Utilisation of Health Services in Poor Rural China:

An Analysis Using a Logistic Regression Model

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1 Introduction

The aim of this article is to explore the determinants of utilisation of health services in poor rural areas of China. Such a systematic identification of the factors which influence the demand for, and use of, health care services may provide information that policy makers can use to target services to those in greatest need and assist in the design of risk-sharing schemes to protect the poor from the adverse impact of health expenditures.

Previous research results in other developed and developing countries [3-8][1] have shown that demand for and utilisation of health services is determined by three types of factor:

• Perceived level of sickness

In order for individuals or households to seek health care, they must be aware of an illness or its possibility [12]. Surveys typically attempt to measure the perception of illness in terms of symptoms reported, number of disability days, or actions taken, for example physician contacts. Here we use the number of days confined to bed as an indicator of perceived severity of sickness, and predict that this will be positively correlated with health service utilisation.

• Predisposing characteristics

Some individuals or households have a greater propensity to report sickness than others, based on social or demographic characteristics, health beliefs or other attitudinal factors. In the absence of other data on these aspects, we here focus on gender, age and education as proxies for such predisposing traits. Based on results from other studies, we hypothesise that females, infants, older persons and those with higher education levels will tend to report more illness and make greater demands on health services.

• Enabling characteristics

Although an individual or household may wish to use health services, they must also have the means to obtain them. If access is restricted, either because services are not easily available or because they are too costly, this may not only reduce utilisation but also discourage the reporting of illness. Here, two enabling factors are considered, house-

[1] Numbers in square brackets refer to references.

Table 1: **Percentage of people reporting a health problem and using health services, selected countries**

Region or Country	Health Problem	Used Services
San Salvador El Salvador[a]	48.0	17.0
Santo Domingo Dominican Rep.[a]	37.0	31.0
Rural areas in Peru[b*]	20.3	29.6
Rural areas Côte d'Ivoire[b*]	15.6	40.3
Rural China[c]	12.7	66.7
rich counties	12.4	67.4
poor counties	12.7	63.3
Study counties	12.7	61.3

Sources: [a] Ellis [8]; [b] Gertler [6] This data stems from the Living Standard Survey, conducted in 1985; [c] National Health Survey 1993
Note: *Estimated at one half the rate of reported illness during a 30-day recall period

hold income (health provision in the study counties is almost entirely on a fee-for-service basis – health insurance coverage is virtually non-existent), and distance to the nearest health facility

2 Methodology

For the purposes of this article, households with annual incomes in excess of ¥10,000 (around one per cent of the total) are excluded, giving a sample size of 2,694 households, 12,828 individuals. Deletion of observations due to missing values resulted in a final sample of 12,509 for the analysis of outpatient care.

Morbidity and service utilisation rates are initially analysed by considering a simple univariate breakdown by the variables: sex, age, education level, travel time and income of household. Next, a multivariate model is developed in order to examine the joint impact of these variables. A logistic regression approach is adopted, using the dichotomous variables: reporting/non-reporting of sickness and use/non-use of services. Because most of the explanatory variables included within the model are categorical, bivariate or multivariate representations are created. One value of each variable was selected as a reference value and a series of dummy variables created (see Table 4). For example, the reference category for travel time was 0-14 minutes and dummy variables were created for the alternative values: 15-29, 30-59 and 60+ minutes. A maximum-likelihood procedure was used to estimate the coefficients.

3 Morbidity and Outpatient Service Utilisation

As indicated above, the sample used here is of 2,694 households containing 12,509 individuals, giving an average household size of 5.3 persons. Overall, 1,585 individuals (12.7 per cent) reported at least one episode of illness or injury in the 14-day recall period, and of these 972 (61.3 per cent) reported at least one outpatient consultation.

