

THE DEVIL IS IN THE DETAILS: RED DE PROTECCIÓN SOCIAL AND MATERNAL
HEALTH SERVICE UTILIZATION IN NICARAGUA

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By

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ABSTRACT

Conditional cash transfer (CCT) programs have been steadily gaining popularity as a policy tool for alleviating poverty through a cash benefit and conditions promoting human capital acquisition for children in order to break the intergenerational transmission of poverty. Due to their documented success at improving health and education outcomes, attention has turned to whether there are also positive externalities leading to other potential applications of these programs, and maternal health service utilization is one area of interest. Through the careful examination of CCT programs and their impact on maternal health service utilization policymakers can learn about which policies have an impact and use the knowledge to inform future program design. This analysis uses data from an impact evaluation of the pilot *Red de Protección Social* program in Nicaragua and follows the framework established by de Brauw and Peterman (2011) examining whether the program had a positive impact on four components of maternal health service utilization: prenatal care, skilled presence at birth, institutional birth and postnatal care. The results of an OLS regression and a difference in difference regression show that the program had no significant impact on any of the outcomes of interest. This suggests that general CCT programs might not improve maternal health outcomes and future research on the mechanisms through which CCT programs impact maternal health service utilization is needed.

The research and writing of this thesis is dedicated to my parents for their generosity, support and encouragement every step of the way. Thank you for all of the opportunities you have provided for me and for making me the person I am today.

KATHRYN E. STEINGRABER

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INTRODUCTION

Conditional cash transfer (CCT) programs have been steadily gaining popularity as a policy tool for alleviating poverty through a cash benefit and conditions promoting human capital acquisition in order to break the intergenerational transmission of poverty. These programs have spread throughout the developing world since they first appeared with *Progres*a (later renamed *Oportunidades*) in Mexico in 1997 and *Bolsa Familia* in Brazil in 2003. The World Bank has financed CCTs in 13 countries; during 2009 alone the World Bank provided US\$2.4 billion in lending to scale up and start CCT operations. Nancy Birdsall, president of the Center for Global Development was quoted as saying “these programs are as close as you can come to a magic bullet in development”^a. While there are mixed views on the comparative advantages of CCT programs, in a review of CCT programs worldwide Fiszbein & Schady (2009) report that in general, these programs consistently increase school enrollment and attendance and promote growth and weight gain in children as well as increased health center visits^b.

Improved maternal health is an area that policymakers in developing countries are focusing on and research on whether CCT programs can stimulate demand for maternal health care is developing. According to the United Nations Development Programme (UNDP), most maternal deaths could be avoided as more than 80% are caused by treatable conditions such as hemorrhage, sepsis, unsafe abortion, obstructed labor and hypertensive diseases associated with pregnancy. Focus on the efforts to improve maternal health is on increasing prenatal care in order to identify possible risks and treat harmful conditions that present early and throughout

^a Dugger, C. (2004, January 03). To help poor be pupils, not wage earners, Brazil pays parents. *New York Times* [online] retrieved March 8,

^b For a lengthier discussion of social welfare programs see Appendix A.

pregnancy. Additional attention is focused on efforts to increase institutionalized birth, skilled presence at birth, and postnatal care. These efforts address issues that occur during the birth process that can be handled in a clinical environment with skilled practitioners but not in a home birth setting and ensuring that newborns and mothers receive adequate care after birth. In addition to being in a health category of its own, is deeply tied to infant and child health and an important component of poverty reduction strategies that focus on health. Thus a relevant question is the degree to which CCTS have made inroads in achieving the goal of increasing maternal health service utilization.

Due to their documented success at improving health and education outcomes for children, attention has turned to other potential applications of these programs. Maternal health care utilization is one area targeted for additional research and program expansion. Because of their success stimulating demand for health care for children, CCT programs are a natural fit for improving maternal health. Though not designed to directly impact maternal health utilization, there is good reason to think a CCT such as *Red de Protección Social* (RPS) might indirectly impact health-seeking behaviors for pregnant women. It is important to note that while some CCT programs do have conditionality components for pregnant women, to date in Latin America there has not been a CCT program with the primary goal of increasing maternal health care utilization, as there has been in Nepal and India. Research on the impact of CCTs and maternal health is growing with availability of new data and as policy makers realize the potential for these programs to improve maternal health outcomes. This analysis examines whether a CCT program had any spillover effects, or externalities that positively impacted maternal health care utilization. By breaking down program conditionality components and comparing CCT

programs throughout the world in terms of their impact on maternal health care utilization, policymakers can learn about whether CCTs are already having a positive impact, which suggests that their design may just need to be tweaked. Conversely, in order to see an impact on maternal health utilization it is possible that a specifically tailored set of interventions may be required.

