The Differential Impact of User-Fee Exemption Compared to Conditional Cash Transfers on Safe Deliveries in Nepal

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Objective. To assess the differential impact of a copayment exemption compared to a cash incentive on increasing skilled birth attendance (i.e., birth attended by a skilled health worker) in Nepal.

Data Sources/Study Setting. This study used data on 8,785 children born between July 2005 and December 2008, obtained from the nationally representative Demographic and Health Surveys, 2006 and 2011.

Study Design. Twenty-five districts received both the policy interventions, and the remaining 50 control districts received only the cash incentive. We employed a difference-in-differences model to compare children born in districts with both interventions to those in districts with conditional cash transfers only. Average marginal effects of the difference-in-difference coefficient on skilled birth attendance measures are estimated.

Principal Findings. Skilled birth attendance in districts with both interventions was no higher on average than in districts with only the cash incentive. In areas with adequate road networks, however, significantly higher skilled birth attendance was observed in districts with both interventions compared to those with only the cash incentive.

Conclusions. The added incentive of the user-fee exemption did not significantly increase skilled birth attendance relative to the presence of the cash incentive. User-fee exemptions may not be effective in areas with inadequate road infrastructure.

Key Words. Conditional cash transfers, user fees, financial incentives, maternal health, skilled birth attendance

The use of financial incentives applied to patients is a key characteristic of health services for its ability to alter health care utilization. Such incentives include either charging fees to patients (negative incentives) or, alternatively, paying patients to use services (positive incentives). The landmark study

testing negative financial incentives is the Rand Health Insurance study, which found that the increasing patient copayments were effective in reducing utilization of health care services (Newhouse et al. 1981; Manning et al. 1987). In contrast, a distinct and more recent strand of work has focused on the use of cash incentives paid to patients to increase utilization, namely through “cash transfers” usually to women, conditional on seeking certain health care services (Lagarde, Haines, and Palmer 2007, 2009). These two types of interventions act on the cost of health care faced by patients in opposite ways, either by imposing higher prices and payments faced by patients or by effectively reducing the relative price through specific payments to patients. However, the literature on these two interventions has developed independently and separately; there is very little work to date that has examined the effects of both interventions together.

There is extensive evidence on the effectiveness of copayments, cost-sharing, and “user fees” in altering health care utilization in a variety of contexts in both developed and developing nations. Whereas copayments in developed countries are seen as a mechanism to control costs and deter unnecessary health care utilization, recent work in developing countries has found highly elastic price elasticities of demand for essential, life-saving, and preventive health care products and services such as bed nets (Cohen and Dupas 2008), leading policy makers to eliminate user fees for such services. Although eliminating or reducing user fees can increase service utilization and improve its distribution within the population, the intervention can sometimes negatively impact health-service quality as a result of the increased demand, and its impacts on health outcomes are not established (Lagarde and Palmer 2008, 2011). The elimination of user fees specific to facility-based delivery care has, as expected, increased facility-based deliveries in some low- and middle-income countries (Ridde and Morestin 2011).

The second strand of work on cash incentives to households, or more commonly known as “conditional cash transfers (CCTs),” has gained considerable prominence in Latin America, South Asia, and even New York City

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(Cookson 2008). Most of these programs are tied to specific indicators pertaining to utilization for child health and child development, and more recently, for maternal health in particular. CCT programs have been shown to be effective in increasing health-service utilization, especially in the uptake of preventive services for child health, and in some cases in improving certain health outcomes (Lagarde, Haines, and Palmer 2007; Powell-Jackson, Mazumdar, and Mills 2015). Moreover, programs have complemented payments to beneficiaries with payments to health care workers on the supply side, although the evidence disentangling the two types of CCTs is limited (Maluccio and Flores 2005; Guanais 2014). A few maternal health incentive programs have used cash transfers to both beneficiaries and health workers (Glassman et al. 2013; Morgan et al. 2013).

