

FACTORS INFLUENCING MATERNAL HEALTH CARE IN NEPAL: THE ROLE OF SOCIOECONOMIC INTERACTION

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This paper relies on an extensive data set on Nepalese families to examine factors influencing the extent to which maternal health care is provided. A number of hypotheses are examined: Do social networks that evolve to support market exchange allow for the dissemination of knowledge concerning the effectiveness of maternal care? Do social norms regarding maternal care have a significant influence on decisions to seek such care? Do educational spillover effects play an important role in decision-making concerning maternal health care? Does gender preference influence the extent to which a family supports health care for expectant mothers? Finally, are women who are perceived as more independent likely to choose additional care?

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I. INTRODUCTION

The availability of maternal health care continues to be a major problem in developing countries. There were an estimated 303,000 maternal deaths worldwide in 2015, with 99 per cent of those deaths in developing countries. About two-thirds of maternal deaths occurred in sub-Saharan Africa with one-fifth in South Asia. Many of these deaths could have been prevented had maternal health care been available: “Women are not dying during pregnancy and childbirth from complicated conditions that are hard to manage. Women are dying because they do not receive the health care they need” (Lewis, 2008, p. 2). Reducing maternal mortality and improving maternal health has become a global health priority, demonstrated by its inclusion in the United Nations Millennium Development Goals (MDGs) and the Sustainable Development Goals (SDGs). It is widely recognized that reducing maternal mortality

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is dependent upon the provision of maternal health services, both prenatal and postnatal, by trained medical personnel (Adhikari, 2016). However, the provision of such services is not enough. Policy must also be aimed at reducing gender bias so that women can make effective use of the maternal health services actually provided.

The present study focuses on Nepal – a relatively small developing country in South Asia. The social system in Nepal exemplifies the patriarchal social system commonly found in many South Asian countries. Gender differences and inequalities are present in several distinct socioeconomic areas within the Nepalese community. However, despite its social system and underlying gender inequalities, Nepal has achieved a significant reduction in maternal mortality over the past 25 years. In 1990, there were 901 deaths per 100,000 live births; by 2015, this rate had been reduced to 258 per 100,000 live births. While this reduction appears to be a significant achievement, the maternal mortality rate is nonetheless much higher than other South Asian countries (Adhikari, 2016). Many ascribe the reduction in maternal mortality to the Safe Motherhood Programme initiated by the government of Nepal, in collaboration with the World Health Organization (WHO). This programme was founded with three objectives: (1) providing round-the-clock emergency obstetric care; (2) ensuring the presence of skilled attendants at births; (3) promoting public awareness of safe motherhood practices.

Some scholars have questioned the validity of maternal mortality estimates generated from the data in the Nepal Demographic and Health Survey. Their scepticism is partly due to the lack of clarity over what changes could have accounted for the significant drop in maternal mortality rate. The moderate improvements in key services appear insufficient to explain the dramatic drop in maternal deaths. Moreover, during much of the relevant period, Nepal had been involved in a prolonged internal armed conflict, which would have likely disrupted many of the government programmes and services. As such, it was not at all clear whether government programmes alone could have brought about such a significant drop in maternal mortality, nor is it even clear that the programmes had achieved their full potential. Finally, estimates of maternal mortality rates in data from smaller regions in Nepal were much higher (Prize and Bohara, 2013).

Notwithstanding whether there has been, in fact, a significant improvement in maternal mortality rates, inadequate maternal care remains a significant problem in Nepal. As such, this paper chooses not to focus on maternal mortality, but rather on maternal care and the link between inadequate maternal care and maternal mortality rates. Specifically, it analyses factors that influence women's use of maternal care services in Nepal. Evidence indicates that a majority of maternal and infant deaths arising out of pregnancy complications could have been averted with early and frequent prenatal check-ups (Kamal, 2009; Reynolds, Wong and Tucker, 2006). In addition, according to the World Health Organization (2010), maternal and neonatal

problems could be reduced if women were able to receive more appropriate and timely postnatal care. Inadequate maternal care in Nepal not only compromises the welfare of women, but also poses a significant obstacle to long-term growth and development in Nepal. Part of the problem is lack of facilities, requiring women to travel long distances to receive care. However, another part of the problem is the number of obstacles preventing women from accessing services even when they are available. This paper will examine a range of factors that influence maternal care in Nepal, based on household survey data from the 2010 – 2011 Nepal Living Standard Survey III.

The literature on this issue is extensive (Glei, Goldman and Rodriguez, 2003; Bloom, Wypij and Das Gupta, 2001; Chakrabarti and Chaudhuri 2007; Das Gupta and others, 2003; Karkee, Lee and Binns, 2013), and for the most part, this paper relies on variables cited in previous studies. However, five additional variables representing five new hypotheses have been introduced into the analysis of this paper.

