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Maternal health services in China's western rural areas: uptake and correlates

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Abstract

Purpose – Many public health systems have struggled with the dual questions of: why the uptake rate of maternal health (MH) services is low among some subpopulations; and how to raise it. The purpose of this paper is to assess the uptake rate of a new set of MH services in poor rural areas of China.

Design/methodology/approach – The analysis is based on the survey responses of women's representatives and village cadres from almost 1,000 villages in June 2012 as part of a wide-scale public health survey in Sichuan, Gansu and Yunnan provinces in the western part of China.

Findings – The authors find that the uptake rate of MH services (including in-hospital delivery, antenatal care visits and post-partum care visits) in poor rural areas of Western China are far below average in China, and that the rates vary across provinces and ethnic groups. The analyses demonstrate that distance, income, ethnicity and availability appear to be systematically correlated with low uptake rates of all MH services. Demand-side factors seem to be by far the most important sources of the differences between subpopulations. The authors also find that there is potential for creating a Conditional Cash Transfer program to improve the usage of MH services.

Originality/value – The authors believe that the results will contribute positively to the exploration of answers to the dual questions that many public health systems have struggled with: why the uptake rate of MH services is low among some subpopulations; and how to raise it.

Keywords China, Poor, Decomposition, Maternal health services, Rural, Uptake rate

Paper type Research paper

Despite China's rapid economic growth, maternal and infant health in rural areas remains a policy concern. Congenital birth defects account for 10 percent of child deaths among children under five years old. It has been shown that treatable conditions among newborns and child under-nutrition jointly account for a majority of the

under-five mortality rate in China (World Health Organization, 2012a). Many women suffer from nutritional and health problems during pregnancy (Gausia *et al.*, 2012). Moreover, national-level statistics mask a marked gap in child outcomes between rural and urban areas; in 2010, the newborn mortality rate, the infant mortality rate, and the under-five mortality rate were all more than twice as high in rural areas as in urban areas (National Bureau of Statistics (NBS), 2011).

In recent years China's government has recognized and begun to address these problems. A comprehensive rural health insurance system was set up in the early 2000s and has steadily expanded since then (Gu, 2012). In the past five years health care spending by the government has increased by more than 200 percent (State Council, 2012b). There are a large number of new programs in the area of public health: folic acid for pregnant women; programs to encourage delivery in hospitals; immunization programs for newborns; and initiatives to increase health awareness and literacy on issues ranging from antenatal to postnatal and postpartum (Ministry of Health, 2008; China National Immunization Program, 2010; State Council, 2012a, b). Despite these initiatives, there is evidence that maternal and child health care service utilization remains low (Li *et al.*, 2005; Zhou, 2010; Jing *et al.*, 2012).

In an effort to further encourage service uptake, in 2009 the national government announced a new public health initiative that provides free or highly subsidized maternal and child health services in rural areas (Ministry of Health and Ministry of Finance, 2009). Although enormous effort has gone into funding and promoting this new initiative, there is concern that some subpopulations, most notably those in poor rural areas and areas with large concentrations of ethnic minorities, have not been taking advantage of the services. However, to our knowledge, there have been no studies that rigorously consider service uptake in the wake of the new policy.

If it is found that there are, in fact, subpopulations that are underutilizing the new public health services, an equally important question is "why." More precisely, since many of these services are free, why are the take-up rates still so low? While there is no study to our knowledge that has systematically studied this issue in the context of rural China, in the public health literature more generally analysts frequently examine two broad sets of the reasons for low utilization of public health services: supply side barriers and demand-side barriers.

Health economists have identified a number of reasons why demand for public health services may be low: distance, since it increases the costs of seeking public health services (e.g. Thaddeus and Maine, 1994); income, since it controls individuals' purchasing power to pay the costs of care – both direct and indirect (e.g. Peters *et al.*, 2008); and ethnicity, since it may be that there are beliefs and suspicions among ethnic minorities that make the uptake of public health services less desirable (e.g. Ensor and Cooper, 2004). In short, if the underutilization of public health services in China follows the trend found in the international literature, then distance, income and ethnicity may be three demand-side reasons that utilization rates are low.

Public health scholars have also identified supply side reasons for the low uptake of public health services. Specifically, service availability and quality have been cited as obstacles to utilization of health services (Peters *et al.*, 2008). The logic of these findings is that even if demand for public health services is high, if the services are unavailable (or only available with a great amount of effort) or if the quality of services is low, uptake may be reduced. Following the international literature, then, it is possible that the rates of service utilization in China are correlated with the availability or quality of public health services.

The goal of this paper is to assess the degree of uptake of a new set of maternal health (MH) services in poor rural areas of China. To do so, we have four specific objectives. First, we will seek to identify which subpopulations are using the MH services and their rates of service uptake. Second, we will try to identify which factors are correlated with uptake, focussing specifically on whether demand-side factors (e.g. distance, income and/or ethnicity) or supply-side factors (availability and/or quality) are more important. Third, we will conduct a decomposition analysis of the data to explain why low uptake poses a significant problem in some areas but not in others. Finally, we consider women's willingness to accept Conditional Cash Transfers (CCTs) as a possible solution to the problem of low uptake.

To achieve these objectives, we report on the results of a large-scale survey, conducted by the authors, of nearly 1,000 villages across 14 counties in Sichuan, Gansu and Yunnan provinces. The study villages contain more than 22,000 women who gave birth to babies in 2011 (and hence are eligible for utilization of the new MH services). We document the uptake rate of MH services in the study areas, which are representative of the poor western parts of rural China. Our large sample size also allows us to conduct regression and decomposition analyses which we will use to identify the correlates of service uptake and explain variations in the data across provinces; across counties within provinces; and between Han and non-Han minority groups. To our knowledge, it is the largest study of its kind to examine this set of questions.

The paper is organized as follows. In the next section we describe the data set and survey methodology. In third section we present evidence on the uptake of MH services in the survey areas. In fourth section we identify the correlates of MH service uptake. In fifth section we conduct a decomposition analysis to examine the magnitudes of the correlates and explain why low-uptake rates pose a significant problem in some areas but not in others. In sixth section we explore women's willingness to accept a CCT in exchange for utilizing the services. In seventh section we summarize the overall findings and conclude.

Data and survey methodology

The data used in this paper were collected by the authors in June, 2012 as part of a survey of MH services in Sichuan, Yunnan and Gansu Provinces. These provinces are all in China's western region. These provinces were chosen because they were identified by the Ministry of Health (MOH), the host administrative unit of the United Nation's Children Fund, as targets of their efforts to enhance the health outcomes of women and infants in poor rural areas of China (Center for Disease Control (CDC), 2011). The average net per capita incomes in the rural areas of Sichuan, Yunnan and Gansu are 5,087 RMB, 3,952 RMB and 3,425 RMB per year (820 USD, 637 USD and 552 USD) putting them in the bottom one-third of China's rural income distribution (NBS, 2011).

Once the provinces were selected, the next step was to choose the sample counties. A total of 14 rural counties – five in Sichuan, five in Yunnan and four in Gansu – were selected. These counties were chosen by MOH as the future locations of a new project to improve health outcomes of women and their infants in poor rural areas of China (CDC, 2011). Our data collection, however, preceded any project work. The location of the study counties is shown in Figure 1.