This analysis uses multivariate regression to determine whether the *Red de Protección Social* (RPS), the government CCT program in Nicaragua that was in place from 2000 – 2005, had a positive impact on maternal health care utilization as measured by prenatal visits, skilled attendance at birth, birth in a medical facility and postnatal care.

This paper is organized as follows: Section 2 discusses background information on maternal health statistics in Nicaragua and gives an overview of the RPS program. Section 3 reviews relevant literature on maternal health services utilization and maternal health and CCT programs. Section 4 gives a conceptual framework for how CCT programs might impact maternal health care utilization. Section 5 discusses data and methodology, describing an Ordinary Least Squares (OLS) regression and a difference in difference estimation strategy. Section 6 gives descriptive statistics. Section 7 presents results while section 8 concludes with policy implications and suggestions of areas for future research.

2. BACKGROUND

2.1 Maternal Health in Nicaragua

Nicaragua is one of the poorest countries in Central America; in recent history Nicaragua has experienced political unrest, dictatorships, military intervention by the United States, fiscal crisis and natural disasters. In 2010 Nicaragua had the second lowest GDP per capita in the region at USD\$3000, the only country with a lower GDP per capita was Haiti^c. In 2010 the population was approximately 5,788,000. In 2003, when the RPS program was still in place, Nicaragua ranked 112 on the Human Development Index (HDI) out of 177 countries^d, by 2011 Nicaragua ranked 129 out of 183 countries^e. In comparison with neighboring countries in 2011, Nicaragua had a higher HDI than Guatemala, but a lower HDI than both Costa Rica and Honduras. The 2008 poverty rate in Nicaragua was 46%, but poverty is much more prevalent in rural areas with 65% of poor and 80% of extreme poor living in rural areas^f.

One of the Millennium Development Goals (MDG) for Nicaragua is to lower the maternal mortality ratio to 22 deaths per 100,000 live births by 2015. Nicaragua is not on track to meet that goal, with an actual maternal mortality ratio in 2005 of 95.7 and a projected 2015 maternal mortality ratio of 80.3^g. Nicaragua has the highest percentage in Latin America of young women aged 15 – 19 with at least one child, followed by Guatemala. Maternal health care utilization statistics vary across rural and urban populations. In 2005^h (2001 statistics reported in parenthesis), 92.5% (88.6) of pregnant women in Nicaragua received prenatal care. Of women

^c Indexmundi

^d World Bank Human Development Report 2005

^e UNDP

^f World Bank Nicaragua Poverty Assessment 2008

^g Ibid

^h World Bank Nicaragua Poverty Assessment 2008

living in urban areas, 96.1% (91.3) received prenatal care with an average number of 6.5 visits (6.0). In comparison, 88% (85.3) of women living in rural areas received prenatal care with an average number of 5.5 (5.2) visits. Also in 2005, 19.8% (27.4) of women in Nicaragua had a non-institutional birth. Here the urban/rural differential is striking, with only 4.4% (14.7) of urban women having non-institutional births compared to 38.9% (42.7) of rural women. In terms of skilled attendance at birth, 78.1% (70.5) of women in Nicaragua had their birth attended by a doctor and again the urban/rural differential is apparent with 93.6 % (83.5) of rural women reporting births attending by a doctor compared to 59% (54.7) of their rural counterparts. A comparison of 2001 and 2005 statistics show that maternal health care utilization is increasing in all three categories (the report did not include postnatal care statistics) and also in both rural and urban areas, however Nicaragua lags behind the region and as mentioned before, is not predicted to be on track to meet the MDG of reducing the maternal mortality ratio to 22.