In this study, we examine a nationwide program that used both negative and positive incentives; the program eliminated copayment, while offering cash incentives for women to deliver in the presence of a skilled health worker. In 2005, Nepal implemented a nationwide experiment of its Safe Delivery Incentive Program (SDIP), which comprised these two interventions to raise the levels of skilled birth attendance and institutional births and in turn tackle its high maternal mortality ratio of 281 per 100,000 live births (Government of Nepal 2005; Ministry of Health and Population [MOHP] [Nepal], New ERA, and Macro International Inc 2007). Specifically, SDIP offered (1) CCTs for women who give birth in health facilities and health workers who assist in deliveries in all districts, and (2) free delivery care, that is, a user-fee exemption for delivery, for women living in the 25 districts with a low (district) human development index (HDI). Our study, to our knowledge, is the first study which examines the effect of the user-fee exemption intervention relative to only CCTs.

Previous studies have examined the impact of SDIP in selected and limited areas of Nepal. For example, Powell-Jackson and Hanson (2012) focused on 6 of 75 districts in the country and found that women who had heard of SDIP were 17 percent more likely to deliver with the aid of a skilled birth attendant. Another paper by Powell-Jackson et al. (2009a,b) found that the SDIP did not impact neonatal mortality rates in one district (Makwanpur) over the study period of 2 years after the program was implemented. Our study uses national representative data to examine the national impact of SDIP on health-service utilization and assess the marginal impact of the user-fee exemption compared to only CCT.

Framework

We classify the determinants of health-seeking behavior into four categories—availability, accessibility, affordability, and acceptability (Penchansky and Thomas 1981). In the case of seeking skilled birth attendance, availability refers to the geographic distribution and presence of the health providers and facilities and issues related to stockouts in medicines, health commodities, and medical supplies. Accessibility refers to the ease of travel between household members and health providers and facilities, including transportation and condition of roads. Affordability refers to a household's costs for the health care of a member, whereby distinctions can be made in the direct, indirect, and opportunity costs of skilled birth attendance. Acceptability relates to cultural and social factors and covers the social acceptability of delivering at a health facility or with a skilled birth attendant, satisfaction with the health provider's behavior, and gender considerations of being attended by a member of opposite sex during delivery (Hausmann-Muela, Ribera, and Nyamongo 2003).

These determinants of health-seeking behavior can be further analyzed while examining the supply- and demand-side barriers to skilled birth attendance. The interventions—the cash transfers to health workers and to women and the exemption of user fees—affect the four dimensions of access to skilled birth attendance by attenuating supply- and demand-side barriers. Cash incentives to the health worker increase the availability of health services to women as the health worker is incentivized on a fee-for-service basis and gets paid by the number of births he or she has assisted. The cash incentive to the woman increases the affordability and accessibility of the service through transportation and reduces the opportunity costs to the household. User-fee exemption of the delivery also increases the affordability of the service faced by the woman. Both the cash incentive to women and user-fee exemption could also increase the acceptability of the service as the norms around skilled birth attendance could change through social networks formed around women who were first incentivized to give birth in a government health facility.

These incentives will only work if the beneficiaries know about the program beforehand (Kroeger 1983). Health workers are more likely to know about the incentive program for them because they work in government facilities. However, for the CCT incentive to the women and the user-fee exemption intervention to have a sizeable impact, the program needs to influence women who otherwise would not have delivered in a health facility. This requires that women (1) have accurate, precise, and up-to-date information

about the incentive program; (2) the information and program are trustworthy; and (3) the incentives are large enough for the women to overcome the availability, accessibility, and affordability barriers.

From an economic perspective and specifically on the demand side, the CCT to the woman provides income which can be used to pay for the costs of seeking health care services (including the costs of transportation), whereas the user-fee exemption is a direct reduction in the price of health care services that the woman faces.

Policy Background

Launched nationally in July 2005, SDIP aimed to increase skilled birth attendance and increase births in health facilities. The program introduced two main policy interventions to encourage women to give birth at a health facility (Table 1). In this study, we label the CCT incentive as Intervention I and the exemption of user fees for delivery care as Intervention II. By comparison, gross national income per capita in Nepal of \$540 in 2010 dollars or approximately Rs. 54,000, and 57 percent of the population live on less than \$2 a day and (World Bank 2013).