Once the counties were selected, the next step was to choose sample townships. In each county we obtained from the local health bureau a list of those townships with township health centers (THCs) that were equipped to offer basic antenatal/delivery/post-partum MH services. The percentage of total townships per county that offered
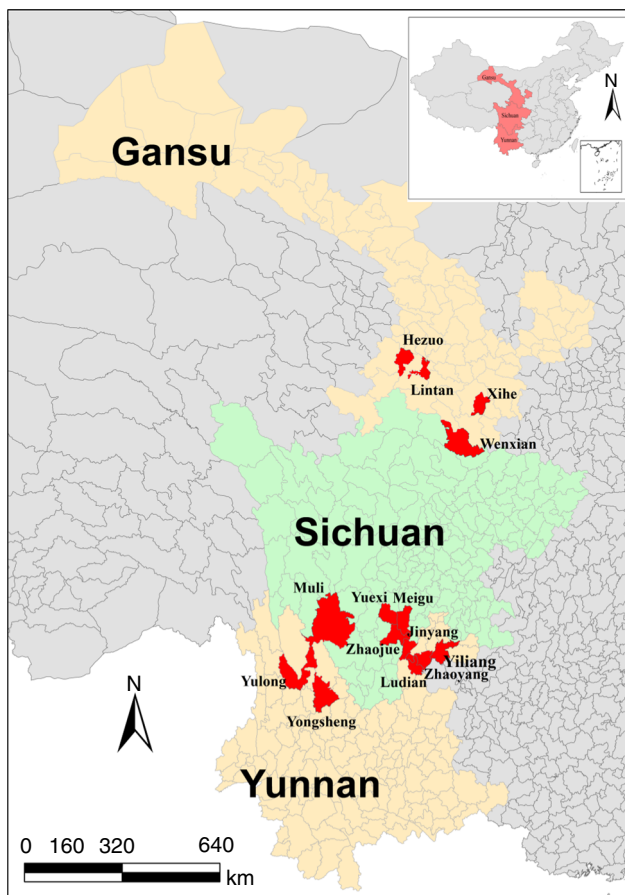
Figure 1.
Location of sample
counties

these basic MH services varied by county, from 15 to 70 percent. Our survey teams visited all of the townships on the lists, for a total of 120 townships (Table I). Because of the way we chose the townships, the THC in each sample township was supposed to offer basic antenatal/delivery/post-partum MH services; however, as we will see later in the manuscript, sometimes the THC did not actually offer these services. It should be noted that given our selection criterion, our sample is limited to those villages (and women) with relatively good access to MH services. This may lead to an upwards bias in our results, so we emphasize that the uptake rates we report should be considered to be upper-bound estimates.

The final step of the sampling strategy was to choose the sample villages. Before our survey teams visited each township, township officials asked each village in the township to send two representatives (the Women's Federation representative for the village – henceforth the women's representative; and the village leader) to a meeting in the township seat. These village representatives were then interviewed by our survey team.

Not all village representatives invited to the survey actually attended the meeting; as a result, it is important to determine whether this attrition had any systematic effect

	Number of townships (1)	Number of villages (2)	Percent of villages (3)
1. Total sample	120	993	100
2. Sichuan	*30*	*162*	*16*
3. Zhaojue	7	50	5
4. Muli	8	23	2
5. Meigu	4	29	3
6. Yuexi	6	36	4
7. Jinyang	5	24	2
8. Gansu	*32*	*414*	*42*
9. Xihe	19	281	28
10. Wenxian	4	63	6
11. Lintan	3	39	4
12. Hezuo	6	31	3
13. Yunnan	*58*	*417*	*42*
14. Yulong	11	76	8
15. Yongsheng	11	97	10
16. Ludian	11	61	6
17. Yiliang	9	65	7
18. Zhaoyang	16	118	12

Source: Authors' survey

Table I.
Distribution of sample townships and villages across counties

on the findings of the study (since it may have been that certain types of villages might have systematically decided not to come). We have two reasons to believe that attrition did not have a material effect on the findings. First, the proportion of villages that did not participate in the survey was only 11 percent. Second, while we were not able to collect data about the characteristics of the villages that did not participate in the survey, we did keep track of the total number of villages in each township and the number of villages that made it to the survey. These two numbers allowed us to create a variable, share of total villages taking part in survey. When we run a regression with service uptake as the dependent variable (e.g. share of women in a village that deliver their baby in the hospital) and with the share of total villages taking part in the survey as the independent variable (with and without other control variables – see description of the multivariate analysis below for a list of controls), we find that the coefficient on the independent variable (share of total villages taking part in the survey) is not significantly different from zero[1]. This indicates that the attrition rate within townships is not systematically related to the service uptake rate, and suggests that there is no systematic difference between villages that participated in the survey and those that did not.

The survey included a total of 993 villages. Table I shows summary statistics for the townships and villages in the sample.

Content of the survey
The women's representative survey included four modules: measures of the uptake of MH services (including in-hospital delivery, antenatal check-ups and post-partum check-ups), demand-side factors (including distance, income and ethnicity), supply-side factors (including measures of availability and quality of MH services), as well as other control factors.

Uptake of MH services
The first module collected information on the uptake of MH services in the village in 2011. The women's representative was first asked for the total number of live births during 2011, information for which the women's representative is responsible for keeping detailed records.

In-hospital delivery. The women's representative was next asked about in-hospital deliveries. Most women's representatives also had written records on this. Those who did not have written records were still able to answer accurately, due to their role in the community (they are often asked to help with births) and due to the close-knit nature of China's villages[2].

Antenatal check-ups. The second measure of the uptake of MH services is the antenatal care (ANC) visit rate. The ANC rate refers to the percentage of the pregnant women that underwent one or more ANC examinations. However, this variable needs to be carefully defined since the number of antenatal visits (for those that go to the THC for an ANC examination) can range between 1 and 5. According to the MH services guidelines issued by the Ministry of Health (MOH) (2011), all women are supposed to have at least five antenatal visits between the time they discover they are pregnant and the time that they give birth (not including the in-hospital delivery visit). During each antenatal visit pregnant women are supposed to receive a full physical examination, including a blood pressure reading; weighing; blood and urine tests; and a pelvic exam. Guidelines also require Doppler fetal heart monitoring (MOH, 2011). Doctors/clinicians are also supposed to give women advice on nutrition, care and other fundamental MH information. To measure full compliance we should count only the women that made five ANC visits. It may be, however, that having at least one antenatal visit prior to delivery is important. In the rest of the paper, therefore, we distinguish between the percentage of new mothers who had at least one antenatal visit (ANC-1) and the percentage of new mothers who had all five recommended antenatal visits (ANC-5).

Post-partum check-ups. The third outcome measure that we use in the study is the uptake of post-partum care (PPC) services. The PPC rate refers to the percentage of post-partum women that made a PPC visit to the THC approximately 42 days following the delivery. According to the MOH guidelines, every mother should have at least one PPC visit, and this visit is free if it occurs 42 days (six weeks) after the delivery (MOH, 2011). During the visit the doctor is supposed to check the woman's blood pressure and weight, check on pelvic and uterine recovery, and check for any obvious post-partum complications (MOH, 2011).

Demand-side factors
Distance. The second module of the women's representative's survey asked a series of questions designed to identify demand-side correlates of high/low rates of uptake, focussing on distance, income and ethnicity characteristics. The survey instrument included questions that allowed us to create two alternative measures of distance. First, we collected information on the distance from the village office to the nearest paved road in kilometers (distance in kilometers). Enumerators also asked about the time it would typically take to travel from the center of the village (the village office) to township seat (the location of the THC). We asked the respondents to calculate this time for an average individual using the mostly common form of transportation and to give the time in minutes (distance in minutes).

Income. The second demand-side factor is income. In the survey, enumerators asked the women's representatives the net per capita income (in yuan) in the village in 2011 (per capita income). This was also asked of the village leader and the two estimates were reconciled if different.

Ethnicity. The third demand-side factor is ethnicity. We include this here in the demand-side section of the paper (although we know it is may be correlated with other variables) in order to capture a number of factors associated with being a non-Han in China. We measure ethnicity in two different ways. One is a broad dummy variable that takes the value of 1 if the major ethnic group of a village is non-Han and 0 otherwise (non-Han village). The other is a set of more specific dummy variables indicating the majority ethnicity in each non-Han village (Yi village, Tibetan village, Miao village, Hui village, Naxi village and other non-Han village). We also created a variable called Han village if the main ethnic group in the village was Han.

Supply-side factors
Availability of MH services. The third module of the women's representative survey collected information on supply-side correlates of service uptake, namely, availability of MH services and quality of MH services. To measure the availability of MH services we create a dummy variable indicating whether the THC actually offers MH services (THC offers MH services). Our sample selection method called for only choosing townships with THCs that provide full MH services; however, it was discovered during the survey that in reality, not all THCs in our sample supplied the full set of services. More specifically, 28 percent of women's representatives reported that their local THC did not provide full MH services. Hence, in our analysis, if the THC offers the full set of MH services, the dummy variable is equal to 1; otherwise it is 1.