The first variable or hypothesis concerns the importance of social networks in facilitating information exchange on health-care related issues. A study by Deri (2005) draws attention to the association between social networks and health care utilization. However, relatively little has been done to look specifically at the role of social networking or social interactions on health-care decisions by pregnant women before and after childbirth. Mukong and Burns (2015) have found that social networks have a beneficial impact on maternal health care utilization behaviour, enhancing prenatal completion and the probability of early prenatal check-ups among pregnant women in Tanzania. Social networks that allow for and support market exchange may also act as a mechanism for conveying information concerning health care, including maternal health care. As a place where people congregate regularly, markets offer a platform for buyers to interact with a multiplicity of sellers and with each other. It is hypothesized that in the course of regular meaningful conversations, social connections develop within these markets, with a likelihood of knowledge spillover into other topics, including information relating to maternal health care. Therefore, people engaging regularly in market activities will likely have access to information about maternal care services available in their region, and thus may be more likely to participate in prenatal and postnatal care visits with trained professionals. In this respect market activity, specifically participation, and buying and selling in markets could generate greater knowledge-sharing relating to health.

The second variable or hypothesis posited in this paper suggests that when a woman lives in an area where the average level of education is relatively high, she is more likely to be exposed to information about maternal care and its effectiveness through neighbours and peers. This exposure to knowledge will likely increase the probability that whatever a woman's educational level, she will pursue maternal care.

The third variable or hypothesis posited in this paper considers the extent to which accessing maternal health care has become a social norm in the region. Social norms appear to play an important role in determining health-care decisions. This type of social norm can be a powerful influence on decision-making.

The fourth variable or hypothesis posited in this paper focuses on the extent to which women are able to make decisions independently. Over and above the role of social interactions via markets, educational spillovers and social norms, this paper looks at the impact of other socioeconomic factors on maternal health care utilization. Empirical evidence has suggested that a variety of household and community factors influence maternal health services in both developing and developed countries (Gage, 2007; Kamal, 2009; Jat, Ng, and San Sebastian, 2011). For instance, in many regions in Asia, especially South Asia, the presence of a patriarchal social system (ADB, 1999) means that men will generally make the important decisions with respect to financial matters, major household economic decisions and health matters. Within the context of this type of social structure, especially in rural areas, one would indeed expect that households in which females lack autonomy are likely to spend less on maternal health care. Thus, the more autonomous a woman, the more likely expenditure will be made on maternal health care.

The fifth variable or hypothesis posited in this paper concerns the measure of son bias - much of South Asia is characterized by preference for a son or male heirs. Most families prefer sons for a variety of cultural and social reasons which have evolved over time (Priya and others, 2012). These norms and cultural values are likely to influence expenditure on maternal health care. Specifically, if the family already has a son, it may affect expenditure on prenatal and postnatal care in subsequent pregnancies. Thus, if a son preference has already been satisfied, it is suggested that less prenatal and postnatal care will be provided for additional pregnancies.

The remainder of the paper will be structured as follows. Under section II, the methodology will be explained in detail and general characteristics of the data set will be presented. Section III will analyse empirical results. Section IV will provide a summary of the paper with policy implications explored.

II. DATA AND EMPIRICAL MODEL

The empirical estimation utilized an ordered logit estimation, which is a direct generalization of the ordinary two-outcome logit model. Ordered logit models are used to estimate relationships between an ordinal-dependent variable and another set of independent variables. Under the ordered logit model, the actual values taken by the dependent variable are irrelevant, except that larger values are assumed to

correspond to “higher” outcomes. With reference to the analysis, higher outcomes indicate greater usage of maternal care by the mother. The dependent ordinal variable ranges in value from zero to two, where zero represents a woman not receiving any type of maternal care; one represents a woman receiving at least one form of care - prenatal or postnatal; two represents a woman receiving both prenatal and postnatal care. It is assumed that two is the desirable outcome, while zero is the least desirable outcome. In ordered logit, an underlying score is estimated as a linear function of the independent variables and a set of cut-points. The probability of observing outcome (i) corresponds to the probability that the estimated linear function, plus random error, is within the range of the cut-points estimated for the outcome:

$$\Pr(\text{outcome}_j = i) = \Pr(k_{i-1} < \beta_1 x_{1j} + \beta_2 x_{2j} + \dots + \beta_k x_{kj} + u_j \leq k_i),$$

where u_j is assumed to be logistically distributed in ordered logit and k represents the number of outcomes, which in this case is three.

The empirical model to be estimated will take the form:

$$\text{Maternal_care}_{ijk} = a_0 + a_1 \text{Indiv}_{ijk} + a_2 \text{HH}_{ijk} + a_3 \text{Community}_{ijk} + e_{ij} \quad (1)$$

where *Maternal_care* measures the extent of maternal care that a woman i , living in household j and community k receives. Indiv_{ijk} , HH_{ijk} , and Community_{ijk} represent individual, household and community specific characteristics of the woman and her spouse.

The selection of explanatory variables is influenced, as discussed above, by existing literature, theory and hypotheses being tested in this paper. It is hypothesized that the extent of maternal care that a woman receives is dependent on individual, social and economic factors. For ease of analysis these characteristics are bundled under individual, household and community-level characteristics. Individual characteristics can be economic and/or social in nature, as are household characteristics. Community characteristics measure how individual behaviour is influenced by the social spillover of community-level behaviour. In addition, we have controlled for regional characteristics. The definitions of all the variables used are provided in table 1.

