

The Influence of Social Health Protection Mechanisms and Community Level Factors on Facility Delivery and Antenatal Care Use in Cambodia: A Multilevel Modeling Approach

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Extended Abstract

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Introduction

In South East Asia, there has been substantial progress in the use of maternal health services in recent years; an average 75% of women delivered with a skilled birth attendant (a trained doctor, nurse or midwife) in 2008 compared to 46% in 1990 (United Nations 2010). However, such improvements mask severe disparities between and within countries in the region. Cambodia is one of the poorest countries in South East Asia and the health status of its population lags behind many of its neighbors (AusAID 2011; World Bank 2009). In Cambodia, recent improvements in maternal health outcomes and maternal health service use are evident, although they remain below regional averages. Most impressive has been the decline in the maternal mortality ratio (MMR). The latest Demographic and Health Survey (DHS) in Cambodia in 2010 reports the current MMR at 206 per 100,000 live births, representing a substantial decrease from the 2005 estimate of 472 per 100,000 live births (National Institute of Public Health & National Institute of Statistics 2010). Cambodia's MMR is, however, still among the highest in the region. Commensurate with Cambodia's reduction in MMR are impressive increases in use of maternal health services over the last decade. Facility-based deliveries have increased from 10% in 2000 to 53% in 2010; over the same period skilled birth attendance at delivery increased from 32% to 69% respectively; the proportion of women receiving at least four antenatal care visits during their pregnancy increased from 9% to 57% respectively; use of postnatal care increased from 55% to 74% respectively (CDHS, 2010).

Given the established links between service use and maternal health outcomes, understanding what drives improvements in maternal health service uptake is of critical importance for designing and refining future health interventions. The investigation of the determinants of maternal healthcare use in developing countries is thus an ever-growing area of research and a number of factors have been identified as key determinants of service use, although these vary by region and context. Some of the strongest determinants of maternal health service use that are applicable in multiple contexts include maternal education and household wealth. Other important determinants of maternal health service use in developing countries include maternal age, ethnicity, health beliefs, husband's education, women's autonomy, perceived quality of care, use of services during previous pregnancies and experience of complications, urban/rural location and distance to services (see Yanagisawa et al. 2006; Liu et al. 2011; Kesterton et al. 2010; Jat et al. 2011; Gabrysch & Oona M R Campbell 2009; Chomat et al. 2011; Babalola & Fatusi 2009; Agha & Carton 2011; Amin et al. 2010; Collin et al. 2007; M. E. Chowdhury et al. 2006; Pallikadavath et al. 2004).

In Cambodia, the landscape of healthcare and healthcare financing has undergone major transformation over the last several decades, particularly since the fall of the Khmer Rouge regime. Following a period when healthcare was essentially free at public health facilities, the government introduced user fees in 1997, increasing the financial burden on Cambodians seeking critical services like maternal and reproductive healthcare. With the introduction of the first health equity funds (HEF) in 2000, the government and donors have experimented with a number of innovative financing interventions for the poor to offset user fees and stimulate equitable uptake of services. Although there have been a slew of pilot social health protection schemes, contracting models, output-based payments to providers, cash transfers to households, and demand-side subsidies for the poor, health equity funds remain the most noteworthy model and government appears interested in forming a standard model to provide free access to a tertiary healthcare package for the poor, with a view to extend cover for primary level care (University Research Company 2011).

In this paper, we examine the determinants of the utilization of maternal healthcare services against the backdrop of the burgeoning social health protection programs in Cambodia over the last decade. This analysis is part of a larger study being conducted by the Population Council evaluating a targeted reproductive health voucher and accreditation pilot program that subsidizes maternal services for new, poor users (Bellows et al, 2011). This paper draws on baseline data, collected in early 2011, from this larger evaluation study, which employs a quasi-experimental design. The end line survey of this study is scheduled to be collected in early 2013.