The CCT was launched nationally in all districts at the same time and rewarded cash to a woman after delivering at a government health facility. The incentive was primarily intended to cover transportation costs, and the incentives varied by geographic region, ranging from Rs. 500 in Terai districts to Rs. 1,500 in mountain districts, where transportation costs are the highest (Powell-Jackson et al. 2008). Separately, women who delivered in a government health facility were exempted from the user fee (Intervention II) in 25 of

Table 1: Safe Delivery Incentive Program 2005

Intervention I: Conditional Cash Transfer Incentive (all 75 districts)			
(1) For Women Delivering at Eligible Government Health Facilities			
By Region	Mountain Districts (16)	Hill Districts (39)	Terai Districts (20)
Cash Incentive	Rs. 1,500	Rs. 1,000	Rs. 500
(2) For Providers Assisting in Delivery at Government Facilities or at Home			
Cash Incentive	Rs. 300		
Intervention II: Exemption of User Fees for Delivery Care (25 districts)			
(1) For Women Delivering at Eligible Government Health Facilities			
Exemption	User-fee exemption for both normal and complicated cases (ranging from Rs. 678 to Rs. 5,500)		
(2) For Eligible Health Facilities (Reimbursed for Providing Free Delivery Care)			
Subsidy	Reimbursed Rs. 1,000 per delivery regardless of complications		

Source: Government of Nepal (2005).

75 districts. Districts were ranked by its HDI and the lowest 25 districts were chosen for the additional Intervention II (Figure S1). Borghi et al. (2006) found that the typical user fee levied to a woman for a facility-based delivery ranged from Rs. 678 for a vaginal delivery to Rs. 5500 for a cesarean delivery (for which the rate was 5.7 percent in 2011).

METHODOLOGY

Data

For this study, we use the 2006 and 2011 Nepal Demographic Health Surveys (NDHS) (Ministry of Health and Population [MOHP] [Nepal], New ERA, and Macro International Inc 2007, 2012). NDHS uses two-stage cluster sampling stratified by urban or rural residence type across the 13 ecological zones. The surveys are conducted at household level, interviewing women aged 15–49 and men aged 15–54 years. We use data from the two surveys on 8,785 children born 5 years prior to the survey. The survey includes a birth history of the child, which records the year and month of birth, the location of delivery (e.g., government health facility, private health facility, home, etc.), and the presence of a skilled birth attendant.

Using information on each child's year and month of birth, we identify whether the child was born during the period of treatment in the analysis. Children born before July 2005 are coded as pre-SDIP and those born between July 2005 and December 2008 as SDIP. Next, the treatment groups (Intervention I vs. Interventions I & II) are identified by the household's (and the child's) district of residence. Whereas all households received Intervention I, only households in the 25 districts with low HDI received Interventions I & II. Intervention II was launched nationally in January 2009.

The two dependent variables in this study, examined separately, are the probability of the birth delivered in a government health facility and the probability of the birth attended by a government health professional. "Government health facilities" include primary health posts, public health centers, and district hospitals. "Government health professionals" include doctors, nurses, midwives, health assistants, or trained birth attendants.

Difference-in-Differences Analysis

Using a difference-in-differences (DID) estimator, we estimate the intent-to-treat impacts of Intervention II (and I) compared to only Intervention I on

measures of skilled birth attendance. We identify whether a child was born during the period of the intervention by the child's month and year of birth, and the treatment group by the district in which the household resides at the time of the survey interview. Our two main outcomes of interest are births delivered at a government health facility and births delivered by a government health professional. As our primary outcomes of interest are binary variables, we employ a probit regression model to understand the differential impact of the two interventions, constructed as follows:

$$\begin{aligned} \text{Probit}^{-1}(Y_{ilt}) = & \alpha_i + \zeta * \text{Treated}_l + \gamma * \text{Post}_t + \delta * \text{Treated}_l * \text{Post}_t + \sum_k \nu_k \\ & * \text{Wealth}_{ki} + \beta_1 * \text{Educ}_i + \beta_2 * \text{Age}_i + \beta_3 * \text{Age}_i^2 + \beta_4 * \text{Rural}_i \\ & + \beta_5 * \text{HDI}_l + \beta_6 * \text{RoadDensity}_i + \sum_t \gamma_t * \text{Year of Birth}_t + \epsilon_{ilt} \end{aligned}$$