Table 1. Definition of variables

<i>Maternal_care</i>	Variable taking value 0 if woman received no maternal care; 1 if she received either prenatal or postnatal care; and 2 if she received both prenatal and postnatal care
<i>Age</i>	Age of respondent
<i>Age_sq</i>	Age squared
<i>Edu</i>	Education of respondent (categorical variable)
<i>Head_Edu</i>	Education of husband/household head (categorical variable)
<i>WageWork</i>	Dummy variable taking value 1 if respondent works for wages and 0 otherwise
<i>Good_health</i>	Dummy variable taking value 1 if respondent is neither disabled nor suffers from any chronic illness or missed any days of work or regular activities due to illness
<i>Time_to_healthcare</i>	Time (in minutes) to nearest health-care facility
<i>Health_autonomy</i>	Dummy variable taking value of 0 if someone else made the decision about a woman seeking health care; 1 if the spouse alone made the decision; 2 if the decision was a joint one between the woman and her spouse; and 3 if the woman alone made this decision
<i>Birth_order</i>	Birth order of last child
<i>Shoptime</i>	Time spent (in minutes) by household members in the market shopping for the family
<i>HH_Size</i>	Number of people living in the house
<i>Sons</i>	Number of sons
<i>High_Caste</i>	Dummy variable taking value 1 if family belongs to high caste of Brahman, Newar or Chetri and 0 otherwise
<i>Landowner</i>	Dummy variable which takes value 1 if the household owns land and 0 otherwise
<i>Home_electric</i>	Dummy variable which takes value 1 if household has electricity and 0 otherwise
<i>Community_Edu</i>	Average education level of members of the primary sample units where the respondent lives
<i>Community_maternalcare</i>	Proportion of women in the primary sample units (where the respondent lives) that received both prenatal and postnatal care
<i>Urban</i>	Dummy variable that takes value 1 if the respondent lives in an urban region and 0 otherwise

Individual level explanatory variables relate to the woman and her husband. In terms of individual variables relating to the woman, we first controlled for age (*Age*). This was a continuous variable, commonly included in empirical analysis on maternal care. We also included a quadratic term which is the square of the woman's age

(*Age_sq*) to see whether the relationship between age and extent of maternal care was non-linear. We then carried out estimations relating to the age variable, constructing dummy variables to represent different age groups. One might expect that older women would be less likely to utilize maternal health care as they would be more influenced by tradition. However, older women may also have accumulated much more information concerning maternal care through experience. Thus, it is unclear whether older women will be less or more likely to involve themselves in maternal care.

We also included information concerning the woman's employment status as an explanatory variable (*WageWork*). This was a binary variable: one represented a woman who worked and received wages, and zero represented a woman who did not receive wages for work. The assumption was that if a woman worked for wages then she could potentially contribute towards the finances of the family. This was expected to increase her bargaining power within the family, while at the same time increasing her access to resources. The importance of a woman's ability to contribute financially towards household expenses is supported by empirical research on female autonomy. This literature also mentions the presence of a son or sons (*Sons*) as one another avenue in which a woman's autonomy may be enhanced within a household in a patriarchal society (Jejeebhoy and Sathar, 2001). That said, the impact of having a son or sons on a woman's utilization of maternal care is not straightforward. Although having a son or sons may enhance women's bargaining power within the household, son preference behaviour may nonetheless affect and limit how resources are allocated to maternal care, especially if the family has already had one or more sons. Thus, if the net impact of having sons is positive, it would imply that the positive impact of increased female autonomy outweighs the negative impact of son preference behaviour and vice versa. This is one of the five new variables and hypotheses introduced into the analysis in this paper.

The education level of the woman (*Edu*) and her spouse/household head (*Head_Edu*) are included as additional explanatory variables. Education level is segregated into a categorical variable ranging from zero to four in value. A value of zero signifies being illiterate; a value of one signifies being literate; a value of two signifies primary-level education (grades 1 to 5); a value of three signifies secondary-level education (grades 6 to 12); and a value of four signifies tertiary education (education above secondary-level education). We also carried out alternative estimations where we included education as separate dummy variables to represent the categories explained above, however these results are not represented here. These categorical variables are expected to have a positive impact on maternal care. Education has frequently been utilized as an indicator of a mother seeking maternal care. Several studies have shown that women with better education were more likely to receive the recommended number

of prenatal care visits (Nielsen and others, 2001; Erci, 2003). Moreover, educated women have been shown to be more likely to start prenatal care visits earlier than less educated women (Miles-Doan and Brewster, 1998; Matthews and others, 2001). Several studies have also examined the importance of a husband's education in terms of a woman receiving maternal care. For example, in the State of Andhra Pradesh in India, a husband's education was a statistically significant predictor, though in the State of Karnataka, this was not the case (Navaneetham and Dharmalingam, 2002).

We did not have information on the cost of utilizing maternal care. In the absence of a direct measure of cost, we employed an indirect measure – the time required to travel to the nearest health-care facility (*Time_to_healthcare*). It was assumed that the farther away a person lived from a health-care facility the less likely they would be to utilize such services. On this basis, the length of time required to access care was considered as a cost of care. One would expect this variable to have a negative impact on likely use of maternal care. This type of variable was also relied upon in Gleit, Goldman and Rodriguez (2003) and Magadi, Madise and Rodrigues (2000) as a predictor of women receiving maternal care.