2.2 Red de Protección Social Life Cycle

Typical of a CCT program, the *Red de Protección Social* (RPS) program was designed address both immediate and long run poverty through incentivizing human capital acquisition in children through cash transfers delivered to targeted poor households in rural Nicaragua (Maluccio and Flores 2005). Specific objectives were tied to conditions designed to: increase expenditures on food; reduce dropout rates during the first four years of primary school; and increase the health-care and nutritional status of children under age five. The five-year program was implemented in two phases, starting in 2000. The pilot phase lasted three years and had a budget of US\$11 million, approximately 0.2 percent of Nicaragua's GDP and 2 percent of annual government spending on health and education. Funding for RPS by the Inter-American

Development Bank was conditional on external evaluation; this analysis is based on data gathered as part of that effort. Based on the success of the pilot program, a second phase expanding the program was approved in late 2002 with a budget of US\$22 million. Despite its success at achieving the desired outcomes, the program was not renewed in late 2005 for political reasons (Moore 2009).

2.3 Targeting

This analysis will look at data compiled on the households targeted during the pilot phase of the program. The pilot program focused on the rural departments of Madriz and Matagalpa from the northern central region, selected because these departments saw worsening poverty during a time period when poverty in the country was decreasing and had high rates of poor and extremely poor segments of the population¹. According to census data, Madriz and Matagalpa were designated high poverty departments, a categorization used by the Nicaraguan government that takes into account all the municipalities, districts, or counties that are above the second quartile but below the third quartile of households that are in extreme poverty. Two other departments (in addition to Madriz and Matagalpa) share this designation. There are four departments in Nicaragua (out of a total of 17 departments) that have a more severe poverty designation than Madriz and Matagalpa. These two departments were also selected because they offer easy access to Managua where the program was headquartered and strong institutional capacity and health and education coverage (Maluccio and Flores, 2005).

¹ In 1998 80% of the population in these departments was poor, half of this ratio was also extremely poor (IFPRI 2002).

RPS next used six municipalities that were part of a prior participatory development program, and then created a marginality index^j at the *comarca*^k level. Based on this index, 42 *comarcas* were selected for participation in the program. These *comarcas* were then randomly selected into control or treatment groups, leading to a stratified random sample.

2.4 Demand Side Components

There were three demand side transfers at the household level; a *bono alimentario* or “food security transfer”, a *bono escolar* or “school attendance transfer and a *mochila escolar* or “school supplies transfer”. The food security transfer amounted to Córdoba (C) \$2,880 (US\$224)^l per household per year and was given to all targeted beneficiary households, conditional upon bringing children under the age of 5 for preventative health-care appointments and attendance at educational workshops that were held every other month. These workshops typically had 20 participants and covered topics including household sanitation and hygiene, nutrition, and of particular interest for this analysis, breastfeeding and reproductive health. The school attendance transfer amounted to C\$1,440 (US\$112) per household per year and was given to all targeted beneficiary households with children ages 7 – 13 who had not yet completed fourth grade. The school supplies transfer of C\$275 (US\$6) per child at the beginning of the school year contingent on enrollment.

^j More information on how this index was calculated is in Appendix B.

^k Comarcas are administrative areas within municipalities that include between one and five small communities averaging 100 households each (IFPRI 2005).

^l All equivalents in USD are given using the September 2000 exchange rate of C\$12.85 to US\$1.

2.5 Supply Side Components

In order to meet the increased demand the program generated on the health and education sectors, supply side benefits were implemented. In the health sector RPS trained and paid private healthcare professionals to provide the health care checkups and training workshops mandated in the conditionality component of the program. The amount paid to these health care providers was substantial; US\$50 was spent annually, per beneficiary, for the education workshops and US\$110 was spent annually for health care services for children under five, including the value of vaccines, medication, vitamins, etc. which were provided by the ministry of health (Maluccio and Flores 2005).

2.6 Red de Protección Social Results

According to the impact evaluation this program had “positive and significant effects on a broad range of outcomes” (Maluccio and Flores 2005). Notably, RPS increased average annual per capita household expenditures by 18 percentage points, and most of this increase was spent on food. Average school enrollment for seven – thirteen year olds who had not yet completed grade four increased 12.8 percentage points; average attendance rate for the same group increased an average of 20 percentage points. Health center visits for children increased on average 16 percentage points. Child labor force participation decreased by 4.6 percentage points for the seven – thirteen year old targeted age group, possibly indicating that children are staying in school instead of working outside the home.

In sum, this program increased expenditures on food, increased average enrollment for targeted school-aged children and increased health center visits for children five and under. It also improved health care services available to families as measured by process indicators.

Household diet improved and consequently nutritional status of beneficiary children under five increased as well. This program was considered successful at achieving targeted goals at a time when Nicaragua was not on schedule to meet these poverty reduction goals. After reporting the positive effect the program had, the RPS impact evaluation suggested “RPS could prove to be an important component of Nicaragua’s overall poverty reduction strategy” (Maluccio and Flores 2005). However, to date there has been no exploration of possible externalities in maternal health care utilization as a result of RPS.