In this equation, Y_{ilt} is a dummy-dependent variable which equals one if the baby was delivered in a government health facility (and separately, a dependent variable of whether the birth was attended by a government health professional) for birth i in district l at time t . The independent variable, Treated_l , equals one if the birth occurred in district l that received both Interventions I and II, and equals zero if the birth occurred in a district with only Intervention I. Post_t equals one if the birth occurs during the SDIP period (i.e., after 2005) and zero if before 2005. We calculate the average marginal effects of the DID estimator (the interaction between Treated_l and Post_t).

We controlled for the differences in economic and human development status, including household wealth index, mother's educational status, mother's age, urban-rural stratum, district HDI in 2004 which determined eligibility for treatment (United Nations Development Programme 2004), district road density for 2006–2007 (a proxy for ease of geographic accessibility), and year of birth fixed effects.

Subgroup Analysis

To understand the heterogeneous effect of the interventions across individual- and district-level characteristics, we analyzed the DID model of births delivered at different facilities by subgroups of covariates. This subgroup analysis will allow us to examine the changes in composition of location of deliveries over the study period and intervention groups. The variables for subgroup analysis were as follows: age of the mother at birth, mother's education, road density, urban-rural stratum, HDI, and wealth index. For road density, the cutoff point chosen was the 20th percentile (in ascending

order) of road density across all countries (World Bank 2013), which was 10 km/100 km² of land area.

RESULTS

Descriptive Statistics

Over the study period, 16 percent of the total births in the country occurred in a government health facility, and 22 percent of the total births were delivered by a government health professional. Most births were delivered at home primarily in rural areas to women with no education (Table 2; Table S1). Nearly 60 percent of births in the sample were to mothers without any formal schooling, and nearly 90 percent of births occurred in rural areas. The mean age of the mother at birth was 26 years. Table 2 shows that HDI in most districts is low and the country is classified by the UN Development Programme as having low human development (United Nations Development Programme and Fukuda-Parr 2004).

Table 3 shows the increasing skilled birth attendance over time in the two treatment groups. Panel A shows that the percentage of births delivered in government health facilities increased by 1.5 times—19.1 percent of the births were delivered in government health facilities in the SDIP period compared to 12.8 percent before the program was launched. The increase is slightly more pronounced in the dual intervention group where the proportion of

Table 2: Descriptive Statistics for Births in the Sample

<i>Variable</i>	<i>Mean</i>	<i>SE</i>	<i>Min</i>	<i>Max</i>
Births in government health facility	0.158	0.009	0	1
Births attended by a government health professional	0.223	0.010	0	1
Treatment			0	1
Intervention I (0)	0.825	0.014		
Intervention I and II (1)	0.175	0.014		
Time period			0	1
Pre-SDIP (0)	0.533	0.022		
SDIP (1)	0.467	0.022		
Mothers with no formal schooling	0.581	0.016	0	1
Rural	0.887	0.012	0	1
Age of the mother at birth	25.9	0.105	15	49
Human Development Index, District	0.465	0.003	0.304	0.652
District-level road density (km per district area in hundred km ²)	11.7	0.498	0	82

Table 3: Trends in Skilled Birth Attendance across Treatment Categories

<i>Time Period</i>	<i>Treatment Groups</i>		<i>Total</i>
	<i>Intervention I (0)</i>	<i>Intervention I & II (1)</i>	
(A) Percentage of Births in Government Health Facilities			
Pre-SDIP (0)	14.6	4.9	12.8
SDIP (1)	20.7	11.1	19.1
Total	17.5	7.7	15.8
(B) Percentage of Births Attended by Government Health Professionals			
Pre-SDIP (0)	21.2	8.4	18.9
SDIP (1)	28.5	15.4	26.3
Total	24.6	11.5	22.3

births delivered in government health facilities increased 2.3 times during the SDIP period.