We further included two additional individual level variables that relate to health of the woman. The first relates to the condition of her health, while the second relates to her freedom or autonomy to seek her own health care. We did this in order to investigate whether being disabled, chronically ill or missing work due to illness had an impact on the extent of maternal care that a woman was able to receive. Given that most people in the sample lived in rural areas with low levels of education, one might expect that being healthy could reduce the likelihood of a woman receiving greater maternal care from a health practitioner. The health status variable (*Good_health*) is a binary variable which took a value of one if the woman was disabled or chronically ill or she had been sufficiently ill in the past year to have not been able to carry out her regular duties, or zero if she has not had any medical issues.

The method by which we measured a woman's autonomy (*Health_autonomy*) to seek health care requires some explanation. First, women were asked whether a decision was made regarding their health care and who was involved in this decision-making. There are four possible responses: a woman made the decision on her own; she made it jointly with her spouse; her spouse alone made the decision; someone else made the decision. We created a categorical variable using this information. The variable took the value of zero if someone else made the decision; it took the value of one if the spouse alone made the decision; it took the value of two if the decision was made jointly between the woman and her spouse; it took the value of three if the woman alone made this decision. Khanal and others (2014) use a similar set of autonomy variables to analyse a mother's usage of postnatal care in Nepal. It is anticipated that the greater the autonomy a woman enjoyed in terms of seeking

her own health care, the more likely she would be to receive and utilize such care. This is the second new variable and hypothesis incorporated into the paper.

Finally, we included the birth order of the last child (the most recent birth for whom the respondent is answering the questions relating to maternal care). This variable (*Birth_order*) is expected to have a negative impact on receiving maternal care since the more children a woman has, the greater the financial stress on her family to provide for maternal care.

Next, we turn our attention to the household-level explanatory variables. Of particular interest is the measure of social spillover effects from market place interactions. In order to capture this impact, we construct a variable (*Shoptime*), which calculates the amount of time that household members spend in the market for the purpose of household shopping. This variable measures the time spent in the market directly buying and selling for the needs of the household. It is therefore a fairly narrow definition of market activity, but it is the only measure provided in the data set. It is anticipated that more time spent in the market will translate into better maternal care via knowledge-sharing taking place through social interactions. This is the third new variable and hypothesis incorporated into the analysis of this paper.

In addition to the above, we controlled for caste as a measure of social status of the household. We decided not to control for religion because nearly 100 per cent of the people in our sample self-identified as Hindu. The *High_Caste* variable is a binary variable: the value of one represents the respondent belonging to a high caste, and the value of zero represents the respondent belonging to a low caste. Alternatively, we constructed another binary variable which attributes the value of one to a Dalit household, and the value of zero to all other households. Results relating to Dalit households are not presented here. Given that Nepal is a caste-based society, caste is expected to play a role in determining social status. Jejeebhoy and Sathar (2001) find that female autonomy is influenced by social status along with education and economic activity. Thus, caste is expected to play a role in determining a woman's autonomy, which in turn is expected to influence the allocation of resources towards her maternal care.

Other household level social characteristics considered were the number of members in the household (*HH_Size*), whether or not the household owns land (*Landowner*) and whether or not the household has access to electricity (*Home_electric*). *HH_Size* is a continuous variable measuring the number of members in a household. We were interested in family size to ascertain whether the number of people in a family affects the probability of a woman receiving maternal care. One might argue that this could have either a positive or a negative impact. The positive impact would have likely come from more family members being concerned for the woman's welfare, while

the negative impact may come from the economic pressure of taking care of a large family, which might reduce allocation of resources for the woman. The net impact therefore remains unclear at this time.

The variable *Landowner* is a dummy variable which takes value of one if the household owns land and zero otherwise. Anecdotal evidence suggests that land ownership is seen as an economic status symbol of sorts in Nepal. This is supported by the fact that over 76 per cent of households in our sample own some land. While being a landowner may depict economic status (which would have a positive impact), it also reflects a more traditional household (which may have a negative impact). The net impact of this variable is therefore unclear.

The variable *Home_electric* takes the value of one if a home is electrified and zero if the home does not have electricity. This variable is assumed to be a proxy reflecting the extent of economic development in the area where the respondent lives, and thus would likely have a positive impact on maternal care. Another alternative measure of economic status is household income, but we do not include this variable due to its high collinearity with the variable measuring women's work status (discussed earlier).

We also include two community-level variables where we expect some social spillover effects via social interactions will influence the degree of maternal care that a woman receives. Since we do not have village-specific data, we rely on the primary sampling units to represent communities. We include the average level of education in the primary sampling units where the woman lives (*Community_Edu*). We also consider the proportion of women in the primary sampling units who received both prenatal and postnatal care (*Community_maternalcare*). Literature provides evidence that individuals whose neighbourhoods are healthier are more likely to experience better health outcomes and lower exposure to disease (Ludwig, Duncan, and Hirsch, 2001; Katz, Kling and Liebman, 2001). However, while both of these variables are expected to have a positive impact on the dependent variable through their positive externality effect, we are not including them simultaneously in order to avoid multicollinearity issues. These represent the fourth and fifth new variables and hypotheses introduced into this paper. In addition to the individual, household and community influences, we also controlled for regional influences by controlling for urban region (*Urban*) versus rural regions. The *Urban* variable is a dummy variable that takes a value of one if a woman lives in an urban area and zero if a woman does not live in an urban area. It is assumed that women living in urban areas will have less difficulty accessing maternal care.

