15.1%	87.7%	33.1%	45.2%	49.9%	60.5%	49.0%
Dental	100%	.	18.2%	39.0%	5.3%	22.5%	0.0%	0.0%	3.8%	19.2%
ENT	0%	.	4.5%	21.1%	3.5%	18.6%	0.9%	9.7%	1.9%	13.7%
Family planning	100%		75.0%	43.8%	17.5%	38.4%	1.4%	11.8%	15.0%	35.7%
Health education	100%		40.9%	49.7%	1.8%	13.2%	0.0%	0.0%	6.4%	24.5%
MCH	100%		88.6%	32.1%	8.8%	28.5%	0.0%	0.0%	14.3%	35.1%
Medical	100%		79.5%	40.8%	94.7%	22.5%	65.6%	47.6%	72.9%	44.5%
Obstetrics	100%		40.9%	49.7%	14.0%	35.0%	0.0%	0.0%	8.6%	28.1%
OPD	100%		81.8%	39.0%	80.7%	40.0%	82.1%	38.4%	81.8%	38.6%
Paediatrics	100%		25.0%	43.8%	21.1%	41.3%	6.6%	24.9%	12.1%	32.7%
Pharmacy	100%		86.4%	34.7%	71.9%	45.3%	46.7%	50.0%	57.0%	49.6%
Preventive	100%		77.3%	42.4%	17.5%	38.4%	1.4%	11.8%	15.3%	36.0%
Surgical	100%		25.0%	43.8%	7.0%	25.8%	0.9%	9.7%	5.7%	23.3%
Appearance	N	%	N	%	N	%	N	%	N	%
Excellent	.	.	1	2.3%	4	7.0%	4	1.9%	9	2.9%
Good	1	100%	31	70.5%	48	84.2%	94	44.3%	174	55.4%
Fair	.	.	12	27.3%	4	7.0%	105	49.5%	121	38.5%
Poor	.	.	0	0.0%	1	1.8%	9	4.2%	10	3.2%
Total	1	100%	44	100.0%	57	100.0%	212	100.0%	314	100.0%

Appendix II.   Individual and household characteristics

		N	%
Age			
	0–1	244	2.9
	2–5	577	6.9
	6–15	1950	23.2
	16–59	4944	58.8
	60–99	689	8.2
	Total	8404	100.0
Gender			
	Male	4100	48.8
	Female	4304	51.2
	Total	8404	100.0
Sector			
	Urban	4505	53.6
	Rural	3899	46.4
	Total	8404	100.0
Education			
	None	686	8.9
	Passed Grade 0–4	2219	28.7
	Passed Grade 5–7	1515	19.6
	Passed Grade 8–9	1481	19.2
	Passed G.C.E. (0/L)	1348	17.4
	Passed G.C.E. (A/L)	405	5.2
	Degree	56	0.7
	Post-graduate degree	18	0.2
	Total	7728	100.0
Ethnicity			
	Sinhalese	5671	67.5
	Sri Lanka Tamil	624	7.4
	Indian Tamil	554	6.6
	Sri Lanka Moor	1532	18.2
	Malay	8	0.1
	Burgher	15	0.2
	Total	8404	100.0
Principal activity			
	Employed	2591	30.8
	Available for work	437	5.2
	Household work	1533	18.2
	Retired	162	1.9
	Student	1636	19.5
	Age less than 10 years	1525	18.1
	Other	520	6.2
	Total	8404	100.0
Occupation			
	Legislator, sr. official, manager	30	1.2
	Professionals	175	6.8
	Technicians and assoc. professionals	72	2.8
	Clerks and allied grades	136	5.3
	Service workers	657	25.4
	Skilled agric. and fishery workers	670	25.9
	Craft and related workers	213	8.2
	Plant and machine operators	75	2.9
	Elementary occupations	554	21.5
	Total	2582	100.0

Income per household member	Mean	SD
Urban	696.7	656.8
Rural	454.9	592.2
Total	584.5	639.1

Appendix III.   Complete random effects probit results

c: \sri\bypassp.log
Age 0–17
. xtprobit bypassed age0_1 momeduc qu2-qu4 doc drug hrs price,i(link)
Iteration 20: tolerance = 6.620e-07