Quality of MH services. To measure the quality of MH services, we measure three different dimensions of quality: facilities, services and attitude. We asked women's representatives to rate the facilities, services and attitudes of the THCs on a 1-5 scale (with 1 = very good, and 5 = very bad). Using this information, we constructed a dummy variable that is equal to 1 if a women's representative rated the facilities of the THC in their township as very good or good and 0 if otherwise (good facilities). In the same way, we constructed an additional two dummy variables for very good or good services (good services), and for very good or good attitudes of the staff (good attitudes).

Control variables
Finally, in the fourth module of the women's representative survey, we collected information on a number of village characteristics to act as control variables. These included the education and language ability of the women's representative; the existence of any village-wide policy (or other programmatic effort) that encouraged the women's representative to mobilize women in their villages to better use MH services (mobilization policy)[3]; the village's topography was also made into a control variable (mountainous village). We define all of our variables (uptake; demand correlates; supply correlates; and control variables) in Table II. The summary statistics of these variables are presented in Table AI.

Along with the women's representative, the other village representative that we invited to the survey was the village leader (*cunzhuren*). We chose to invite the village leader because he/she was the head of the village and was in a position to know a lot about his/her village. In the village leader form we asked about many (but not all) of the

Variable	Description
Outcome variables	
In-hospital delivery rate	(Number of babies delivered in-hospital/number of babies who were born alive) 100 percent
ANC-1 rate	% of women who received at least one antenatal care visit during pregnancy
ANC-5 rate	% of women who received at least five antenatal care visits during pregnancy
PPC-1 rate	% of women who received at least one post-partum care visit 42 days post-partum (delivery)
Distance	
Distance, kilometers	Distance from village committee to the nearest paved road
Distance, minutes	Time cost from village committee to township seat by the most common transportation mode
Income	
Per capita income, yuan	Net per capita income in the village in 2011
Ethnicity characteristics	
Non-Han village	The major ethnic group in the village is non-Han, 1 = yes
Yi village	Yi is the major ethnic group in the village, 1 = yes
Tibetan village	Tibetan is the major ethnic group in the village, 1 = yes
Miao village	Miao is the major ethnic group in the village, 1 = yes
Hui village	Hui is the major ethnic group in the village, 1 = yes
Naxi village	Naxi is the major ethnic group in the village, 1 = yes
Other non-Han village	Other non-Han is the major ethnic group in the village, 1 = yes
Availability of MH services	
THC offers MH services	Township health center offers MH services to woman villagers, 1 = yes
Quality of MH services	
Facilities good	Women's representative rates the facilities of town hospital as good/very good, 1 = yes
Services good	Women's representative rates the services of town hospital as good/very good, 1 = yes
Attitudes good	Women's representative rates the attitudes of town hospital as good/very good, 1 = yes
Other factors	
Junior high	Women's representative has junior high-level education, 1 = yes
Senior high	Women's representative has senior high-level education, 1 = yes
College	Women's representative has at least college education, 1 = yes
Ethnic language only	Ethnic minority women's representative speaks ethnic language only, 1 = yes
Mobilization policy	Do special policies encourage mobilization and advertising efforts? 1 = yes
Mountainous village	Village has mountainous topography, 1 = yes

Table II.
Variable description

same non-MH-related variables that were included the women's representative forms, including distance, income, ethnicity characteristics and the topography of the village. During data collection (when the enumerators were in the field), the forms of the women's representative and the village leader were compared. If there were any differences between the two, an immediate reconciliation was made. We therefore believe that the quality of the data was high.

Uptake of MH services in China's western areas

The goal of this section is to document the overall uptake rates of MH services in poor rural areas of Western China. To do so, we first report the uptake rate of MH services by type of service. Next, we demonstrate how the uptake rate of each type of service varies by province and by county.

Uptake of in-hospital delivery services

According to our data, while in-hospital delivery rates are not low compared to other low and lower middle income countries (World Health Organization, 2012b), there are still significant fractions of women in rural China's western areas that do not deliver their babies in hospitals[4]. Overall 80 percent of babies were delivered in a hospital (Table III, row 1, column 1). While this rate may be somewhat over-reported (as discussed above), the point estimate is still lower than that of rural China overall – which was reported by the MOH as being 98 percent (Ministry of Health (MOH), 2012).

The average rate for the overall sample, however, disguises differences among the provinces. Our data show that women's representatives in Yunnan report that 92 percent of babies were delivered in hospitals (row 13, column 1). At the other extreme, only 53 percent of women in Sichuan are reported to have delivered their babies in the hospital (row 2, column 1). The rate in Gansu was in the middle (79 percent – row 8). The variation across provinces is statistically significant at the 1 percent level. In other words, there are obvious differences across our sample – from only around one-half (in Sichuan) to almost all (in Yunnan).

In-hospital delivery rates not only differ across provinces, they also vary across counties within provinces. For example, the in-hospital delivery rate in Muli county in Sichuan was 82 percent (row 4, column 1), vs 39 percent in Zhaojue county delivered their babies in the hospitals (row 3, column 1). These differences are statistically significant. Similar cross-county differences are found in Gansu Province (rows 11 and 12, column 1).

	In-hospital delivery (1)	ANC-1 (2)	ANC-5 (3)	PPC-1 (4)
1. Total sample	80	89	68	64
2. Sichuan	*53*	*62*	*23*	*20*
3. Zhaojue	39	60	24	25
4. Muli	82	82	27	14
5. Meigu	48	48	17	28
6. Yuexi	45	69	27	19
7. Jinyang	70	55	18	4
8. Gansu	*79*	*93*	*68*	*63*
9. Xihe	79	95	80	76
10. Wenxian	84	90	63	24
11. Lintan	98	90	35	45
12. Hezuo	44	81	20	40
13. Yunnan	*92*	*95*	*85*	*83*
14. Yulong	97	98	92	96
15. Yongsheng	92	98	87	80
16. Ludian	92	94	85	83
17. Yiliang	85	87	67	67
18. Zhaoyang	93	96	87	86

Source: Authors' survey

Table III.
Summary statistics of the uptake rates of MH services in 2011

Uptake of antenatal services
Our data also show similar patterns in the use of ANC services. Overall, the women's representatives reported 89 percent of pregnant women in our sample attended at least one ANC visit during pregnancy (row 1, column 2). While 89 percent may not seem especially low, the rate of ANC in terms of the ANC-1 measure is still 11 percentage points shy of 100 percent, which is the rate observed in urban areas and non-poor rural areas (MOH, 2012).

As in the case of in-hospital deliveries, the data show that there are significant differences in the reported rates across provinces and across counties within provinces. The lowest ANC-1 rate appears in Sichuan province: only 62 percent of women there attend one or more antenatal visits (row 2, column 2). This rate means that in the Sichuan sample counties, more than one-third of women never saw a doctor during pregnancy. By contrast, more than 90 percent of women in Yunnan and Gansu attended at least one antenatal visits (rows 8 and 13, column 2). The differences between Sichuan and Yunnan/ Gansu are statistically significant with a *p*-value of 0.00. Even within Sichuan Province there is substantial variation in ANC-1 rates, although these differences are not statistically significant (rows 4 and 5, column 2). The lowest reported ANC-1 rate in Sichuan (and in our entire sample) was in Meigu county, at only 48 percent (row 5, column 2).

The ANC-5 rate (which represents the rate of service utilization deemed appropriate by the MOH) is significantly lower than the ANC-1 rate. Our data show that only 68 percent of pregnant women received the recommended five ANC visits during pregnancy (row 1, column 3), a full 21 percentage points less than that of ANC-1 (row 1, column 2).

Again, there are marked disparities in the ANC-5 measures across both provinces and counties. The lowest ANC-5 rate appears in Sichuan Province, at only 23 percent (row 2, column 3). In contrast, this rate reaches 85 percent in Yunnan (row 13, column 3). The average rate in Gansu for ANC-5 is 68 percent (row 8, column 3). Our data also show significant variation across counties – especially in Gansu (rows 9 and 12, column 3). In our sample the counties with the lowest ANC-5 rates are Meigu (17 percent – row 5) and Jinyang counties (18 percent – row 7).