The paper utilizes household survey data from the Nepal Living Survey Third Round carried out by the Census Bureau of Nepal in 2010-2011, in conjunction with the World

Bank. The surveys followed the Living Standards Measurement Survey methodology developed and promoted by the World Bank. Randomly selected households were clustered within primary sampling units (PSU), which were either individual wards, sub-wards or groups of contiguous wards in the same village development council. Since we do not have specific village information, we relied on the PSUs in lieu of villages, utilizing some PSU-specific information to control for regional heterogeneity. Table 2 provides summary statistics of the variables.

Table 2. Summary statistics

Variables	Obs.	Mean	Std. Dev.	Min	Max
<i>Age</i>	1 633	26.39988	6.076609	14	51
<i>Edu</i>	1 633	1.83711	0.9250964	0	4
<i>Head_Edu</i>	1 633	1.812002	0.922647	0	4
<i>Sons</i>	1 633	1.28414	1.056655	0	6
<i>HH_Size</i>	1 633	6.512554	2.919676	2	20
<i>High_Caste</i>	1 633	0.3392529	0.4736008	0	1
<i>Landowner</i>	1 633	0.76485	0.4242225	0	1
<i>Home_electric</i>	1 633	0.6576852	0.4746297	0	1
<i>WageWork</i>	1 633	0.0385793	0.1926491	0	1
<i>Time_to_healthcare</i>	1 633	66.58216	71.99192	0	520
<i>Good_health</i>	1 633	0.9007961	0.2990272	0	1
<i>Community_Edu</i>	1 633	1.400115	0.2524175	1	2.508197
<i>Shoptime</i>	1 633	0.3093819	0.5548772	0	4.285714
<i>Health_autonomy</i>	1 633	1.401715	1.11597	0	3
<i>Urban</i>	1 633	0.2455603	0.4305508	0	1
<i>Community_maternalcare</i>	1 633	0.2094305	0.2669591	0	1
<i>Birth_order</i>	1 631	3.044145	1.83203	1	11

Our dependent variable is maternal care utilization. Most papers that analyse maternal care utilization focus either on prenatal or postnatal care. This paper took a more holistic approach to maternal care, incorporating both prenatal and postnatal care. The survey addressed its questions on maternal-related care to all women who had given birth in the three years prior to the survey. A group of 1,633 women forms the sample for the empirical analysis.

III. EMPIRICAL ANALYSIS

We use ordered logit to carry out our estimations, since the dependent variable is an ordinal variable, ranging in value from zero to two, with two representing a woman who received both prenatal and postnatal care. Thus, the higher the value of the dependent variable, the greater the likelihood that the woman received higher-quality maternal care. Needless to say, we are making an implicit assumption that receiving prenatal and postnatal care from a trained doctor/practitioner is preferable to not receiving such care.

Explanatory variables are added to the base model in various combinations in order to verify the sensitivity of results to the inclusion of different variables, as well as to determine the robustness of the results, which remain very consistent. We control for issues such as multicollinearity by not including highly correlated variables simultaneously in any estimation. For example, we do not include *Community_Edu* and *Community_maternalcare* in the same estimation. In addition, earning wages from work (*WageWork*) and health autonomy (*Health_autonomy*) are not included in the same estimation, since there is likely to be a high correlation between the two. These are the reasons that six different versions of the model are estimated. It allows one to determine whether the results are robust using different formulations of the model.

Findings of the study

Table 3 represents ordered logit results, and presents six different specifications of equation (1). Our analysis initially focused on the five new variables utilized in the paper. Under the first hypothesis, it was argued that households more involved in market exchange would be more likely to receive information concerning maternal care and thus more likely to make use of these services. Indeed, the results indicated that those families spending more time shopping (*Shoptime*) were associated with a greater use of maternal care – this held for all estimations. Thus, social networks that evolved in market exchange situations seemed to encourage the spread of information concerning the usefulness of maternal health care, leading to women indeed receiving increased amounts of such care.

Under the second hypothesis, it was suggested that in those areas where the proportion of women utilizing maternal health care was high (*Community_maternalcare*), the use of maternal health care by individual women would also be high. That is, if there was a social norm attached to using maternal care, then individuals would be more likely to use these services. Indeed, this variable was positive and significant in all relevant estimations. Thus, a social norm validating the use of maternal health care did seem to promote the use of such care.

The third hypothesis postulated that the higher the average level of education in any particular area (*Community_Edu*), the more likely that there would be a spillover effect favouring the use of maternal care. Indeed, this appeared to be the case for

all relevant estimations. These results pointed to the importance of social spillover effects in improving maternal care utilization by women in Nepal. Similar conclusions were reached by Mukong and Burns, (2015) and Gage (2007) in developing countries of Africa.

Under the fourth hypothesis, increased female autonomy was thought to lead to increased maternal care. Female autonomy was measured by the variables *Health_autonomy* and *WageWork*. The signs for these two variables were both positive and significant for all relevant estimations. Thus, a woman who had some input regarding health-care decisions was more likely to receive maternal care. In addition, if the woman earned a wage, it also seemed to enhance her autonomy leading to an increase in the use of maternal health-care services. The results relating to the woman's autonomy over her health care, and the positive impact emanating from her ability to work for wages were similar to those found in Khanal and others (2014). Pallikadavath, Foss, and Stones (2004) also found that a woman's autonomy was linked with receiving prenatal care in rural north India. In addition, Erci (2003) found a woman's employment outside the home had a significant impact on her receiving prenatal care.