General estimating equation for panel data		Number of obs	= 191540
Group variable:	link	Number of groups	= 610
Link:	probit	Obs/group, min	= 314
Family:	binomial	avg	= 314.00
Correlation:	changeable	max	= 314
	chi2(9)		= 635.26
Scale parameter:	1	Prob > chi2	= 0.0000
Pearson chi2(191530):	234600.33	Deviance	= 94846.61
Dispersion (Pearson):	1.224875	Dispersion	= 0.495205

bypassed		Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
age0_1	−0.0003398	0.101879	−0.003	0.997	−0.200019	0.1993395
momeduc	−0.0019396	0.0010288	−1.885	0.059	−0.003956	0.0000768
qu2	−0.1623374	0.1055223	−1.538	0.124	−0.3691574	0.0444825
qu3	−0.5271934	0.1139139	−4.628	0.000	−0.7504606	−0.3039262
qu4	−0.2189752	0.10813	−2.025	0.043	−0.4309061	−0.0070442
doc	−0.0139643	0.0037531	−3.721	0.000	−0.0213203	−0.0066083
drug	−0.0065027	0.0012712	−5.115	0.000	−0.0089941	−0.0040112
hrs	−0.0006979	0.000073	−9.557	0.000	−0.000841	−0.0005548
price	0.0052563	0.0002495	21.071	0.000	0.0047674	0.0057453
_cons	−1.291631	0.0911285	−14.174	0.000	−1.47024	−1.113023

c: \sda\bypassl.log
Age 16–49?

General estimating equation for panel data		Number of obs	= 168304
Group variable:	link	Number of groups	= 536
Link:	probit	Obs/group, min	= 314
Family:	binomial	avg	= 314.00
Correlation:	exchangeable	max	= 314
	chi2(15)		= 1069.34
Scale parameter:	1	Prob > chi2	= 0.0000
Pearson chi2(168288):	261271.22	Deviance	= 101323.5
Dispersion (Pearson):	1.552524	Dispersion	= 0.6020843

bypassed		Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
age	0.0184581	0.0038535	4.790	0.000	0.0109055	0.0260108
sex	0.2848277	0.07385	3.857	0.000	0.1400844	0.429571
educ	0.2265343	0.0252791	8.961	0.000	0.1769882	0.2760805
qu2	0.1281366	0.0980879	1.306	0.191	−0.0641122	0.3203853
qu3	0.0776257	0.0957329	0.811	0.417	−0.1100073	0.2652586
qu4	−0.0769902	0.1005985	−0.765	0.444	−0.2741597	0.1201793
basehosp	0.0287564	0.230265	0.125	0.901	−0.4225547	0.4800675
mnpw	−0.1951445	0.0169788	−11.493	0.000	−0.2284224	−0.1618666
ayurved	−0.2632146	0.0123249	−21.356	0.000	−0.2873709	−0.2390582
doc	−0.0768764	0.0084562	−9.091	0.000	−0.0934503	−0.0603025
drug	−0.0102368	0.0013682	−7.482	0.000	−0.0129183	−0.0075553
hrs	0.0000635	0.0000812	0.783	0.434	−0.0000956	0.0002226
price	0.0028915	0.00026031	1.107	0.000	0.0023812	0.0034017
look	−0.0767179	0.0078441	−9.780	0.000	−0.092092	−0.0613438
beds	0.0023934	0.0005348	4.475	0.000	0.0013452	0.0034417
_cons	−2.748443	0.200542	−13.705	0.000	−3.141498	−2.355388

Appendix IV. Sample selection for being linked to a specific facility

A probit estimation was undertaken to determine if the 314 individuals for whom it was not possible to determine which facility they visited or who visited a facility outside of the district were characteristically different from the 1567 individuals who could be linked to the specific facility they attended.

In general, those who could not be linked tended to be in the younger age groups, particularly ages 2–16 years. There was no relationship between education or income and not being linked to a specific facility. However, relative to individuals with mild illnesses, those who were severely ill were more likely to be linked to a facility. Finally, those who could not be linked were also more likely to come from households with fewer members.