Outside of the intended outcomes impact evaluation has uncovered the following program effects: average adult labor force participation for men as measured by hours worked in the past week decreased by 5.5 hours, significant at the 10% level; change in hours worked for women was not significant.

3. LITERATURE REVIEW

3.1 Conditional Cash Transfer Programs and Associated Externalities

There has been much research on externalities associated with means tested transfer programs in Latin America. Similarly, researchers have been examining whether CCTs create perverse incentives such as reduced labor force participation or increased fertility. In an analysis measuring the impact that three CCT programs had on fertility Stecklov et. al (2006) found that *Oportunidades* and *RPS* had no significant impact on fertility but the *Programa de Asignación Familiar* (PRAF) in Nicaragua had a positive impact on fertility which the authors attributed to specific features of program design. Research has also turned to whether these programs have positive externalities such as decreasing domestic violence or child labor. Research investigating the theory that giving increased economic power to women (transfers are usually disbursed to women heads of household) would reduce the occurrence of domestic violence was conducted on the *Oportunidades* program by Bobonis, Castro and Gonzalez-Brenes (2009) and Bobonis and Castro (2010). They found that in an analysis looking at short run estimates, acts of physical violence decreased in treatment households by 29 – 55 percent, significance for these results range from 5 to 10%. However, when examining additional years of data the results did not hold and in the long run abuse rates do not significantly vary between treatment and control households.

Research on *Oportunidades* in Mexico by Skoufias and di Maro (2006) found the program had no significant effects on adult labor force participation. The same result of no significant effect on adult labor force participation for program participants was found by

Edmonds and Schady (2008) for the *Bono de Desarrollo Humano* program in Ecuador and by Filmer and Schady (2009) in Cambodia.

Examining the unintended outcomes that occurred as a result of the implementation of these programs has implications for program design as policymakers consider expanding the CCT model to achieve different outcomes including improvements in maternal health through stimulating demand for maternal health service. The next section will explore literature on maternal health service utilization and the following section will review research on CCT programs and maternal health.

3.2 Maternal Health Service Utilization

Maternal health service utilization is key to improving maternal health outcomes. In a desk review of CCT programs in Latin America Morris (2009) points out that there is “indisputably a problem with weak demand for health services in pregnancy and childhood in Latin America and the Caribbean” (Pg. 223). The importance of service utilization can also be seen in the literature on maternal mortality. In their qualitative analysis of a framework for analyzing the determinants of maternal mortality McCarthy and Maine (1992) describe the distant and intermediate determinants of maternal mortality. The distant factors are socioeconomic and cultural factors and the intermediate determinants are health status, reproductive status, access to health services, and health care behavior/use of health services (Figure 1). Research on what McCarthy and Maine deem distant determinants has shown that there are indeed various cultural and socioeconomic factors that impact maternal health care service utilization (Addai 2000 and Abor et al. 2009). A recent study on maternal health care in Latin America found similar socioeconomic determinants of utilization of prenatal care (Jewel

2009). His analysis on demand for prenatal care in South America found that age, previous pregnancies, education, marital status, household wealth, and degree of wantedness of child all had significant impacts on whether a mother obtained adequate prenatal care. Wong (2010) found that marital status had a significant impact on type of delivery; with unmarried women more like to seek institutionalized care in Guatemala. Overall, the vast majority of women in Latin America receive prenatal care during pregnancy, typically beginning their visits early in pregnancy and completing a high number of visits, however the quality of care received is low (Morris 2009). Overall, the literature shows that prenatal care, skilled presence at birth and postpartum care are important for the health of mother and baby and can help drastically lower mortality and morbidity rates in line with the Millennium Development Goal (MDG) for maternal health.

3.3 Maternal Health Service Utilization and Conditional Cash Transfer Programs

The emerging research on CCTs designed with the purpose of impacting maternal health service utilization shows mixed results. Lim et al. (2010) evaluated the *Janani Suraksha Yojana* (JSY) conditional cash transfer in India that provided a one time cash transfer after women gave birth in a qualifying facility and found a positive impact on pre-natal care, institutionalized birth, skilled presence at birth and a reduction in the number of neonatal and perinatal deaths. Another CCT aimed at increasing institutionalized births was not as successful. Nepal's Safe Delivery Incentive Programme (SDIP) provided cash to women who gave birth in a health facility as well as offering an incentive to health care providers. Unlike JSY this program had a weak impact on institutional births, Powell-Jackson et al. (2009) attribute this to inadequate institutional capacity and low uptake.