Finally, the fifth hypothesis examined the role of gender-bias. In other words, did already having a son or sons result in less maternal care for the mother? The sign on the *Sons* variable was statistically significant and negative. It implied that once a son was born into a family, and son preference was fulfilled, it was likely that a woman would receive less maternal health care for additional pregnancies.

Results for other variables at the individual level were also interesting. From the results presented in table 3, one can see that education played an important role in maternal care utilization. The education of a woman (*Edu*) and her husband (*Head_Edu*) had both a positive and statistically significant impact on maternal care, although the size of the coefficient for women's education was greater. The quadratic age variable (*Age_sq*) was found to be negative and statistically significant, implying that as women grew older, they were much less likely to receive maternal care. The results also showed that a woman's current health (*Good_health*) was associated with a lower probability of maternal care use. In other words, the better the health of an expectant mother, the less likely it would be that she would receive maternal care during or after her pregnancy. The results relating to health seemed to reflect those of Chowdhury, Mahbub and Chowdhury (2003) which found that prenatal care was not seen as essential unless there was physical discomfort during pregnancy and complications in previous pregnancies or childbirth. Finally, as one would expect, the results showed that the greater time it took to access a health-care facility (*Time_to_healthcare*), the lower the probability that women would access maternal care services. Several qualitative studies have shown that distance to services or barriers to accessing services played a role in the utilization of prenatal care services (Griffith and Stephenson, 2001; Chowdhury, Mahbub, and Chowdhury, 2003; Myer and Harrison, 2003; Mathole and others, 2004).

Table 3. Ordered logit estimations of the determinants of maternal health care

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Age	0.188*** (0.0631)	0.0894 (0.0677)	0.0390 (0.0696)	0.0655 (0.0688)	0.150** (0.0643)	0.0390 (0.0696)
Age_sq	-0.00396*** (0.00108)	-0.00242** (0.00116)	-0.00133 (0.00120)	-0.00175 (0.00118)	-0.00299*** (0.00111)	-0.00133 (0.00120)
Edu	0.314*** (0.0691)	0.405*** (0.0720)	0.355*** (0.0733)	0.362*** (0.0730)	0.279*** (0.0698)	0.355*** (0.0733)
Head_Edu	0.152** (0.0620)	0.226*** (0.0670)	0.190*** (0.0678)	0.174*** (0.0674)	0.134** (0.0623)	0.190*** (0.0678)
High_Caste	0.192* (0.115)	-0.0373 (0.127)	-0.00440 (0.127)	0.0224 (0.127)	0.240** (0.117)	-0.00440 (0.127)
Time_to_healthcare	-0.00171** (0.000827)	-0.00304*** (0.000866)	-0.00159* (0.000927)	-0.00168* (0.000925)	-0.000367* (0.000887)	-0.00159* (0.000927)
Good_health	-0.437** (0.176)	-0.644*** (0.190)	-0.630*** (0.193)	-0.605*** (0.193)	-0.471*** (0.177)	-0.630*** (0.193)
Shoptime	0.215** (0.0948)	0.266** (0.107)	0.255** (0.107)	0.234** (0.107)	0.219** (0.0978)	0.255** (0.107)
Sons	- (0.0948)	-0.138** (0.0584)	-0.104* (0.0602)	- (0.0602)	- (0.0602)	-0.104* (0.0602)
HH_size	- (0.0948)	0.0393* (0.0217)	0.0495** (0.0230)	0.0419* (0.0219)	0.0434** (0.0201)	0.0495** (0.0230)
Landowner	- (0.0948)	0.313* (0.161)	0.316* (0.161)	0.278* (0.161)	0.0924 (0.149)	0.316* (0.161)
Home_electric	- (0.0948)	- (0.161)	0.547*** (0.139)	0.554*** (0.139)	0.509*** (0.133)	0.547*** (0.139)

Variables	(1)	(2)	(3)	(4)	(5)	(6)
<i>WageWork</i>	-	1.121*** (0.329)	1.074*** (0.330)	-	-	1.074*** (0.330)
<i>Health_autonomy</i>	-	0.103** (0.0459)	-	0.0988** (0.0501)	0.111** (0.0463)	-
<i>Birth_order</i>	-	-	-0.0793** (0.0399)	-0.105*** (0.0389)	-0.136*** (0.0364)	-0.0793** (0.0399)
<i>Community_Edu</i>	2.059*** (0.319)	-	-	-	1.671*** (0.334)	-
<i>Community_maternalcare</i>	-	5.634***	5.596***	5.566***	-	5.596***
<i>Urban</i>	-	(0.301)	(0.303)	(0.302)	-	(0.303)
	-0.0896 (0.154)	0.119 (0.165)	0.0361 (0.167)	0.0737 (0.166)	-0.115 (0.162)	0.0361 (0.167)
Observations	1 633	1 633	1 631	1 631	1 631	1 631

Note: All estimations include a constant term not presented here. Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

In addition to the above, results also indicated that the *High_Caste* variable was statistically significant and positive for only some of the estimations. Also, the more children that a woman already had (*Birth_order*), the less likely that resources would be allocated for her maternal care in additional pregnancies. Thus, we see that the higher the birth order of the last pregnancy, the less likely a woman is to receive prenatal and postnatal care.