Another important recent development in the literature on the determinants of maternal health service use is that studies have increasingly begun to include community-level factors as determinants and employ multilevel models in their analyses. This development reflects a growing recognition of the importance of factors beyond the individual

or household-level in understanding health-seeking behaviour and service use (Gabrysch & Oona M R Campbell 2009). A number of studies from the developing world that employ multilevel models have found that community level variables are associated with changes in service use. Babalola and Fatusi (2009), for instance, included community level variables such as urban/rural residence, community media saturation, prevalence of a small family norm within the community and average population per primary health facility in the state in their analysis of the determinants of maternal health service use in Nigeria, finding them to significantly determine use of skilled birth attendance. Furthermore state level random effects were found to be significant, indicating clustering of service use at the state level after controlling for all other factors (Babalola & Fatusi 2009). Kesterton et al (2010) included community level factors in their analysis of the determinants of facility-based delivery in rural India and found that 27% of the variation in institutional delivery was accounted for by variation at the village level (Kesterton et al. 2010). Jat et al (2011) found similar results in Madhya Pradesh, India, where after controlling for all other factors, 15% of variance in skilled birth attendance at delivery was attributed to differences at community level (Jat et al. 2011). In this paper, we similarly employ a multilevel modeling strategy to analyze the role of social health protection mechanisms and other determinants of maternal healthcare use in Cambodia, advancing the literature further. Community level effects are likely to be important indicators of social normative influences around the use of maternal healthcare. Given that vouchers are designed to generate demand for utilization of services that eventually drive social normative changes, the investigation of community level variance is particularly salient for this study.

The literature on the determinants of maternal health service use in Cambodia is extremely limited, making this study timely and relevant, particularly as the scenario of healthcare and healthcare financing changes rapidly. A survey of the available literature revealed only two studies that have addressed maternal healthcare use in Cambodia: Yanagisawa et al. (2006) and Chomat et al. (2011). Neither study, however, explores the influence of social health protection mechanisms on maternal healthcare service utilization nor do they employ a multilevel modeling approach to their analysis to account for community level influences. We therefore expect to advance the literature in both regards in addition to generating preliminary evidence for our larger evaluation of the RH voucher program.

Data

Data

Data for this study come from the baseline survey of the Population Council's evaluation of the RH Vouchers program in three provinces, Kampong Thom, Kampot and Prey Veng in Cambodia. A total of 2,201 women and 799 men from across 18 operational districts (ODs) were sampled. While data was collected from nine ODs containing voucher facilities and from nine control non-voucher ODs with propensity-score matched facilities, the analyses presented in this study only draws on baseline data and does not employ the treatment-control framework from the quasi-experimental design. Data for the study sample come from women aged 18 to 49 years in the baseline survey who had either had a birth or had been pregnant and used maternal healthcare services in the last 12 months. The survey collected data on a range of topics in reproductive health including the access to and use of reproductive and maternal health services over the last five years including information on pregnancies and births, attitudes, experiences of and reasons for use and non-use of services, including accredited voucher services present at the time. Further details on the implementation of this survey, which was collected by the Center for Advanced Studies (CAS) in collaboration with the Population Council, can be found in a published protocol (Bellows et al. 2011).

Variables

The key dependent variables examined in this study are Facility Deliveries and the use of Antenatal Care (ANC) at least 4 times during a pregnancy. Trends in facility births and ANC use are examined using data over the last five years for women. Multivariate and multilevel models of the determinants of service utilization are run only on the most recent birth or pregnancy.

The key explanatory variable examined in the study is the use of any Social Health Protection (SHP) schemes by women in the sample. A mutually exclusive set of dummy variables of SHP use are utilized that indicate whether women had a) a HEF card, b) Community Based Health Insurance c) a Voucher (non MoH-KfW) d) Health Priority Provision Cards, e) any other form of SHP, and f) if the woman had no SHP at all.

Community level variables, operationalized at the **commune** level, are also included in the multilevel framework. The commune represents a significant and meaningful demarcation of a community in Cambodia that shares a number of social, demographic and normative characteristics. These and other explanatory variables are described below in detail in the Empirical Strategy section.

Preliminary Descriptive Results

Preliminary results from our sample on the 2006–2011 trends in facility deliveries and ANC use at least 4 times corroborate national reported trends, showing a general rising trend over the 5-year period for both indicators in Figure 1 and 2. Additional trend analysis using richest and poorest quintiles, however, also indicates that the increasing trend in average use masks inequities in healthcare use favoring the rich.