A key assumption in DID is that, prior to the treatment, the trends (and not the levels) in outcomes should be similar across treatment groups. Figure S2 shows the trends over time in proportion of births delivered in government health facilities before and during SDIP. Prior to the SDIP, there is no significant difference in trend in the two treatment groups. We also control for the eligibility criteria (i.e., HDI) used for determining treatment of user-fee exemption. During the SDIP period, we see that proportion of births delivered in government health facilities increase in both treatment groups, but that the rise of the proportion of births is not remarkably different between the groups—formally tested using the probit DID model reported next.

Difference-in-Differences Model

We estimated a probit DID regression for each dependent variable, interacting the time period of the SDIP program with the two groups. Table 4 presents the average marginal effect of the intervention from the DID model and Table S2 presents the results of the probit model. Skilled birth attendance during the SDIP period was not significantly different across the two groups, and the added intervention of user-fee exemptions did not significantly increase skilled birth attendance. Specifically, although birth in a government health facility during the SDIP period appears higher in the

Table 4: Effect of the Intervention on Skilled Birth Attendance

	<i>Dependent Variables</i>	
	<i>Birth in Government Health Facility</i>	<i>Birth Attended by Government Health Professional</i>
(A) Raw DID		
Intervention Group*Time Period		
Intervention I & II*SDIP	0.0098 (0.0216)	0.0149 (0.0253)
(B) Full Model DID		
Intervention Group*Time Period		
Intervention I & II*SDIP	0.0168 (0.0210)	0.0245 (0.0237)
Observations	8,785	8,785

Notes. Standard errors (SE) clustered at the district level in parentheses.
Significance: *** $p < .01$; ** $p < .05$; * $p < .1$.

combined intervention group as compared to the CCT-only group, the estimates are not significant at the $p < 0.1$ level.

Household wealth is associated with higher likelihood of birth attended by a government health professional and birth in a government health facility. Women without any education or older women are less likely to seek skilled health workers for delivering their child. Women in urban areas are more likely to see skilled birth attendance. Births in districts that have better road networks are more likely to take place in a health facility and to be attended by a government health professional.

Subgroup Analysis

Table S3 presents the changes in birth attendance by type of facility, which shows that the changes in births across treatment groups during the intervention period are not significant in any type of health facility.

Table 5 presents subgroup analysis of the model by ease of geographic access. The dual intervention significantly increases births in public health facilities in areas with higher road density as compared to CCT-only program. In areas with better road networks, women who received the dual intervention are 7.12 percentage points more likely to deliver in government health facility compared to women who received only CCT and 8.03 percentage points more likely to deliver with the assistance of health professionals. The effect of

Table 5: Subgroup Analysis across Districts with Different Geographic Access

	<i>Subgroup by Road Density</i>			
	<i>Districts with Road Density < 10 km/100 km²</i>		<i>Districts with Road Density > 10 km/100 km²</i>	
	<i>Dependent Variables</i>			
	<i>Birth in Government Health Facility</i>	<i>Birth Attended by Government Health Professional</i>	<i>Birth in Government Health Facility</i>	<i>Birth Attended by Government Health Professional</i>
Intervention Group*Time Period				
Intervention	-0.0093	0.0049	0.0803**	0.0712*
I & II*SDIP	(0.0244)	(0.0282)	(0.0334)	(0.0393)
Observations	4,895	4,895	3,887	3,887

Notes. Standard errors (SE) clustered at the district level in parentheses. All regressions controlled for wealth index, mother's age at birth (linear and quadratic), mother's education, rural/urban, road density, and human development index.
Significance: *** $p < .01$; ** $p < .05$; * $p < .1$.

the dual intervention compared to only CCT across other subgroups of interest is insignificant (Table S4).