The variables measuring economic status also had a significant impact on maternal care. Being a landowner (*Landowner*) increased the probability of receiving maternal care, implying that landowning families were more likely to allocate resources towards a woman's maternal care. We also considered household income to assess the impact of economic status on maternal care, however this variable was statistically insignificant in all specifications of the model. As such, we have not presented any results where household income was included as an explanatory variable. The results in table 3 also show that living in a house with access to electricity (*Home_electric*) had a statistically significant and positive impact on the probability of receiving prenatal and postnatal care. This implies that economic development was contributory towards women receiving adequate maternal care.

In table 4 we present marginal probabilities associated with the probability of the *Maternal-care* variable having a value of two, indicating the probability that a woman received both prenatal and postnatal care. The six specifications of the model presented in table 4 were identical to those presented in table 3 - with the only difference being these coefficients represented elasticities or dy/dx values.

The two variables measuring social spillover effects related to maternal care social norms and community education levels were found to have the greatest influence on maternal health care utilization. We found that a 1 per cent increase in the proportion of women receiving maternal care in a community increased a woman's likelihood of receiving prenatal and postnatal care by approximately 61 per cent. Additionally, a 1 per cent increase in the education level of community members was associated with a 23 to 29 per cent increase in the likelihood of a woman receiving both types of maternal care, depending on the model used. These results echoed Bloom, Wypij and Das Gupta (2001) who also found that social ties could influence a woman's decision to seek prenatal care through exposure to different ideas and access to information about providers.

The two measures of female autonomy (*Health_autonomy* and *WageWork*), both revealed significant positive effects on maternal care utilization. Of the two, a woman's ability to engage in wage work was most important with a 1 per cent increase associated with approximately 17 per cent increase in the likelihood of utilizing maternal care.

Another important variable with a positive influence was the *Home_electric* variable. It showed that a 1 per cent increase in the likelihood of a woman living in a home with access to electricity increased the probability of her receiving maternal care by

between 6 and 7 per cent, depending on the model. These results have direct policy implications. Increasing investment in education and infrastructure (i.e. increasing access to electricity) will enhance the likelihood of women being able to access maternal care.

The health of the woman (*Good_health*) also seemed to play an important role. A 1 per cent increase in her health level was associated with a decline in maternal care utilization by between 6.8 and 8.6 per cent. Thus, the initial health of a woman significantly influenced the overall decision-making process for her to access maternal health care.

In addition to the above results, it was also found that a 1 per cent increase in the education level of a woman was associated with a 3.9 to 4.5 per cent increase in the probability that she would receive both prenatal and postnatal care. Also, a 1 per cent increase in the education level of a woman's husband was associated with a 1.8 to 2.5 per cent increase in the probability of the woman receiving both prenatal and postnatal care.

In respect of *Shoptime*, the amount of time that household members spent in the market for the purpose of shopping, seemed to have an important effect on the utilization of maternal health care, although not as important as the variables discussed in the previous paragraphs. A 1 per cent increase in the amount of time devoted to shopping was associated with an approximately 3 per cent increase in utilization of maternal care.

Land ownership (*Landowner*) also seemed to have a relatively large effect on access to maternal health care. A 1 per cent increase in landownership was associated with a 1.3 to 3.3 per cent increase in maternal care utilization. This apparent increase in wealth appeared to enhance the capability of families to support and provide maternal care. However, one of the estimations using this variable appeared to be insignificant, casting some doubt on the importance of this variable.

Other variables were statistically significant, but the relationship and effect on maternal health care appeared much smaller. The distance to a health-care facility (*Time_to_healthcare*) had a significant negative relationship with maternal health care, as would be expected, but its impact was relatively small. Having already had sons appeared to be associated with a decline in maternal health care use (a negative relationship), but the impact was also relatively small. Household size (*HH_size*) was positively and significantly related to access to health care, but again the impact was small. Finally, birth order (*Birth_order*) which translated into the number of children already in the family was negatively associated with health care, but the magnitude of the influence was also small. The results for *Age* and *Age_sq*, represented a non-linear relationship between the use of health-care services and age, indicating that as women's age increased, the utilization of such services also increased, but at a declining rate. That said, several of these estimations were not statistically significant.

Table 4. Marginal probabilities that a woman receives both prenatal and postnatal care