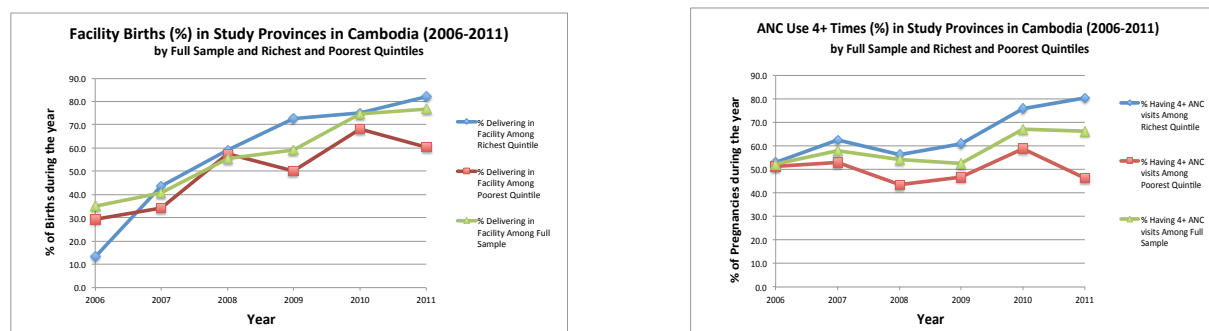


Table 1. Characteristics of Women by Use of Facilities for Delivery and ANC use

Characteristics of Women	Facility Based Deliveries			4+ Antenatal Care Visits		
	Women Delivering in Facilities (Most Recent Births)	Women not Delivering in Facilities (Most Recent Births)	Difference Statistically Significant?	Women having 4+ ANC Visits (Most Recent Pregnancy)	Women not having 4+ ANC Visits (Most Recent Pregnancy)	Difference Statistically Different?
	N=1011	N=428	sig. Level (t-test)	N=1231	N=852	Sig. Level (t-test)
<u>Social Health Protection</u>						
Has some form of Social Health Protection?	0.228	0.180	*	0.206	0.231	*
<u>Type of SHP</u>						
No Social Health Insurance	0.772	0.820	*	0.794	0.769	*
Has Health Equity Fund	0.182	0.143	*	0.154	0.182	**
Has Community Based Health Insurance	0.005	0.000		0.004	0.005	
Has Voucher (non KFW/MoH)	0.025	0.049	**	0.037	0.045	
Has Health Priority Provision Card	0.022	0.005	*	0.017	0.008	**
Has Other form of Social Health Protection	0.007	0.002		0.008	0.012	
Has Difficulty in spending US\$13 to treat illness	0.954	0.951		0.946	0.962	**
<u>Wealth Quintiles from Asset Index</u>						
First Quintile	0.174	0.252	***	0.163	0.248	***
Second Quintile	0.180	0.227	*	0.178	0.222	***
Third Quintile	0.222	0.168	*	0.209	0.187	
Fourth Quintile	0.207	0.182		0.206	0.190	
Fifth Quintile	0.218	0.171	*	0.245	0.154	***
<u>Community Level Variables (Accessibility)</u>						
Proportion of Commune that Delivered in Facility for Last Birth	0.756	0.577	***	0.724	0.673	***
Proportion of Commune that had 4 of more ANC visit for Last Pregnancy	0.612	0.557	***	0.620	0.549	***
Proportion of Commune that had some form of Social Health Insurance	0.227	0.207	**	0.223	0.216	

* Sig at $p < 0.10$, ** Sig at $p < 0.05$, *** Sig. at $p < 0.01$

In Table 1, we report characteristics of women in the key domains that are examined in this paper: SHP, characteristics of their communities and socio-economic status by maternal healthcare service use (facility deliveries and ANC use). In this table, the differences in characteristics between women who do and do not use services are quite evident. Service utilization is higher among wealthier socio-economic groups as well as among women with some form of SHP, though ANC care was lower among women with SHP. Community level variables also appear to be important, showing that women in communes with higher levels of service utilization and SHP have higher levels of facility deliveries and ANC use. All but a few differences are statistically significant at the 10% level. In the full paper, these relationships along with a host of socio-cultural, economic and healthcare use perception variables will be examined in a multivariate framework.