DISCUSSION

In Nepal, the risk of skilled birth attendance is significantly lower in rural areas and in districts with inadequate road networks. Implemented in 25 districts, the added intervention of user-fee exemption for delivery at health facilities was meant to alleviate some access barriers. However, we did not find a significant effect of the added intervention relative to the CCT-only group. This may be explained for several reasons.

If the treatment was porous across the two treatment groups, the DID estimates would be biased by spillover effects. However, the spillover of the treatment of one group on another is less likely in this assignment because the treatments were assigned by districts, and mostly in geographic blocks. The dual intervention would not have a significant impact over the CCT program if information about the user-fee exemption was not widely known in the dual intervention districts. In a survey conducted in six districts 2 years after SDIP was implemented, the investigators find that only a quarter of women had

knowledge of the program before giving birth (Powell-Jackson and Hanson 2012). These findings suggest that the lack of significant impact of the user-fee exemption program could be partially attributed to the lack of awareness of the incentive program. Moreover, implementation issues regarding delays in payments to the women and reimbursements to the health facilities may have also played a role in attenuating the impact of the intervention (Powell-Jackson et al. 2009a,b). A process evaluation of SDIP suggests incomplete but improving implementation of both the CCT to women and health workers as well as the institutional reimbursement to cover services exempted from user fees (Powell-Jackson et al. 2009b). Hence, our study's main effects should be interpreted as an intention to treat.

The cash size of the incentive from the user-fee exemption was generally smaller than that of the CCT. Borghi et al. (2006) found that financial costs of delivering in health facilities are indeed significant barriers to delivering in a health facility in Nepal, which may have been more adequately addressed by the larger CCT incentive, which was 3 percent of the average per capita income. Moreover, our study does not disentangle the distinct effects of CCT components—to the beneficiary and separately to the health worker.

Lack of geographic access seems to mediate the impact of dual intervention on skilled birth attendance. As shown in the subgroup analysis, conditional on adequate district-level road networks, the dual intervention significantly increased births in health facilities as compared to the CCT-only program. These results suggest that investments in infrastructure to increase road networks, or perhaps higher incentives to subsidize transport and opportunity costs are important policy measures that can increase skilled birth attendance in areas with inadequate geographic access. The road density variable may also capture other aspects of development of districts; that is, districts with a higher density of roads may also have more advanced infrastructure and economic activity which are not captured by the HDI.

There are no other studies to our knowledge that examine the role of geographic access mediating the effectiveness of user-fee removals and specifically for skilled birth attendance. In one literature review of user-fee policies, studies on user-fee removals did not provide results disaggregated specifically for skilled birth attendance or institutional deliveries as an outcome (Lagarde and Palmer 2011). User-fee exemptions may have differential impacts by population and service type. A study in Kenya found lower impacts of user-fee removals for women compared to men (Moses et al. 1992). A study in South Africa found larger impacts for curative rather than preventive services, though skilled birth attendance in South Africa is high (94 percent) compared

to Nepal (54 percent) over 2008–2015 (Wilkinson et al. 2001; WDI Reproductive Health table 2.17), whereas a study in Uganda found that user-fee removals led to an increase in outpatient but not inpatient services (Nabyonga et al. 2005).

The interventions attempted to increase skilled birth attendance by modulating three dimensions of access—affordability, accessibility, and availability. However, acceptability of skilled birth attendance could also be a major barrier to seeking care in health facilities. According to the Nepal DHS 2011 (Ministry of Health and Population [MOHP] [Nepal], New ERA, and Macro International Inc 2012), among women who did not deliver in a health facility in the last 5 years, 69 percent of them report that they did not deliver in a health facility because it was not necessary or customary. Furthermore, 40 percent of the births in the last 5 years were assisted by a relative or friend, and an additional 11 percent by traditional birth attendants (Ministry of Health and Population [MOHP] [Nepal], New ERA, and Macro International Inc 2012). Hence, the next iteration of policy interventions needs to address the acceptability and cultural barriers to increase skilled birth attendance.