Variables	(1) dy/dx	(2) dy/dx	(3) dy/dx	(4) dy/dx	(5) dy/dx	(6) dy/dx
Age	0.0261*** (0.0631)	0.009 (0.0677)	0.004 (0.0696)	0.007 (0.0688)	0.021** (0.0643)	0.004 (0.0696)
Age_sq	-0.0005*** (0.00108)	-0.003** (0.00116)	-0.0001 (0.00120)	-0.0002 (0.00118)	-0.0004*** (0.00111)	-0.0001 (0.00120)
Edu	0.044*** (0.0691)	0.045*** (0.0720)	0.039*** (0.0733)	0.041*** (0.0730)	0.038*** (0.0698)	0.039*** (0.0733)
Head_Edu	0.021** (0.0620)	0.025*** (0.0670)	0.021*** (0.0678)	0.019*** (0.0674)	0.018** (0.0623)	0.021*** (0.0678)
High_Caste	0.027* (0.115)	0.004 (0.127)	0.0004 (0.127)	0.002 (0.127)	0.034** (0.117)	0.0005 (0.127)
Time_to_healthcare	-0.0002** (0.000827)	-0.0003*** (0.000866)	-0.0002* (0.000927)	-0.0002* (0.000925)	-0.0005 (0.000887)	-0.0002* (0.000927)
Good_health	-0.068** (0.176)	-0.086*** (0.190)	-0.083*** (0.193)	-0.079*** (0.193)	-0.073*** (0.177)	-0.083*** (0.193)
Shoptime	0.029** (0.0948)	0.029** (0.107)	0.028** (0.107)	0.026** (0.107)	0.031** (0.0978)	0.028** (0.107)
Sons	- (0.0584)	-0.015** (0.0584)	-0.011* (0.0602)	- (0.0602)	- (0.0602)	-0.011* (0.0602)
HH_size	- (0.0217)	0.004* (0.0217)	0.005** (0.0230)	0.005* (0.0219)	0.006** (0.0201)	0.005** (0.0230)
Landowner	- (0.161)	0.033* (0.161)	0.032* (0.161)	0.029* (0.161)	0.013 (0.149)	0.032* (0.161)

Variables	(1) dy/dx	(2) dy/dx	(3) dy/dx	(4) dy/dx	(5) dy/dx	(6) dy/dx
<i>Home_electric</i>	-	-	0.056*** (0.139)	0.057*** (0.139)	0.066*** (0.133)	0.056*** (0.139)
<i>WageWork</i>	-	0.177*** (0.329)	0.166*** (0.330)	-	-	0.166*** (0.330)
<i>Health_autonomy</i>	0.014** (0.0459)	-	-	0.011** (0.0501)	0.015** (0.0463)	-
<i>Birth_order</i>	-	-	-0.009** (0.0399)	-0.011*** (0.0389)	-0.019*** (0.0364)	-0.009** (0.0399)
<i>Community_Edu</i>	0.286*** (0.319)	-	-	-	0.229*** (0.334)	-
<i>Community_maternalcare</i>	-	0.626***	0.612***	0.611**	-	0.612***
<i>Urban</i>	-	(0.301)	(0.303)	(0.302)	-	(0.303)
	-0.012 (0.154)	0.013 (0.165)	0.004 (0.167)	0.008 (0.166)	-0.015 (0.162)	0.004 (0.167)
Observations	1 633	1 633	1 631	1 631	1 631	1 631

Note: All estimations include a constant term not presented here. Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Limitations of the study

An important matter to address is the issue of endogeneity. Endogeneity refers to the fact that an independent variable included in the model is potentially a choice variable, and thus correlated with unobservables relegated to the error term. Thus, in our sample, a case for endogeneity could be made concerning a woman's employment outside of the home and her level of education and/or autonomy to seek her own health care. These may be simultaneously influenced by a third factor such as the family's economic status or the general social environment in the village. Or, perhaps women who wish to enjoy a better job or receive better maternal care may choose to settle in urban areas, where there are greater opportunities for both. We realize that failure to control for these factors will likely underestimate the effect of the explanatory variables on the utilization of maternal care.

If the above-mentioned variables are indeed endogenous, then the ordered logit estimation would possibly generate biased and inconsistent estimates of the impact of explanatory variables on the outcome. A common strategy for dealing with this endogeneity is to use instrumental variables estimation, where "instruments" are variables assumed to have no direct association with the outcome. However, the paucity of available data restricted our ability to find or construct appropriate instruments for all the explanatory variables. Thus, the reader should beware of interpreting the results obtained here as being causal in nature.

IV. CONCLUSION

This paper has sought to examine factors which are important in determining the extent of maternal health care utilization in Nepal. The results indicate that an increase in educational levels can have direct and indirect effects that may lead to a significant increase in the use of maternity health care. Education levels of women (and men) by themselves were found to have a significant positive effect; however, an increase in the level of education of the community as a whole was also associated with a significant positive effect on health care utilization. Therefore, investment in education, especially of women, remains an important mechanism through which health care utilization can be increased.

The results also indicated that as the use of maternal health-care services became the norm, more women began to access and use them. Thus, efforts to publicize the use of such services and create norms supporting this activity could have a significant positive impact.

It also appeared that opportunities for women to engage in paid work also led to a significant association with the use of maternal health care. There were likely two mechanisms at play: a woman's ability to earn wages allowed for increased expenditures on health care; and access to paid work likely increased a woman's autonomy in terms of making health-care decisions. Thus, the growth of employment opportunities for women remains crucial.

It appeared that investment in certain types of infrastructure was also associated with an increase in the use of maternal health care. Specifically, the provision of electricity in households had a significant positive impact. This likely enabled household members to access media and engage in educational activities that allowed them to learn about the effectiveness of maternal health care.

Finally, the results indicated that the extent to which families engaged in market activity affected the likelihood that a woman would receive maternal health care. The social networks involved in market activity seemed to convey information on maternal health care. Thus, efforts aimed at promoting market activity had a spillover effect in terms of knowledge on the benefits of maternal health-care services. This effect could be enhanced by the creation of information outlets within market areas. Further qualitative research on how social networks in the market actually affect and alter people's behaviour would be quite useful.

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