Additional research on maternal health and CCTs focuses on the CCT programs in Latin America that have some component that addresses maternal health. This literature shows that these interventions also have had mixed results. There are a number of maternal health indicators that are typically targeted; antenatal (or prenatal) care, skilled attendance at birth and birth in a medical facility. An evaluation of *Oportunidades* found a 12.2 percent increase in use of prenatal care for beneficiaries when analysis focused on a quality of care index (Barber and Gertler 2009). Other evaluations of *Oportunidades* have focused on delivery; Urquieta-Salomon et al. (2009) found minimal impact on skilled attendance at birth for beneficiaries. In contrast, Sosa-Rubi et al. (2011) found that younger demographics (women less than 24) have a significantly higher likelihood of choosing a skilled medical professional over traditional midwife. A recent paper analyzed a range of maternal health impacts related to the *Comunidades Solidarias Rurales* program in El Salvador. The analysis by de Brauw and Peterman (2011) looked at a range of maternal health outcomes (adequate prenatal care, birth in a medical facility, skilled presence at birth and adequate post natal care) and was the first to analyze a range of outcomes in relation to a CCT program in Latin America. Their analysis used regression discontinuity design and found that the program had robust impacts on skilled presence at birth and birth in a medical facility, but no impacts on prenatal and postnatal care utilization.

Figure 2 compiles recent CCT programs in terms of transfers directed at pregnant women, conditionality requirements and impact. Comparing outcomes of these programs even when maternal health was not the main component of the program can help policymakers determine which mechanisms have an impact on maternal health outcomes.

Table 1: Impact of CCT programs on maternal health service utilization in Latin America

Program	Bolsa Alimentação/ Bolsa Família ^m	PRAF-II ⁿ	Progresa/ Oportunidades ^o	CSR ^p	RPS I ^q
Country	Brazil	Honduras	Mexico	El Salvador	Nicaragua
<i>Benefits for pregnant women</i>					
Transfer	Transfer for pregnant and lactating women	Transfer for pregnant women	Grant for food consumption for pregnant women	Transfer for pregnant women	Transfer for all eligible households ^r
Supplements			Nutritional supplements for pregnant and lactating women		
Medical Care			Free pre-natal and delivery care		
<i>Conditions for pregnant women</i>					
Health center visits	Regular attendance at prenatal health checkups	Regular attendance at prenatal health checkups	Pre and post natal health checkups	Pre-natal monitoring for pregnant women	N/A ^s
Education component	Regular attendance at health and nutrition education workshops		Regular attendance at nutrition and health education lectures	Regular attendance at nutrition and health education lectures	Regular attendance at nutrition and health education lectures
<i>Impact</i>					
Prenatal care	Increased	Not measured ^t	Increased when measured in terms of quality of care index	No impact	
Skilled attendance at birth	Mixed results	Not measured	Little impact (younger demographic groups more likely to seek skilled attendance)	Positive impact	
Birth in medical facility	Not measured	Not measured	Not measured	Positive impact	
Postnatal care	Decrease in perinatal deaths	Not measured	Not measured	No impact	

Source: Author's compilation

^m Hodinott, 2009.

ⁿ Ibid.

^o Ibid.

^p de Brauw and Peterman, 2011.

^q Maluccio and Flores, 2005.

^r Transfers were available for all households, there were no specific transfers directed towards pregnant women nor conditionality components for pregnant women. Transfers and conditionality components depended on number and age of children in the household.

^s A condition for pregnant women was added to RPS II.

^t PRAF II was found to lower maternal mortality rates, but the program did not measure the outcomes of interest for this analysis.