The primary objective of increasing skilled birth attendance is the reduction in maternal and neonatal morbidity and mortality. However, the evidence of abolishing user fees or CCTs in improving health outcomes is mixed (Lagarde and Palmer 2008; Dzakpasu, Powell-Jackson, and Campbell 2014). If the incentive programs increase utilization but the health facilities are understaffed or overcrowded because of increased demand, then these policies are unlikely to improve maternal and neonatal health (Daponte, Guidozzi, and Marineanu 2000), or worse, such policies may be detrimental to health. Moreover, it remains to be seen whether skilled birth attendance will continue to rise at the pace observed in the study, or whether supply-side constraints will temper the growth in coverage.

Our results indicate large disparities in accessing delivery care across households by wealth. Poorest of the poor households are much less likely to have skilled birth attendance—suggesting perhaps a need for an intervention that specifically enables the poorest households to overcome the barriers to accessing maternal health. Clearly, to reach the poorest, targeting only districts will be inadequate; policies that address the poorest within districts are needed. SDIP initially imposed eligibility criteria based on obstetric complications or parity (for households with two or fewer living children), but this criteria was removed in 2007, when all women became eligible for SDIP conditional on their district of residence (Witter et al. 2011). It is worth

considering, however, to create eligibility criteria which target the poorest households who are least able to afford the high costs of delivery.

The final desired outcome of increased skilled birth attendance is reduction in maternal and neonatal mortality and morbidity, and our dataset is not adequately powered to detect effects on health outcomes. Nevertheless, since there were no significant impacts detected on the main utilization measures, it is unlikely that there were any changes in mortality.

Additionally, the place of child's birth was derived from the family's current place of residence. Therefore, if the child's actual district of birth is different from the current place of residence, then the estimated effect could be biased. If migration is random between the two treatment groups, then the estimates should not be biased by migration. However, if the migration is mostly rural to urban, which is most likely the case (Gurung 2012), then the births that took place in mostly rural dual intervention group will be attributed to the more urban intervention I group. Hence, the rural to urban migration will result in an underestimate of the effect of both interventions as compared to CCT-only program.

The estimated effect of the interventions across the two treatment groups could vary by differential quality, geographic distribution, and quantity of health facilities available. Women are unlikely to seek care even with the user-fee exemption if the quality of care received at the facility is low, or if there are no working health facilities nearby (Acharya and Cleland 2000). We lack data sources to capture differential quality of care across intervention groups.

CONCLUSION

Nepal has made considerable progress in maternal health over the past few decades. Skilled birth attendance has increased significantly over the SDIP period—proportion of births attended by a government health professional has increased from 18 percent pre-SDIP period to 26 percent during the SDIP period, suggesting that the SDIP program successfully increased utilization overall, though it remains to be seen whether skilled birth attendance will continue to rise at the pace observed in the study. Using an intent-to-treat and DID approach, we found that the added impact of user-fee exemption was not significant in increasing skilled birth attendance compared to the CCT-only program. Substantial progress remains to be made in reaching households that do not use skilled professionals for deliveries. Investments in district infrastructure to increase road networks in areas with inadequate geographic access,

and understanding and mitigating acceptability barriers to seeking skilled birth attendance are critical in increasing skilled birth attendance in Nepal.

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article:

Appendix SA1: Author Matrix.

Table S1. Percentage of Births by Different Facility Type.

Table S2. Impact of the intervention on Skilled Birth Attendance—Results from the Adjusted Probit Model.

Table S3. Subgroup Analysis—Effect of the Intervention across Different Locations of Delivery.

Table S4. Subgroup Analysis by Key Covariates.

Figure S1. Geographic Distribution of Treatment Groups (Government of Nepal 2005).

Figure S2. Trends in Births at a Government Health Facility across Two Treatment Groups.