Probit Estimates   Number of obs   = 1883
                                    chi2(14)   = 45.48
                                    Prob > chi2   = 0.0000
Log Likelihood = −829.147   Pseudo R2   = 0.0267

linked	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
sex	0.1123292	0.0705228	1.593	0.111	−0.0258928	0.2505513
age0_1	0.3550679	0.193834	1.832	0.067	−0.0248397	0.7349755
age2_5	0.4233446	0.1642596	2.577	0.010	0.1014017	0.7452876
age6_15	0.2858428	0.1027556	2.782	0.005	0.0844455	0.4872401
age60_99	−0.0239595	0.1023456	−0.234	0.815	−0.2245532	0.1766342
edyrs	−0.0012931	0.0116775	−0.111	0.912	−0.0241805	0.0215943
sector	0.0628454	0.0747657	0.841	0.401	−0.0836927	0.2093834
qu2	−0.0378738	0.0953491	−0.397	0.691	−0.2247547	0.149007
qu3	0.027364	0.1047178	0.261	0.794	−0.177879	0.2326071
qu4	−0.1477812	0.1174373	−1.258	0.208	−0.3779541	0.0823916
severe2	−0.1998128	0.0857714	−2.330	0.020	−0.3679215	−0.031704
severe3	−0.1858668	0.1098497	−1.692	0.091	−0.4011683	0.0294347
people	0.0564571	0.0185057	3.051	0.002	0.0201866	0.0927277
rooms	0.0259806	0.1087022	0.239	0.811	−0.1870717	0.239033
_cons	0.3581027	0.2810011	1.274	0.203	−0.1926493	0.9088547

Appendix V. Characteristics of chosen facilities relative to bypassed facilities

Facility characteristic	Bypassed Minor Public Western N = 960		Chosen Private Western N = 110		t-statistic / $\chi^2(1)$	Bypassed Private Western N = 1477		Chosen Minor Public Western N = 299		t-statistic / $\chi^2(1)$
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Beds										
Have?	0.39	0.49	0.00	0.00	65.99[a][x]	0.01	0.10	0.90	0.30	1466.72[a][x]
Number	17.70	31.58	0.00	0.00	97.59[a]	0.13	1.36	63.31	31.69	−117.41[a]
Western doctors										
Have?	0.84	0.36	0.99	0.10	17.95[a][x]	0.90	0.30	0.98	0.15	20.13[a][x]
Number	1.41	1.35	1.62	0.85	−2.21[b]	1.24	1.01	3.53	1.47	−19.15[a]
Ayurvedic doctors										
Have?	0.03	0.16	0.00	0.00	3.39[a][x]	0.08	0.27	0.00	0.00	25.62[a][x]
Number	0.03	0.16	0.00	0.00	1.96[b]	0.09	0.33	0.00	0.00	5.05[a]
Non-medical pers.	4.58	5.28	1.66	2.00	18.96[a]	0.66	1.17	11.06	6.99	−40.83
Drugs	6.33	2.75	7.01	3.10	−3.87[a]	5.12	3.30	9.10	1.63	−29.45[a]
Price	0.00	0.00	23.32	10.62	−75.06[a]	23.49	15.16	0.00	0.00	186.94[a]
Hours open/week	89.24	62.37	42.79	13.20	108.01[a]	43.71	25.55	155.28	38.97	−180.77[a]
Index of units	3.94	1.60	3.75	1.45	1.55	3.16	1.34	5.30	1.10	−20.08[a]
Services										
MCH	0.93	0.25	0.36	0.48	286.14[a][x]	0.14	0.34	0.95	0.22	815.78[a][x]
Medical	0.76	0.43	0.99	0.10	30.79[a][x]	0.96	0.20	0.96	0.19	0.00[x]
OPD	0.76	0.43	0.83	0.38	2.71[x]	0.86	0.35	0.97	0.18	28.19[a][x]
Paediatric	0.29	0.45	0.25	0.44	0.77[x]	0.16	0.37	0.64	0.48	313.38[a][x]
Pharmacy	0.80	0.40	0.85	0.36	1.57[x]	0.70	0.46	0.73	0.45	1.08[x]
Surgical	0.29	0.45	0.25	0.43	0.77[x]	0.04	0.20	0.71	0.46	862.29[a][x]
Appearance										
Excellent	6	0.6%	7	6.4%	27.08[a][x]	106	7.2%	1	0.3%	20.56[a][x]
Good	695	72.4%	103	93.6%	23.49[a][x]	1154	78.1%	264	88.3%	15.96[a][x]
Fair	259	27.0%	0	0.0%	39.15[a][x]	2031	3.7%	34	11.4%	1.21
Poor	0	0.0%	0	0.0%		14	0.9%	0	0.0%	2.86[a][x]
	960	100.0%	110	100.0%		1477	100.0%	299	100.0%	40.59

'x' denotes test statistic is from $\chi^2(1)$ distribution.
[a] denotes significant at 1% level.
[b] denotes significant at 5% level.