Uptake of post-partum services
The pattern of uptake of PPC services in our sample areas is similar to that of ANC-5 and overall is fairly low. The women's representatives report that 64 percent of the women in their villages attended a PPC visit at around 42 days following delivery (row 1, column 4). This PPC rate is much lower than the national average of 91 percent (MOH, 2012).

As with the other measures, we observed marked disparities across provinces. The lowest PPC rate appears in Sichuan province at only 20 percent (row 2, column 4). In contrast, this rate reaches 83 percent in Yunnan and 63 percent in Gansu (rows 13 and 8, column 4).

Our data also show significant variation across counties. In Sichuan, Jinyang county had a PPC rate of only 4 percent (row 7, column 4). In Gansu, Wenxian county also had a low rate of only 24 percent (rows 10, column 4). In contrast, the women's representatives in Yulong county in Yunnan reported that 96 percent of women had attended a PPC visit (row 14, column 4).

Correlates of MH service uptake in China's western areas
In this section we seek to explore the factors that correlate with uptake of MH services in the sample area. As has been discussed above, the correlates of the uptake of MH

services can be broken into two broad types: demand-side factors and supply-side factors. In the rest of this section, we will first examine the descriptive statistics. Then, we will examine the results of the multivariate analysis.

Descriptive analysis

Demand-side factors. Our descriptive statistics show that demand-side factors are correlated with the uptake of MH services. Specifically, both types of distance factors are negatively correlated with the uptake of MH services, regardless of the specific type of service. Villages that are furthest away from a paved road (furthest tercile) have in-hospital delivery uptake of 73 percent, compared with 88 percent uptake for villages that are closest to a paved road (closest tercile – Table IV, section 1, column 1). Similar patterns also appear when looking at the uptake of ANC visits and PPC visits (section 1, columns 2-4). Moreover, this correlation holds when we rank villages according to distance measured in time (section 2, columns 1-4).

The uptake rates for all MH services also increase as income rises. For example, as villages move from the poorest third of the villages (when ranked in terms of per capita income) to the richest third, the uptake of deliveries in hospitals rose from 77 to 86 percent (Table IV, section 3, column 1). Likewise, when examining the uptake rates of ANC visits (both ANC-1 and ANC-5) and PPC visits, there is an evident upward trend between poorest one-third of the villages to the richest one-third (section 3).

Ethnicity is also a strong correlate of uptake (Table IV, section 4). When we divide our sample into Han and non-Han we observe a significant difference in the uptake of all three MH services. For example, the uptake of in-hospital delivery services is 86 percent for Han; the rate for non-Han is 70 percent. The ANC-1, ANC-5 and PPC rates are also significantly higher for Han women than for non-Han.

These differences are even more distinct when looking at specific ethnic groups. For example, the in-hospital delivery rates for Yi and Tibetan minorities are under 60 percent (Table IV, section 4, column 1), compared with 86 percent for Han, and their ANC-5 and PPC rates are under 40 percent (columns 3 and 4), compared with around 70 percent for Han. Interestingly, some non-Han majority villages (e.g. Hui and Naxi) have higher uptake rates than do Han villages (section 4, columns 1-4).

Supply-side factors. Several supply-side factors are also associated with the uptake of MH services. In particular, there is a clear trend that the uptake rate of in-hospital delivery is higher (85 percent) in villages where villagers are able to obtain MH services from their local THC than it is in villages where villagers have to go to a neighboring THC for care (67 percent – Table IV, section 5, column 1). This pattern holds true for the uptake of all other services: ANC-1 (94 vs 86 – column 2); ANC-5 (76 vs 58 – column 3) and PPC (71 vs 49 – column 4). This pattern suggests that when services are more readily available, the uptake of all MH services is higher.

The quality of the MH services (in terms of facilities, service provision and staff attitudes) is only slightly positively correlated with the uptake of MH services (Table IV, sections 7-9). While service uptake is higher when facilities are ranked as better (by the women's representative), the percentage point difference for the different services ranges from only 2 percentage points (for ANC-1 – section 7, column 2) to 7 percentage points (for ANC-5 and PPC – columns 3 and 4). The gaps between those THCs rated as having good services and those THCs rated as having less good services

	In-hospital delivery (1)	ANC-1 (2)	ANC-5 (3)	PPC-1 (4)
Distance				
1. Distance, kilometers				
Furthest 1/3	73	83	59	57
Medium 1/3	78	90	67	64
Closest 1/3	88	94	76	70
2. Distance, minutes				
Furthest 1/3	75	82	62	60
Medium 1/3	80	91	68	64
Closest 1/3	85	92	72	67
Income				
3. Per capita income				
Poorest 1/3	77	85	61	53
Medium 1/3	77	89	66	63
Richest 1/3	86	93	76	77
Ethnicity characteristics				
4. Major ethnicity of the village				
Han	86	94	75	69
Non-Han	70	80	55	55
Of which: Yi	58	68	39	40
Tibetan	54	80	26	33
Miao	82	83	62	59
Hui	95	96	93	88
Naxi	94	97	89	93
Other non-Han	90	98	85	81
Availability of MH services				
5. THC offers MH services				
Yes	85	94	75	71
No	67	86	58	49
Quality of MH services				
6. Facilities good				
Yes	85	94	77	73
No	82	92	70	66
7. Services good				
Yes	84	93	76	72
No	83	92	69	65
8. Attitudes good				
Yes	83	95	77	73
No	84	89	65	61
Source: Authors' survey				

Table IV.
Characteristics
correlated with the
uptake rate of MH
services (%)

ranges from 1 percentage point (for in-hospital delivery and ANC-1 – section 8, columns 1 and 2) to 7 percentage points (for ANC-5 and PPC – columns 3 and 4). Finally, the difference between THCs rated as having good staff attitudes and those having less good staff attitudes ranges from −1 percentage point (the uptake for in-hospital delivery is actually higher, 84 percent, when the attitudes of the doctors were poor vs when the attitudes of the doctors were good – 83 percent, section 9, column 1) to 12 percentage points (for PPC – column 4).

Multivariate analysis

In order to better understand the strength of the correlations between each of the potential explanatory factors and the uptake of MH services, we conduct a multivariate analysis using two regression models. The basic model is:

$$Y_i = \beta_0 + \beta_1 Distance_i + \beta_2 Income + \beta_3 Ethnicity_i$$
$$+ \beta_4 Availability_{ii} + \beta_5 Quality_i + \beta_6 Others_i + \varepsilon_i \quad (1)$$

where i is an index for the village. Y_i can be any of the four variables representing MH service uptake (in-hospital delivery; ANC-1; ANC-5 and PPC). The variables *Distance*, *Income* and *Ethnicity* are vectors that include indicators for the three categories of demand-side factors that we defined and discussed above. In the case of Distance, since the two variables (distance in kilometers and distance in minutes) are two measures of the same factor, we run separate regressions using each measure independently of the other. The same is true for *Ethnicity*. The variables *Availability* (THC offers MH services) and *Quality* are vectors that include indicators for the two types of supply-side factors that were defined and discussed above. Quality is a vector of three variables, good facilities; good services; and good attitude. Finally, *Others* represents a vector that includes six additional control variables: *junior high*, *senior high* and *college* (which indicate the educational attainment of the women's representative; *ethnic language only* (which indicates whether the women's representative can speak Mandarin Chinese, or just the local dialect); *mobilization policy*; and *mountainous village*. (These variables are described in more detail above.) The parameter vectors, β_0 through β_6, are the parameters of interest. The symbol, ε_i, is a random disturbance term. We control for clustering at the township level. Because there are two ways to measure distance (distance in kilometers and distance in minutes) and two ways to measure ethnicity (non-Han village and a set of six ethnic village variables), we are going to run four different specifications of the basic model.

The second model, the township fixed effects model, can be defined as:

$$Y_{hi} = \beta_0 + \beta_1 Distance_{hi} + \beta_2 Income_{hi} + \beta_3 Ethnicity_{hi}$$
$$+ \beta_5 Quality_{hi} + \beta_6 Others_{hi} + \varphi_h + \varepsilon_i \quad (2)$$

where h is an index for the township. There are two differences between Models (2) and (1). One is the addition of φ_h, a variable that represents a set of township-level indicator variables. This township effect term is used in the analysis to control for all non-time varying factors at the township level (and above) that might be correlated with the uptake of MH services. The second difference is that, since the availability of MH services has been subsumed in the township fixed effect, we do not include availability in the model. The results of this multivariate analysis will help shed light on which factors are most strongly associated with the uptake of MH services, holding other factors constant.