To put some of these statistics in perspective, Table 1 provides comparative data on the frequency of illness reporting and service utilisation from surveys in El Salvador, the Dominican Republic, Peru and Côte d'Ivoire. This table indicates that individuals in the study counties appear to report illness less often, but are then more likely to seek formal health care services. The usual caveats with regard to international comparisons of this type should be kept in mind. Note also that the proportions of the study population reporting illness and seeking treatment are very similar to those estimated by the 1993 National Health Survey in rural China.

Table 2 provides a breakdown by selected demographic and social characteristics of both the overall study population and those reporting sickness.

Table 2 **Profile of the sample and percentage reporting illness or injury in two-week period**

	Total N	%	Sick N	%	X2	P
All	12509	100.0	1585	12.7		
County						
Donglan	4353	34.8	735	16.9		
Shibing	4210	33.7	398	9.5		
Xunyi	3945	31.5	452	11.5	114.4	0.000
Gender						
Male	6443	51.5	767	11.9		
Female	6066	48.5	818	13.5	7.1	0.008
Age Group						
0-4	998	8.0	182	18.2		
5-14	2836	22.7	274	9.7		
15-44	5763	46.1	544	9.4		
45-59	1756	14.0	337	19.2		
60+	1156	9.2	248	21.5	253.6	0.000
Mean	29		34			
Education*						
None	5269	42.1	749	14.2		
1-4	1955	15.6	230	11.8		
5-6	2322	18.6	283	12.2		
7+	2961	23.7	323	10.9	21.6	0.000
Mean	3.5		3.1			
Per Capita household Income**						
Low	3160	25.1	367	11.6		
Middle	6346	49.9	834	13.1		
High	3003	25.0	384	12.8	4.5	0.110
Mean	650		663			
Median	510		523			
Travel Time (min. by foot) nearest facility						
0-14	5689	45.5	659	11.6		
15-29	2055	16.4	223	10.9		
30-59	2340	18.7	334	14.3		
60+	2425	19.4	369	15.2	31.9	0.000
Mean	28		34			

Notes: * The relevant education for children under 15 years old is taken as that of the mother, who is assumed to be responsible for reporting illness.
** High-income households are those in the top 25 per cent. Low-income households are those in the bottom 25 per cent. All other households are classified as middle-income.

Based on survey respondents' description of their own health status, 12.7 per cent suffered from an illness or injury during the two-week reference period. The age structure reflects a relatively small number of children per household, with only 30 per cent of the population below the age of 15 years. The percentage of the sample having no formal education is high, at over 42 per cent, while less than 25 per cent have received seven or more years of education. (Note that the education variable used for children under 15 is that of their mother, who is assumed to play the central role in decisions relating to their health care.)

Reliable income data are rarely available in developing countries [8], and numerous studies have found household income to be biased downwards [14-16], possibly due in part to intentional understating for tax or other reasons. A number of studies, for example Kemprecos and Oldham [13], have focused on annual household expenditure as a summary measure of ability to pay, on the grounds that expenditure data are less prone to such bias. However, there is some evidence that people in poor rural China do tend to inflate expenditures in order to gain social relief. Here we have adopted an income approach, with gross cash incomes adjusted to incorporate the value of various subsidies and subsistence goods, using the estimation method developed by Khan *et al.* [16]. The mean per capita income (¥650) includes income from agriculture, supplementary household activities, wage labour, salaries and social relief. A similar approach is adopted by Henderson [4] to adjust 1989 China Health and Nutrition Survey data, producing estimates of income which are considerably higher than those of the State Statistical Bureau.

For most of the sample, health care facilities are available within a reasonable distance. As Table 2 shows, almost half of the facilities named as the nearest choice for care are within 15 minutes by foot. However, a considerable proportion (around 40 per cent) are more than 30 minutes away, and 20 per cent are more than one hour.

Gender, age, education and travel time appear to be potentially important factors influencing 'self-perceived need'. Within the study population, morbidity for females (13.5 per cent) was somewhat higher than that for males (11.9 per cent). Young children (0-4) and the elderly (over 60) reported the highest rates of sickness. Those with no formal education reported higher rates, as did those living in areas where the travel time to the nearest facility was over 30 minutes. However, the difference in the rates of self-reported illness was not found to be statistically significant between income groups. There were considerable differences between the study counties, reflecting regional variation in reporting illness or injury which is not captured by other variables, with the prevalence of self-reported illness being highest in Donglan, at 17 per cent.