Table 2: Impact of CCT programs designed to improve maternal health

Program	JSY^u	SDIP^v
Country	India	Nepal
<i>Benefits targeted at pregnant women</i>		
	Cash transfer to pregnant women after birth	Cash transfer to pregnant women after birth (and incentives for health providers)
		Free health care for pregnant women
<i>Conditions for pregnant women</i>		
	Delivery in a government health facility or accredited private health facility	Delivery in a public health facility
<i>Impact</i>		
Prenatal care	Positive impact	Positive impact
Skilled attendance at birth	Positive impact	Positive impact
Birth in medical facility	Positive impact	Positive impact
Postnatal care	Not measured	Neonatal and Perinatal deaths decreased

Source: Author's compilation

The question becomes, do CCTs need specific conditions targeted at women to positively impact maternal health, or can a “regular” CCT without these specific conditions still achieve these impacts. This analysis adds to the literature on maternal health and conditional cash transfer programs through an examination of whether, over and above the documented intended impacts on child education and health, the *Red de Protección Social* program had any impact on maternal health service utilization.

^u Lim, 2010..

^v Powell-Jackson et al, 2009.

4. CONCEPTUAL FRAMEWORK

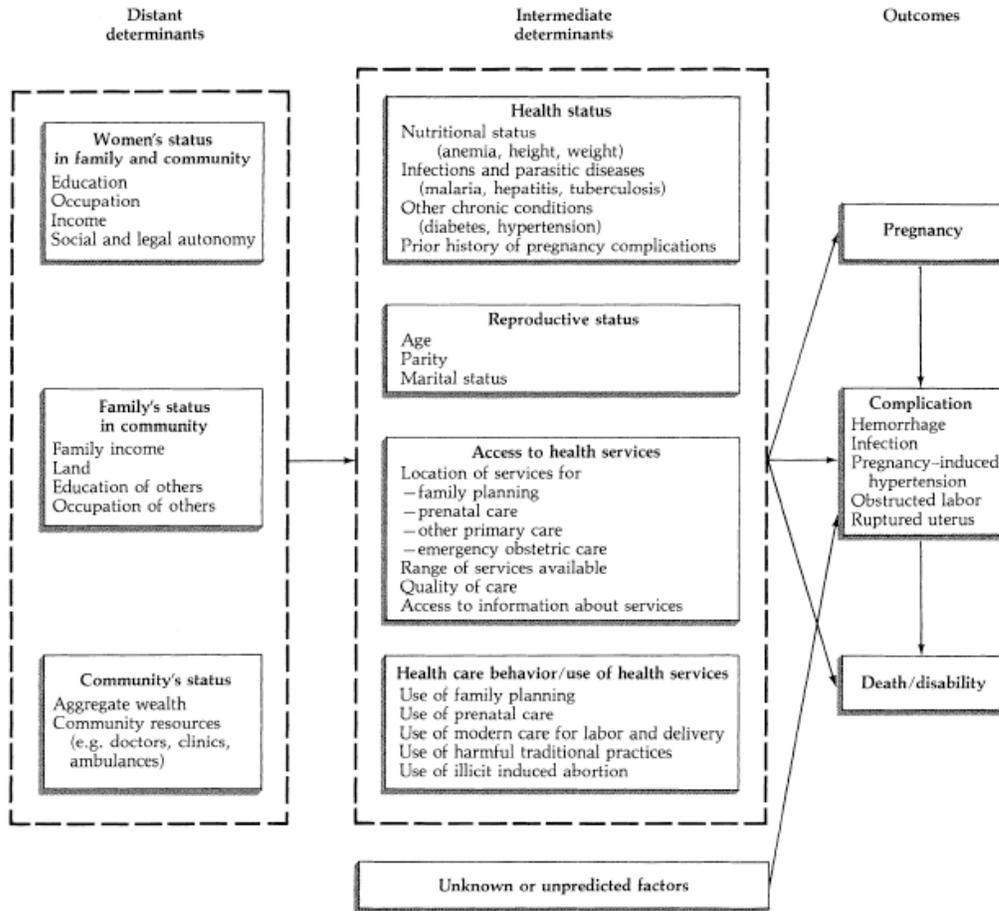
4.1 Proposed Hypothesis

Based on conflicting evidence presented in previous research, it is not clear whether a CCT need include specific maternal health utilization conditions or whether a standard CCT offers adequate incentives to stimulate increased demand for these services. This paper asks the following question: *Did the Red de Protección Social conditional cash transfer program have a positive impact on maternal health for beneficiaries in Nicaragua over four categories: prenatal care, skilled attendance at birth, birth in a medical facility and postnatal care?*

4.2 Theoretical Framework

This analysis follows the model established by de Brauw & Peterman (2011) examining four specific maternal health indicators: 1) adequate pre-natal care 2) presence of a skilled birth attendant 3) giving birth in a medical facility and 4) adequate post-natal care. Though most CCT programs are not intended to improve maternal health outcomes directly, the programs are typically designed in a way that can promote positive health outcomes for pregnant women and their babies. Conditional cash transfer programs work through stimulating and incentivizing demand, and in some cases providing a complementary increase in supply. Referring back to the framework established by McCarthy and Maine (see figure 1), the role of CCT programs enter into the framework as an intermediate determinant, both as a mechanism to increase access to health services and use of health services.