With a few exceptions, the results of our multivariate analysis are consistent with the results our descriptive analysis. In the multivariate analysis using the in-hospital delivery rate as the dependent variable, we find that the sign on the coefficient of the income variable is positive in all of the equations (row 3, columns 1-4), suggesting that uptake is higher in villages with higher income[5]. The negative signs on the coefficients of the non-Han village variable (row 4, columns 1 and 2) suggest that minority women, in general, deliver their babies in hospitals significantly less often

than do Han women. The statistical significance increases when we include the set of six ethnic village variables in the regression (rows 5, 6, 8 and 9, columns 3 and 4). While Yi and Tibetan women use in-hospital delivery services less than women in Han villages do (rows 5 and 6), the positive and significant signs on the coefficients of the Hui and Naxi village variables suggest that women in these villages use in-hospital delivery services more than women in Han villages do (rows 8 and 9). Hence, two of the three demand-side factors are strongly and consistently correlated with uptake of in-hospital delivery. Similar results are found in the multivariate analysis of the correlates of ANC-1; ANC-5 and PPC (Table AII, rows 2 to 8).

The distance variables, the third measure of demand-side correlative factors, are more ambiguous. Unlike the descriptive statistics, when we control for other demand-side factors, supply-side factors and other control factors, the negative correlation between distance in kilometers and the uptake of in-hospital delivery disappears (Table V, row 1, columns 1 and 3). The negative relationship does exist for distance measured in minutes (row 2, columns 2 and 4); however, the negative correlation is only significant at the 10 percent level in specification 4. If we were to conclude that there is no strong relationship between the time cost of accessing MH services and uptake, this would suggest that the government's plans to expand MH services in poor rural areas as a way to improve uptake (CDC, 2011) may not be sufficient. The correlation between distance and other MH services (ANC-1; ANC-5 and PPC) is also weak (Table AII, row 1).

When we look at the correlation between distance and service uptake including township fixed effects (Model (2)), the results become more consistent with the descriptive results and more supportive of the plans by policy makers to improve access to MH services (Table VI). When comparing the rate of uptake within townships, the measured correlation between distance measured in time and service uptake is negative and strongly significant (at 5 percent level in specification 2; 1 percent level in specification 4).

The results of the multivariate analysis of the correlation between supply-side factors and uptake are similar to the descriptive statistics. When running the basic model (Model (1)), there is a positive and significantly significant correlation between the availability of MH services at the THC and the uptake of in-hospital delivery services (Table V, row 11). When looking the impact of service availability on the uptake of other MH services in Table AII, the positive and significant correlation only exists for ANC-1; for the other services, the signs are all positive, but the results are not statistically significant.

In contrast, but consistent with the findings in the descriptive statistics, we do not find any of the quality characteristics of the MH services variables to be significantly correlated with the in-hospital delivery rate (Table V, rows 12-14). This is true across all econometric models and specifications (see Table VI, rows 12-14). This may be because the freely provided MH services are so new that women in the village (as opposed to the women's representative) do not yet have information on the quality of the MH services. It also may be that women are simply used to low-quality care and in the absence of an institutional alternative, still choose to seek care at their local THC[6]. Or, it may be that most women's representatives have never been to any better hospitals above the township level, so they might think the THCs are good enough.

In summary, our multivariate analysis has shown that both demand-side and supply-side factors matter in explaining the low-uptake rate of MH services in the sample areas. Specifically, all of the demand-side factors: distance (especially when measured in terms of time), income and ethnicity all matter. On the supply side,

	(1)	(2)	(3)	(4)
Distance				
1. Distance, kilometers	0.011 (0.060)		0.037 (0.073)	
2. Distance, minutes		−0.016 (0.013)		−0.023 (0.012)*
Income				
3. Per capita income, yuan	0.003 (0.001)***	0.003 (0.001)***	0.003 (0.001)***	0.002 (0.001)***
Ethnicity characteristics				
4. Non-Han village, 1 = yes	−6.396 (3.333)*	−5.831 (3.346)*		
5. Yi village, 1 = yes			−15.594 (4.069)***	−14.835 (4.140)***
6. Tibetan village, 1 = yes			−23.790 (9.193)**	−23.074 (8.874)**
7. Miao village, 1 = yes			−2.111 (5.982)	−1.167 (5.720)
8. Hui village, 1 = yes			7.424 (3.046)**	7.630 (3.039)**
9. Naxi village, 1 = yes			6.312 (3.828)	7.355 (3.482)**
10. Other non-Han village, 1 = yes			3.012 (4.350)	4.680 (4.161)
Availability of MH services				
11. THC provides MH services, 1 = yes	7.183 (3.436)**	7.372 (3.444)**	5.899 (3.198)*	6.258 (3.222)*
Quality of MH services				
12. Facilities good, 1 = yes	0.090 (2.758)	0.024 (2.778)	0.083 (2.676)	−0.065 (2.695)
13. Services good, 1 = yes	−0.732 (2.305)	−0.411 (2.333)	−0.578 (2.262)	−0.061 (2.282)
14. Attitudes good, 1 = yes	−2.957 (2.951)	−3.230 (2.971)	−3.308 (3.059)	−3.672 (3.048)
Other factors				
15. Junior high, 1 = yes	14.763 (3.062)***	14.892 (3.071)***	11.906 (2.790)***	12.056 (2.781)***
16. Senior high, 1 = yes	11.398 (3.910)***	11.367 (3.893)***	7.648 (3.689)**	7.570 (3.648)**
17. College, 1 = yes	0.407 (5.605)	0.170 (5.589)	2.523 (3.935)	2.158 (3.891)
18. Ethnic language, 1 = yes	−20.273 (4.656)***	−20.178 (4.635)***	−13.765 (4.528)***	−13.260 (4.580)***
19. Mobilization policies, 1 = yes	2.884 (2.388)	2.960 (2.373)	3.402 (2.320)	3.499 (2.298)
20. Mountainous village, 1 = yes	−4.892 (2.797)*	−4.786 (2.806)*	−3.757 (2.454)	−3.560 (2.467)
Constant	68.226 (5.767)***	69.088 (5.676)***	70.721 (5.250)***	72.064 (5.201)***
Number of observations	993	993	993	993
R^2	0.291	0.293	0.344	0.346

Table V.
Multivariate analysis of correlates of the in-hospital delivery uptake rate, basic model

Notes: Robust standard errors that account for clustering at the township level in parentheses. *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$
Source: Authors' survey

	(1)	(2)	(3)	(4)
Distance				
1. Distance, kilometers	−0.128 (0.087)		−0.122 (0.084)	
2. Distance, minutes		−0.031 (0.012)**		−0.034 (0.012)***
Income				
3. Per capita income, yuan	0.002 (0.001)***	0.002 (0.001)***	0.002 (0.001)***	0.002 (0.001)**
Ethnicity characteristics				
4. Non-Han village, 1 = yes	−6.035 (2.036)***	−5.954 (2.050)***		
5. Yi village, 1 = yes			−6.169 (2.864)**	−5.770 (2.868)**
6. Tibetan village, 1 = yes			−2.221 (3.089)	−3.720 (3.952)
7. Miao village, 1 = yes			−4.435 (4.519)	−4.212 (4.620)
8. Hui village, 1 = yes			−2.359 (1.645)	−2.258 (1.589)
9. Naxi village, 1 = yes			−19.579 (11.252)*	−22.171 (13.271)*
10. Other non-Han village, 1 = yes			−10.881 (5.665)*	−9.855 (5.878)*
Quality of MH services				
11. Facilities good, 1 = yes	−1.368 (2.089)	−1.377 (2.065)	−1.030 (2.024)	−0.984 (1.993)
12. Services good, 1 = yes	3.053 (2.403)	3.260 (2.355)	2.977 (2.432)	3.194 (2.381)
13. Attitudes good, 1 = yes	2.049 (1.676)	1.947 (1.620)	2.037 (1.678)	1.941 (1.610)
Other factors				
14. Junior high, 1 = yes	5.793 (1.970)***	5.825 (1.947)***	5.623 (2.001)***	5.699 (1.980)***
15. Senior high, 1 = yes	4.542 (2.005)**	4.587 (1.975)**	4.431 (2.037)**	4.480 (2.005)**
16. College, 1 = yes	4.107 (3.189)	4.243 (3.162)	3.975 (3.237)	4.170 (3.206)
17. Ethnic language, 1 = yes	−3.873 (3.434)	−3.698 (3.424)	−4.290 (3.487)	−4.042 (3.475)
18. Mobilization policies, 1 = yes	1.344 (1.944)	1.207 (1.909)	1.279 (1.947)	1.100 (1.911)
19. Mountainous village, 1 = yes	0.123 (1.997)	0.080 (1.987)	0.090 (2.038)	0.009 (2.032)
Constant	51.108 (4.119)***	53.560 (4.285)***	51.866 (4.822)***	54.281 (4.924)***
Number of observations	993	993	993	993
R^2	0.652	0.654	0.654	0.657