4 Logistic Regression Results for Illness Reporting

To assess the joint effects of the above factors, a logistic regression model was used. The results are presented in Table 3 in the form of 'odds-ratio' coefficients. These indicate the relative likelihood that an individual in a given category reports illness, as compared to an individual in the reference category.

Compared to the univariate analysis, most of the variables being considered continue to be statistically significant. Men tend to report illness less often than women. Those over 60 years are most likely to report an illness, followed by those under five years old. The county variable contributes significantly to the analysis, with those in Xunyi and Shibing much less likely to report illness than those in Donglan.

Other predicted relationships either lose their statistical significance or remain insignificant when all factors are jointly considered. There is no observable education level difference, a result which is in agreement with the findings of Ellis [8] and Henderson [4]. A priori, it is not clear what effect income might be expected to have. On the one hand, those with higher incomes are probably healthier on average; on the other, they may be more likely to report sickness. In the event, the income variable remains statistically insignificant.

5 Utilisation of Outpatient Services

Among those who reported illness or injury, about 60 per cent used health services. Table 4 shows a breakdown of this group by the explanatory factors

Table 3 **Logistic regression results for illness reporting**

Variable name	Odds Ratio	P
County (Donglan)		
Shibing	0.52	0.000
Xunyi	0.67	0.000
Gender (Female)		
Male	0.86	0.011
Age-Group (15-44)		
0-4	2.30	0.000
5-14	0.99	0.919
45-59	2.22	0.000
60+	2.58	0.000
Education (none)		
1-4	1.02	0.846
5-6	1.02	0.822
7+	1.03	0.730
Travel time (0-14 mins)		
15-29	0.99	0.941
30-59	1.26	0.004
60+	1.12	0.184
Log income	1.05	0.208

Note: ( ) indicates the reference group

described above. As can be seen, all of the factors considered are statistically significant ($P<0.05$).

Those aged over 60 years are less likely than young adults (15-44 years) to seek formal treatment in spite of their reporting the highest morbidity. A similar result holds for women as compared to men. Those who have received more years of education or have relatively higher income are more likely to seek formal treatment. The same is true for those who have been confined to bed for longer periods. Those living more than 30 minutes from the nearest facility are less likely to seek formal treatment. In addition, it is important to note that there are considerable differences between the three counties. Almost 90 per cent of patients in Xunyi seek care compared to 56 per cent in Donglan and only 40 per cent in Shibing. This is almost certainly mainly a reflection of variations in health care provision.

6 Logistic Regression Results for Utilisation of Health Services

In Table 5, a model based on the decision to seek formal care was estimated using the same variables as above, plus a variable representing the severity of illness, which might reasonably be assumed to be related to health service utilisation. The severity of an illness can be measured in several different ways. Ideally, it would be possible to collect 'objective' information on health status of household members through physical examination or laboratory tests. However, this is difficult and expensive to implement. The most widely used indirect measure is the number of days away from work or school or confined to bed due to illness. Here the number of days confined to bed is adopted as a proxy for severity.

The inter-county variability is clearly very important, with the probability of seeking assistance in Shibing being half that of Donglan, while in Xunyi it is larger by a factor of four. Age is the next most