Figure 1: A detailed framework for analyzing the determinants of maternal mortality and morbidity

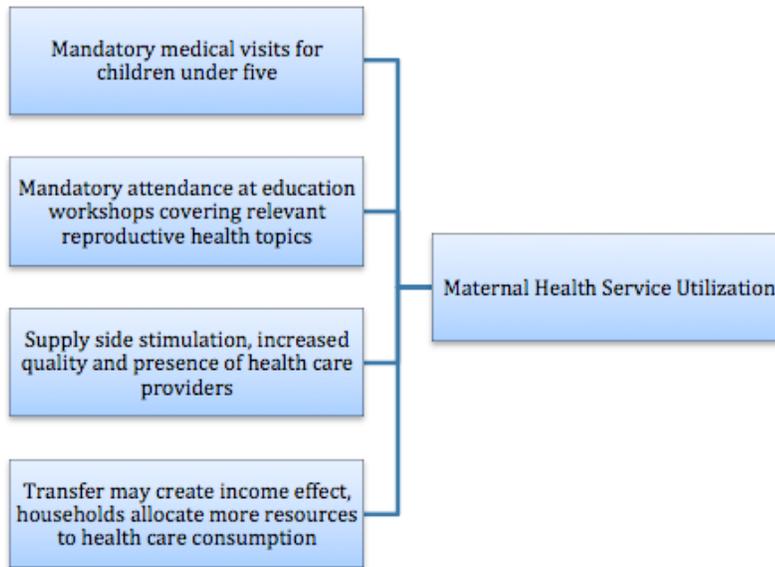


Source: McCarthy and Maine (1992)

There are multiple ways through which the CCT programs might have this effect. First, demand for maternal health care might be stimulated through the conditionality component of the program. In the case of RPS, mothers have to bring children under age five for preventative medical visits and any newborns will be affected by this requirement improving indicators for maternal health outcome 4) listed above. Second many CCTs (including RPS) required women

to attend educational workshops that cover various health related topics including breastfeeding and reproductive health. Increased exposure to these workshops provides more information to mothers and may positively influence their maternal health decisions leading to increases in some or all of the following outcomes: pre-natal care, presence of a skilled birth attendant and giving birth in a medical facility. Third, supply-side stimulation may have occurred as the quantity and possibly quality of health care providers increases as a result of CCT programs. In the case of RPS the Nicaraguan government trained and hired outside NGO health professionals to meet additional demand. In contrast, El Salvador, took a different approach and simultaneously made significant improvements to their health care system, this could have attributed to the increased maternal health care service utilization that the program saw (de Brauw and Gilligan 2011). Fourth, as noted by de Brauw & Peterman (2011) it is possible that the conditional cash transfer has an income effect, leading to increased health care utilization and consequently improved maternal health indicators. Figure 2 maps out the possible pathways through which CCT programs might increase maternal health service utilization.

Figure 2: Pathways for increasing maternal health service utilization as an externality of CCT programs



4.3 Research Design

Four distinct maternal health utilization indicators will be measured: prenatal care, skilled attendance at birth, birth in a medical facility and postnatal care. Model specification follows.

Maternal Health Indicator = $f(T_i, I_i, E_i, M_i, A_i, L_i, F_i, P_i)$, where each indicator is a function of:

T_i = Participation in the RPS program

I_i = Income

E_i = Years of Education

M_i = Marital Status

A_i = Age in years

L_i = Previous live births

F_i = Free pregnancy exams

P_i = Poverty index of village

Independent Variable of Interest

Program effect on beneficiaries will be reflected in the variable *treat*. Women that received the benefit are assigned a value of one, women that did not are assigned a value of zero.