Notes: Robust standard errors that account for clustering at the township level in parentheses. *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$
Source: Authors' survey

Table VI.
Multivariate analysis
of correlates of the
in-hospital delivery
uptake rate,
township fixed
effects model

availability of services matters, but quality of services does not. Based on these findings, it seems that, *ceteris paribus*, demand-side factors might be considered more important than supply-side factors.

We find some supplemental evidence for the relative importance of demand-side factors from a set of additional cross-tabulation analyses (Table AIII). When asked for the most important reason that some women villagers choose not to deliver their babies in

the hospital (even after the implementation of programs that seek to mobilize them), distance (measured in both time and distance) and "being shy" (which may be related to cultural norms among ethnic women) are the reasons most frequently identified. Although there is variation across provinces and ethnicities, overall 40 percent of village women's representatives identified distance in minutes, 38 percent said cost (which included mainly the cost of transportation) and 5 percent said being shy. The rest of the women's representatives (the 15 percent that did not cite demand-side factors) indicated that the MH services were not being used due to other reasons (such as having more children than the family planning policy allows – Table AIII, row 1, columns 1-4).

Decomposition analysis of differences in in-hospital delivery rates

From our analysis of the data, we have identified a number of demand- and supply-side factors that correlate with in-hospital delivery rates; in other words, we know the marginal effects of demand/supply factors on uptake. This information combined with observed differences in the "level of the factors" between Sichuan (the lowest province in terms of uptake) and Yunnan (the highest province in terms of uptake) can be used to identify which factors contribute most to the gap in in-hospital delivery rates between these two provinces. This type of analysis is known as a decomposition analysis.

In conducting this analysis, we use the basic regression model, specifically the specification with distance measured in minutes and ethnicity measured as a set of six ethnicity dummy variables. This model has the highest goodness of fit (as indicated by the R^2) and is largely consistent with all of the other models.

We follow the traditional Oaxaca-Blinder decomposition method (Oaxaca 1973; Blinder 1973) to assess factors that contribute to the observed differences rate in the uptake rates of MH services between provinces. Oaxaca-Blinder type decomposition, originally used to analyze wage differences between groups, has now been applied in a wide variety of contexts. For example, previous research has used this approach to analyze differences in academic achievement across countries (e.g. McEwan and Marshall 2004; Ammermueller 2007). Following this method, we can decompose the differences in uptake between any two provinces into two components. First, there is a component that is due to the between-province differences in the predictors of uptake rate. In the rest of the analysis, we refer to this component as endowment component that due to differences in characteristics. The second component is due to between-province differences in the coefficients associated with those predictors of uptake rate (coefficient component). Since we are interested in which types of factors contribute more to the observed between-province difference in the uptake rate, we grouped the predictors into sets in the Oaxaca-Blinder decomposition, including distance, income, ethnicity, availability, quality and other factors.

Using the in-hospital delivery rate at the focus of our analysis, we conducted the Oaxaca-Blinder decomposition on the observed differences between Sichuan and Yunnan provinces. Overall the observed difference between Sichuan and Yunnan is 39 percentage points (92 percent for Yunnan; 53 percent for Sichuan – Table VII, row 1). The decomposition results are presented in Table VI, including subtotals for both the endowment component and the coefficient component for each set of demand-side factor (distance, income and ethnicity), each set of supply-side factor (availability and quality of MH services) and other factors (the control variables). Note that somewhat stronger assumptions are required to derive the detailed decomposition of the coefficient component. In particular, these subtotal estimates are somewhat arbitrary given their dependence on the choice of reference category (even for continuous variables – Fortin et al., 2011). We therefore focus our discussion on the contributions of

	Differences in in-hospital delivery uptake rates between Sichuan and Yunnan		
	Endowment component		
Categories of factors	Amount (1)	% (2)	Coefficient component (3)
1. Total difference	−39.31 (3.61)***		
Demand-side factors			
2. Distance	0.52 (0.46)	−1.32	−8.65 (2.48)
3. Income	−0.93 (0.53)*	2.37	−5.38 (3.87)
4. Ethnicity	−6.89 (2.53)***	17.53	−23.78 (4.04)
Supply-side factors			
5. Availability	1.81 (1.73)	−4.60	−1.31 (3.21)
6. Quality	−0.36 (0.65)	0.92	0.57 (1.46)
7. Other factors	−12.85 (2.56)***	32.69	19.39 (11.45)
8. Constant			−1.45 (12.3)
9. Total	−18.69 (3.90)***	47.55	−20.62 (4.46)

Notes: Standard errors that account for clustering at the township level in parentheses. In this regression, we used the distance in minutes to measure distance, and the set of six dummy variables to measure the ethnicity characteristics of village, respectively. *$p < 0.1$; ***$p < 0.01$
Source: Authors' survey

Table VII.
Oaxaca-Blinder
decompositions
of differences in
the in-hospital
delivery uptake rates
between Sichuan and
Yunnan provinces

the endowment component to the difference in the in-hospital delivery rate and the portion of the total difference explained by each set of factors.

From Table VII, it can be seen that there are several sets of important factors that contribute to the observed differences in the in-hospital delivery rate between Sichuan and Yunnan provinces. Most fundamentally, the endowment component of the decomposition accounts for nearly half (48 percent) of the overall difference (column 2, row 9). This total figure is the sum of the point estimates of the impacts of all sets of the demand, supply and control factors. The rest of the observed difference between the in-hospital delivery rates between Yunnan and Sichuan (21 percentage points – column 3, row 9) is due to differences in the coefficients and the unexplained residual.

Combined differences in ethnicity – a demand-side factor – are a significant contributor to the observed differences in in-hospital delivery rates between provinces. Combined differences in ethnicity account for 18 percent of the observed differences in in-hospital delivery rates (Table VII, row 4, column 2). This result suggests that almost one-fifth of the total difference in in-hospital delivery rates (7 percentage points out of 39 percentage points – column 1, rows 1 and 5) is attributable to combined ethnic differences. At the same time, more than one-third of the total difference due to observable factors (7 percentage points out of 19 percentage points – column 1, rows 4 and 9) is due to combined differences in ethnicity.

Differences in income – another demand-side factor – are also a significant, albeit modest, contributor to the observed difference in in-hospital delivery rate between provinces. Differences in income account for 2 percent of the total observed differences (row 3, column 2). Although the magnitude is not as large as that of differences in ethnicity, it is statistically significant.

The third finding of note is that a large portion of the observed differences in in-hospital delivery rates between provinces can be attributed to differences in the coefficients (coefficient component) and, importantly, most of these differences in

coefficients also stem from demand-side factors. Specifically, distance (9 percentage points), income (5 percentage points) and ethnicity (24 percentage points) account for more than 100 percent of the differences in coefficients[7]. Hence, when considering differences in endowments and coefficients together, demand-side factors account for nearly all of the 39 percentage point difference in in-hospital deliveries between the two provinces.

In contrast to the demand-side factors, none of the supply-side factors are statistically significant in the decomposition analysis. The point estimates for availability (row 5) and quality (row 6) have almost no explanatory power.