Empirical Strategy: Multilevel Models of the Determinants of Maternal Healthcare Use

In order to examine these relationships in a multivariate framework, a binary response multi-level random effects model (see Steele, 2009; Rabe-Hesketh and Skrondal, 2008, and others) will be employed. Preliminary analyses using single level models (not shown, but available) show significant associations of both outcomes, facility deliveries and ANC visits, with SHP, SES and community level variables. In this paper, we consider multilevel models to allow for and to explore the between commune (community demarcation) variations in maternal health care use by individual women. We structure the data to have a two level structure with approximately 2083 (for ANC) and 1439 (for facility births) women of reproductive age at Level 1 nested in 59 communes at Level 2.

At Level 1 (individual level), we consider a range of explanatory variables: maternal age at birth (or pregnancy), marital status, religion, family size, mother's educational attainment, occupation of the mother and the father, perceived need for delivery care services including use of services in prior pregnancies or births, and household SES using wealth index quintiles. The presence of SHP, using the set of mutually exclusive dummy variables noted above, is the key independent measured at the individual level.

At Level 2 (commune level), we derive community level explanatory variables by aggregating individual-level variables by communes, indicating the proportion of women in the commune delivering in facility, using ANC at least 4 times, and proportion of women who had any form of SHP. These variables are measured as non-self means.

Commune Random Effects: We then allow for the variation at Level 2 by communes using random effects. In our model, we allow for both the intercept and slopes (for individual level explanatory variables) to vary by commune of residence in predicting the probability of using maternal healthcare.

Thus, considering this two level structure, where individual women i , at Level 1, are nested within j communes at Level 2, we can denote the binary outcome (use of ANC or facility birth) by Y_{ij} for individual i in commune j ; X_{ij} represents the vector of individual level explanatory variables that are fixed and do not vary by commune. Z_{ij} represents the vector of individual level explanatory variables that are allowed to vary by commune. C_j represents the contextual Level 2 variables that are aggregated at the commune level. Finally u_{0j} is the random effect that is specific to the commune j and is assumed to have a normal distribution with a variance of σ^2_{u0} . Similarly, u_{2j} represents the random effects associated with the explanatory variables represented by Z_{ij} .

The model, specified as a random slopes and intercepts logit model, will be estimated as below:

$$F^{-1}(\pi_{ij}) = \log(\pi_{ij} / (1 - \pi_{ij})) = \beta_0 + \beta_1' X_{ij} + \beta_2' Z_{ij} + \beta_3' C_j + u_{0j} + u_{2j}' Z_{ij} + \epsilon_{ij}$$

$$\text{Where } \pi_{ij} = E(Y_{ij} | X_{ij}, u_j) = \Pr(Y_{ij}=1)$$

The specification of this final model will be conducted stepwise, testing first a null specification (empty model) with only an intercept and allowing for random commune level variation. Subsequent models will be estimated with the inclusion of individual level explanatory variables as fixed effects first, and then allowing them to vary by communes (random slopes). Finally, models that include Level 2 explanatory variables will be estimated. This stepwise specification of models will enable us to examine how facility based deliveries or the use of ANC and their associations with various explanatory variables (at various levels) is influenced by random effects at the commune level in the different specifications. These models will be estimated using the *xtmelogit* command in Stata 12.0. For each of the estimated models, the Likelihood Ratio (LR) Test will be used to evaluate significance of the random effects, testing whether community level influences are significant in determining use of maternal healthcare services net of individual and community level explanatory variables. Intra-class correlations will also be analyzed to examine whether there is clustering of service utilization at the commune level net of the explanatory variables.

The use of the multilevel modeling strategy has important implications for evidence-based programming, and insights gained from these analyses are likely to be particularly important for interventions such as vouchers that aim not only to subsidize services but also to change social norms around service use. If significant community level effects are found in the multilevel models, a strong case could be made for the need of targeted and contextualized

efforts to raise and improve maternal healthcare utilization, particularly targeting social norms for service use. A pro-poor targeted strategy such as the RH voucher has great potential not only to reduce out-of-pocket spending on women's health, which is a significant deterrent to care, but by generating new demand for services, also to demystify and normalize maternal and reproductive healthcare use in these communities, helping to improve the reproductive health and status of women. Implications of these results for the RH voucher program evaluation in Cambodia as well as for innovation in healthcare financing interventions will be discussed further. This study also will make a significant contribution to advancing a limited literature on maternal and reproductive health in Cambodia.

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