Table 4 **Utilisation profile for those reporting illness**

	All N	%	Users N	%	X2	P
All	1585	100.0	972	61.3		
County						
Donglan	735	46.4	411	55.9		
Shibing	398	25.1	159	40.0		
Xunyi	452	28.5	402	88.9	231.0	0.000
Gender						
Male	767	48.4	502	65.5		
Female	818	51.6	470	57.5	10.7	0.001
AgeGroup						
0-4	182	11.5	135	74.2		
5-14	274	17.3	181	66.1		
15-44	544	34.3	363	66.7		
45-59	337	21.3	165	49.0		
60+	248	15.6	128	51.6	53.5	0.000
Education						
None	749	47.3	429	57.3		
1-4	230	14.5	120	52.2		
5-6	283	17.9	172	60.8		
7+	323	20.4	251	77.7	49.9	0.000
Per Capita household income						
Low	364	23.0	191	52.5		
Middle	818	51.6	513	62.7		
High	403	25.4	268	66.5	17.1	0.000
Travel time to nearest facility						
0-14	659	41.6	490	74.4		
15-29	223	14.7	146	65.5		
30-59	334	21.1	159	47.6		
60+	369	23.3	177	48.0	103.1	0.001

influential factor, with utilisation being twice as large for the under-fives, and half as large for the over 45s, as compared with the 15-44 age-band. Travel time also becomes important when it exceeds 30 minutes, though it should be noted that this result is based on a very small number of observations. The same caution applies to the apparent influence of seven or more years' education. Note that the odds-ratio for severity of illness and log of income cannot be directly compared to those for the other variables, as the former are both treated as continuous. Both are significant in determining utilisation, with income appearing to be somewhat the stronger influence, though with greater variability of effect.

As compared to the univariate analysis, only gender loses its statistical significance in the multivariate model, though the direction of the relationship, i.e. fewer women seeking care, remains. It should perhaps be noted that this may be a reflection of the complex relationship between sex, age and morbidity, which is not fully captured by the simple logistic model.

Table 5 **Logistic regression results for utilisation of health services**

Variable name	OR	Pr>X2
County (Donglan)		
Shibing	0.48	0.000
Xunyi	4.22	0.000
Gender (Female)		
Male	1.24	0.100
Age-Group(15-44)		
0-4	2.19	0.000
5-14	1.35	0.100
45-59	0.55	0.000
60+	0.63	0.014
Education (none)		
1-4	1.08	0.674
5-6	1.03	0.840
7+	1.66	0.008
Travel time(0-14)		
15-29	1.04	0.831
30-59	0.67	0.021
60+	0.55	0.001
Days confined to bed	1.11	0.000
Log income	1.29	0.003

Note: ( ) indicates a reference group

7 Discussion

Any interpretation of the above results must be preceded by a caution that the key variable in this exercise is self-reported morbidity. This variable will probably be correlated with actual morbidity, but is also certainly subject to a variety of other influences, such as tolerance level, expectation of treatment, reluctance to make expenditure on health services, etc., which may well have a major effect on the tendency to report sickness. In spite of these difficulties, it can be argued that such measures do provide a useful indicator of need.

Our study indicates great variation in the utilisation of health services between the three study counties, even when controlling for a number of the key factors which may be assumed to influence demand. Indeed, the relationship between utilisation and the county variables is even more pronounced in the multivariate analysis. Both forms of analysis indicate that those in Donglan and Shibing were much less likely to use health services than those living in Xunyi. Previous research in these counties, which found major problems in financing and delivery of services [1-2] would strongly suggest that service provision lies at the root of these differences.

Among predisposing characteristics, age would appear to be the most powerful predictor of service use. As might be expected, given the adoption of a rigorous family planning policy and the consequential impact on family size, illness among young children will typically result in a decision to seek health care. This pattern appears similar for both male and female children, but the lower reported level of morbidity for girls under five might require further investigation. On the other hand, relatively high levels of morbidity among those over 45 are less likely to lead to utilisation of services. It cannot be ascertained from the existing data if this indicates a greater willingness to accept illness, a lower expec-

tation that health services can provide assistance, or a greater reluctance or lower ability to pay for care.

In some ways contrary to expectations, given the perception that most people have access to a village doctor who will make minimal charges for a simple consultation, income does appear to pay a significant role in the decision to use health services. As indicated above, however, it is possible that this indicates a relationship between income and supply-side factors which are simply not captured by the simple logistic regression model. It is clearly likely that there will be a strong correlation between average household incomes in a county and the finances available for health services in that county.

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