Potential of Conditional Cash Transfer

Our analysis has shown that MH service uptake in the sample areas in 2011 was lower than the national average. Moreover, our correlation and decomposition analyses have demonstrated that demand-side factors are the most important source of the differences. In this final section of the paper, we seek to answer a question: what can be done to improve the uptake of MH services? Of course, this is not a problem that is unique to our sample, or even to China. In fact, countries around the world are working hard to improve the uptake of MH services (McNamee *et al.*, 2009).

To answer this question, we turn to the survey data to report on women's representatives' responses to a series of questions seeking to identify perceived reasons for the low-service uptake.

First, when women's representatives were asked about the biggest obstacle to increasing the in-hospital birth rate, the most common answer was "cost is too high"[8]. Overall, 33 percent of the women's representatives choose this option (Table AIII, row 1, column 1). Interestingly, this result holds in all the three provinces, including in Sichuan where the uptake rates were the lowest.

Second, our data also show that women representatives – regardless of their village's relative location or primary ethnicity – all believed that women would be willing to utilize MH service if they were paid to do so. Specifically, when the women's representatives were asked whether they thought women in their village would deliver their babies in the hospital if they were offered a 200 yuan payment conditional on in-hospital delivery, 90 percent said "yes" (Table VIII, row 1, column 1). When the size of the hypothetical payment was increased to 300 yuan, the estimated percentage of women's representatives who answered "yes" increased to 94 percent (column 2). The percentage of women's representatives who answered "yes" increased to 100 percent when a 600 yuan hypothetical payment was offered (column 3). Importantly, this pattern of payment size and estimated uptake followed the same pattern regardless of the province or ethnic group being considered (rows 2-11, columns 1-3). In addition, the same pattern also held when examining ANC visits (rows 1-11; columns 4-6). (This question was not asked about PPC visits.)

CCTs are an increasingly popular method of improving the participation of individuals in poor areas in education and health programs (Mo *et al.*, 2012; Liu *et al.*, 2011; Maluccio and Flores, 2005). In their most basic form, CCT programs provide cash payments to poor households to encourage them to increase their participation in programs to improve health, nutrition and education (Fiszbein *et al.*, 2009). CCTs have been particularly useful in cases where the demand for a program (typically a program which is thought to have a high social return) is low. The CCT provides an incentive for the individual to use the service. In other words, CCTs are a tool to try to increase the demand for a social program. It is because of this that we are interested in the possible use of CCTs in China's poor areas for increasing the use of social programs, including the new MH services.

	If women were paid (x) to deliver their babies in the hospital, do you think most would go?			If women were paid (x) to attend an antenatal care visit, do you think most women would attend?		
	200 yuan (1)	300 yuan (2)	600 yuan (3)	100 yuan (4)	200 yuan (5)	600 yuan (6)
1. Total sample	0.90	0.94	1.00	0.92	0.96	1.00
Panel A: by province						
2. Sichuan	0.77	0.89	1.00	0.80	0.88	1.00
3. Gansu	0.88	0.92	1.00	0.91	0.95	0.99
4. Yunnan	0.96	0.98	1.00	0.97	0.99	1.00
Panel B: by major ethnic group in the village						
5. Han village	0.94	0.96	1.00	0.95	0.98	1.00
6. Yi village	0.80	0.90	1.00	0.83	0.90	1.00
7. Tibetan village	0.49	0.61	1.00	0.63	0.74	1.00
8. Miao village	0.82	1.00	1.00	0.82	1.00	1.00
9. Hui village	0.93	1.00	1.00	0.90	1.00	1.00
10. Naxi village	0.93	1.00	1.00	1.00	1.00	1.00
11. Other non-Han village	0.98	0.98	1.00	0.98	0.98	0.98

Notes: 1 = yes; 0 = no
Source: Authors' survey

Table VIII.
Willingness to
accept CCT

CCTs have been used in a number of countries to encourage the uptake of health services in both developed and developing countries around the world (Fiszbein *et al.*, 2009). For example, Familias en Accion provided Columbian provided mothers with monetary incentives to bring their children to preventive health care visits (Attanasio *et al.*, 2005). Nicaragua's program Red de Proteccion Social gave households cash transfers for attending monthly health seminars and for bringing their children to receive vaccinations (Barham and Maluccio, 2009). A meta-study on the use and impact of CCTs toward health-related outcomes indicates that CCT programs in Malawi, Columbia, Honduras, Nicaragua and Mexico were significantly effective in promoting desired health outcomes (Lagarde *et al.*, 2009).

Because CCTs have had such obvious success in many other developing settings, and the women in our sample seem amenable to the idea, it is logical to think that there is potential for implementing a successful CCT program in the sample area.

Conclusions
Our data show that uptake rates of MH services (in-hospital delivery; ANC; and PPC) in poor rural areas of Western China, although not low compared to other low and lower middle income countries, are still far below the national average in China (World Health Organization, 2012b). The findings of the paper also demonstrate that there is considerable variation across both provinces and counties, and for different ethnic groups in our sample. If China is to meet its target of nearly universal uptake of basic MH services, there needs to be policy action taken by the government.

In order to understand different options for trying to raise service uptake among certain subpopulations, the paper identified a number of demand-side and supply-side factors that are correlated with the uptake rates of MH services. The descriptive and multivariate analyses show that several demand-side factors and one supply-side factor appear to be systematically correlated with low-uptake rates of all MH services.

The decomposition analysis identified demand-side factors to be by far the most important sources of the differences between subpopulations that fully (or nearly fully) use MH services and subpopulations that do not. On the demand side, the physical distance between the village and the MH service provider; overall village income; and ethnicity were correlated with service uptake. Specifically, the analysis showed that when a village is far from a TCH hospital; when a village is poor; and when a large share of the villagers are Yi or Tibetan minorities, uptake of all MH services is low.

We acknowledge certain limitations in our study. There are thousands of mother-infant pairs in the nearly 1,000 villages in our sample (in our 14 county study area). This should give our analysis a high degree of reliability and representativeness. However, we also caution the reader that within a village, we rely on information provided by a single person (the women's representative). Therefore, the conclusions of the paper need to be interpreted carefully.

From our results, it appears as if there is a role for the government in addressing the problem of low demand in an attempt to raise uptake rates in those villages that are not fully using MH services. Although there may be other options, our results also indicate that there is potential for creating a CCT program to improve the usage of MH services. According to our data, as long as the size of cash payment is large enough, most village women's representatives believe that their fellow villagers would be willing to use MH services. Under the CCT program, the cash transfer could serve as a compensation for the women's time and opportunity cost of seeking MH services, as well as assisting in overcoming the ethnic barriers to participate in MH services. Although the uptake rate of MH services remains frustratingly low in some of the rural areas of Western China, solutions are available that would allow policy makers to take immediate actions to address this problem.

Notes

1. The results from this regression are available upon request to the corresponding author.

2. Villages in China are typically quite small, with rarely more than 200-300 households. Moreover, large events such as births are commonly known to all in the village. Births especially are tracked closely, due to strict government reporting requirements. We therefore believe that the women's representative was well acquainted with information on the number of babies and where they were born.

3. According to the China's MH service policy in our sample areas, the women's representatives in each village were charged with the duties to get women to use the free MH services. During our interviews and from observations during field work, we know that the women representatives often held meetings, posted posters and would often visit women that they knew had become pregnant.

4. For example, according to The United Nations Children's Fund (2011), the in-hospital delivery rate in rural Indonesia is barely 30 percent in 2007.

5. Similar results and even higher levels of statistical significance are found when using the township fixed effects model (Table VI, row 3).

6. However, when looking at other MH services, we see that the signs on staff attitude at THCs are all positive and statistically significant, indicating that when staff have better attitudes, uptake rates of antenatal care and post-partum care visits are higher (Table AII, row 12, columns 1-4).

7. Results from additional analyses show that of the six ethnicity groups (Yi, Tibetan, Miao, Hui, Naxi and other ethnicity minority groups), Yi ethnicity alone accounts for (22 percentage points) more than 100 percent of the differences in coefficients. In contrast, the rest five

ethnicity factors each accounts for less than 10 percent (ranging from 1 to 5 percent) of the differences in coefficients, respectively.

8. The exact question was "Why do you think some women choose not to deliver their babies in the hospital even after mobilization?," and the eight answer choices were: too far away; cost too high; facilities inadequate; services too bad; attitudes of medical staff not good; procedures too complicated; they are shy; and other reasons, please specify.

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Appendix

Variables	Total sample Mean (1)	SD (2)	Sichuan Mean (3)	SD (4)	Gansu Mean (5)	SD (6)	Yunnan Mean (7)	SD (8)
Outcome variables: uptake rate								
1. In-hospital delivery	*80.0*	*25.5*	52.6	29.6	78.9	24.7	91.9	12.7
2. ANC-1	*88.7*	*22.7*	62.3	32.7	92.9	17.7	94.9	13.2
3. ANC-5	*67.6*	*37.1*	23.0	28.4	68.3	35.4	84.3	26.0
4. PPC-1	*64.0*	*40.2*	19.5	28.3	62.5	40.1	82.8	28.4
Distance								
5. Distance, kilometers	*5.72*	*14.64*	13.6	29.6	2.9	6.9	5.5	9.7
6. Distance, minutes	*52.6*	*66.3*	60.1	51.9	30.9	25.6	71.3	89.2
Income								
7. Per capita income, yuan	*1,912*	*995*	1,462	852	1,769	657	2,229	1,204
Ethnicity characteristics								
8. Non-Han village, 1 = yes	*0.37*	*0.48*	0.91	0.29	0.08	0.28	0.46	0.50
9. Yi village, 1 = yes	*0.19*	*0.40*	0.83	0.37	na	na	0.14	0.35
10. Tibetan village, 1 = yes	*0.04*	*0.20*	0.05	0.22	0.08	0.27	0.00	0.05
11. Miao village, 1 = yes	*0.01*	*0.10*	0.02	0.14	na	na	0.02	0.14
12. Hui village, 1 = yes	*0.03*	*0.17*	na	na	0.00	0.05	0.07	0.25
13. Naxi village, 1 = yes	*0.04*	*0.20*	na	na	na	na	0.10	0.30
14. Other non-Han village, 1 = yes	*0.05*	*0.22*	0.01	0.08	na	na	0.12	0.33
Availability of MH services								
15. THC offers MH services, 1 = yes	*0.72*	*0.45*	0.14	0.35	0.90	0.30	0.78	0.42
Quality of MH services								
16. Facilities good, 1 = yes	*0.32*	*0.47*	0.04	0.20	0.52	0.50	0.24	0.42
17. Services good, 1 = yes	*0.42*	*0.49*	0.15	0.36	0.59	0.49	0.35	0.48
18. Attitudes good, 1 = yes	*0.54*	*0.50*	0.19	0.39	0.74	0.44	0.48	0.50
Other factors								
19. Junior high, 1 = yes	*0.34*	*0.47*	0.16	0.37	0.33	0.47	0.42	0.49
20. Senior high, 1 = yes	*0.32*	*0.47*	0.02	0.14	0.32	0.47	0.44	0.50
21. College, 1 = yes	*0.11*	*0.31*	0.01	0.08	0.20	0.40	0.05	0.21
22. Ethnic language only, 1 = yes	*0.09*	*0.28*	0.47	0.50	0.02	0.13	0.00	0.07
23. Mobilization policy, 1 = yes	*0.78*	*0.41*	0.66	0.48	0.77	0.42	0.84	0.37
24. Mountainous village, 1 = yes	*0.93*	*0.25*	0.94	0.23	0.97	0.17	0.89	0.32
Number of observations	*993*		162		414		417	

Source: Authors' survey

Table AI.
Summary statistics
of key variables
by province

	(1) ANC-1	(2) ANC-5	(3) PPC-1
Distance			
1. Distance, minutes	−0.016 (0.008)*	−0.023 (0.025)	−0.006 (0.031)
Income			
2. Per capita income, yuan	0.002 (0.001)**	0.004 (0.002)***	0.007 (0.002)***
Ethnicity characteristics			
3. Yi village, 1 = yes	−13.953 (3.251)***	−15.412 (5.562)***	−9.585 (6.886)
4. Tibetan village, 1 = yes	−7.163 (6.609)	−38.425 (7.372)***	−32.197 (12.458)**
5. Miao village, 1 = yes	−7.792 (7.993)	−8.779 (9.269)	−6.571 (9.748)
6. Hui village, 1 = yes	−0.692 (2.480)	10.553 (3.506)***	10.085 (6.162)
7. Naxi village, 1 = yes	0.472 (3.240)	9.093 (4.854)*	18.446 (5.107)***
8. Other non-Han village, 1 = yes	5.859 (1.916)***	11.756 (5.444)**	15.201 (10.251)
Availability of MH services			
9. THC provides MH services, 1 = yes	3.846 (2.146)*	3.186 (4.821)	7.483 (5.648)
Quality of MH services			
10. Facilities good, 1 = yes	−2.646 (1.337)*	−1.793 (2.796)	0.353 (4.098)
11. Services good, 1 = yes	−2.064 (1.954)	−0.764 (3.004)	−0.258 (3.586)
12. Attitudes good, 1 = yes	7.517 (2.025)***	11.290 (3.735)***	9.292 (3.942)**
Other factors			
13. Junior high, 1 = yes	7.845 (2.549)***	16.751 (4.059)***	13.973 (4.714) ***
14. Senior high, 1 = yes	7.862 (2.501)***	21.024 (4.638)***	23.779 (5.232)***
15. College, 1 = yes	1.259 (2.960)	6.235 (6.106)	14.774 (7.462)*
16. Ethnic language, 1 = yes	−12.106 (5.051)**	−12.028 (5.469)**	1.834 (6.793)
17. Mobilization policies, 1 = yes	2.820 (1.710)	10.430 (3.549)***	11.703 (4.810)**
18. Mountainous village, 1 = yes	−3.079 (2.044)	−6.415 (3.505)*	−9.063 (4.004)**
Constant	80.636 (3.851)***	42.807 (8.892)***	26.416 (10.547)**
Number of observations	993	993	993
R^2	0.324	0.367	0.287

Notes: Robust standard errors that account for clustering at the township level in parentheses. *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$
Source: Authors' survey

Table AII.
Multivariate analysis of correlates of the uptake rate of antenatal and post-partum care visits

	Distance (1)	Cost (2)	They are shy (3)	Other reasons (4)
1. Total sample	0.40	0.38	0.05	0.15
Panel A: by province				
2. Sichuan	0.56	0.15	0.18	0.10
3. Gansu	0.24	0.58	0.02	0.16
4. Yunnan	0.52	0.26	0.02	0.14
Panel B: by major ethnic group in the village				
5. Han	0.38	0.43	0.03	0.14
6. Yi	0.48	0.24	0.14	0.13
7. Tibetan	0.20	0.56	0.00	0.24
8. Miao	0.25	0.25	0.13	0.12
9. Hui	0.56	0.12	0.04	0.16
10. Naxi	0.20	0.60	0.10	0.1
11. Other non-Han ethnic minority	0.50	0.39	0.00	0.11

Notes: 1 = yes; 0 = no
Source: Authors' survey

Table AIII.
Do you think (*x*) is a reason why women choose not to deliver their babies in the hospital even after mobilization?

	Paying women to deliver in-hospital (1)	Setting up transfer route at town hospital (2)	Improving hospital quality (3)	Building a birth center at town hospital (4)	Others (5)
1. Total sample	0.33	0.29	0.20	0.17	0.01
Panel A by province					
2. Sichuan	0.39	0.20	0.15	0.24	0.01
3. Gansu	0.32	0.31	0.23	0.14	0.00
4. Yunnan	0.31	0.31	0.19	0.18	0.01
Panel B by major ethnic group in the village					
5. Han village	0.27	0.33	0.25	0.15	0.00
6. Yi village	0.40	0.25	0.12	0.23	0.01
7. Tibetan village	0.63	0.19	0.02	0.12	0.05
8. Miao village	0.18	0.55	0.00	0.18	0.09
9. Hui village	0.38	0.35	0.14	0.14	0.00
10. Naxi village	0.51	0.14	0.26	0.09	0.00
11. Other non-Han village	0.34	0.23	0.06	0.36	0.02

Notes: 1 = yes; 0 = no
Source: Authors' survey

Table AIV.
Do you think (*x*) would increase the number of women giving birth in a hospital?

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