Other Independent Variables

The *income* variable comes from a household wealth component of the survey; for this analysis income is reflected by the measure of log of per capita annual expenditures as reported by survey respondents. *Education* will be measured categorically: indicator variables are constructed to measure responses to a question about highest level of education achieved and are broken down into no education, completed primary education and completed secondary education. According to the construction of the *marital status* variable in Wong (2010), marital status is measured in terms of whether a woman has ever been married and is also an indicator variable, taking a value of one if responded that they are married, separated, divorced or widowed and a value of zero for all other responses. The number of *previous live births* (in the past five years) is a continuous variable. *Free* access to prenatal care is an indicator variable which reflects that a woman responded that they did not pay for pre-natal exams. Finally, the index variable reflects the poverty *index* given to the community (see appendix for how this was constructed).

Ideally, this analysis would include variables on wantedness of pregnancy (Jewell 2009) and distance to health facility, but as this data was not collected as part of the survey it cannot be included. The wantedness of pregnancy information would be particularly valuable for this

analysis as Nicaragua has the highest number of unplanned pregnancies in the Latin America region with one out of three live births unplanned^w. While distance to health facility is not included in the survey data and thus cannot be included in the regression analysis, there is some general data on average distance to health facility for Nicaragua; in 2005 the average distance to a health center for urban areas was 0.9 km and 14.7 minutes^x; for rural areas like Matagalpa and Madriz, the average distance to a health center was 5.4 km and 66.2 minutes^y.

First this analysis will use an Ordinary Least Squares (OLS) regression to parse out the effect of the program while controlling for other variables that explain maternal health care utilization as described in the literature review. The OLS regression will be on data from the 458 women in the 2002 subsample that has been narrowed to only include women that reported births after the start of the program in 2000. Using this method allows the analysis to compare women in the treatment group with women in the control group and is an appropriate method as these women were randomly assigned into the program.

In addition to the OLS regression, this analysis will also use a difference in difference estimation to account for differences between treatment and control groups across time using the baseline data collected in 2000 before implementation of the program and data collected in 2002 for the impact evaluation. This approach subtracts the difference in the outcome variable (in this case one of the four maternal health indicators) in the control group from the difference in the treatment group. This is equivalent to comparing the difference across time through comparing the difference between treatment and control in 2000 to the difference between control and

^w World Bank Nicaragua Poverty Assessment 2008.

^x Ibid.

^y Ibid.

treatment in 2002. Using a difference in difference isolates the effect of the program through using the changes across time in the control group as a proxy for change across time in the intervention group not due to the program. The difference is then contributed to the average effect of the program and can be attributed to the policy (see Tables 3, 4, and 5).

Table 3. Difference in Difference Estimation

	Treatment	Control	Percentage Point Difference
Baseline 2000	I_0	C_0	$I_0 - C_0$
Follow-up 2002	I_1	C_1	$I_1 - C_1$
Difference	$I_1 - I_0$	$C_1 - C_0$	$(I_0 - C_0) - (I_1 - C_1)$ Difference in Difference Estimation

Table 4. Construction of Difference in Difference Analysis

$$\text{Maternal Health Indicator (Y)} = \beta_0 + \beta_1(2002) + \beta_2(\text{Treat}) + \beta_3(2002*\text{Treat}) + e$$

Average Outcome	Before (2000)	After (2002)	Difference
Control	β_0	$\beta_0 + \beta_1$	β_1
Treatment	$\beta_0 + \beta_2$	$\beta_0 + \beta_1 + \beta_2 + \beta_3$	$\beta_1 + \beta_3$
Difference	β_2	$\beta_2 + \beta_3$	β_3

Table 5. Interpreting Difference in Difference Coefficients

Maternal Health Indicator (Y) = $\beta_0 + \beta_1(2002) + \beta_2(\text{Treat}) + \beta_3(2002*\text{Treat}) + e$

Independent Variable	Definition	Interpretation	Group Represented
Constant/None (β_0)	Baseline	Average Y for control households in 2000	Control, Year 2000
2002 (β_1)	Indicator variable for year of program. Takes value of 1 if year=2002 (post-program) and value of 0 if year = 2000 (pre-program)	Change in Y due to time effects; Difference in Y in the control group from Year 2000 to year 2002	Control, Year 2002
Treat (β_2)	Indicator variable for treatment group. Takes value of 1 if assigned to treatment group, takes value of 0 if not assigned to treatment group.	Change in Y for treatment group compared to control group in 2000	Treatment, Year 2000
2002*Treat (β_3)	Interaction term for year and treatment group. Takes value of 1 for treatment households in year 2002, takes value of zero for all other households.	Change in Y for treatment group in 2002, captures post program treatment effect on Y	Treatment, Year 2002

5. DATA AND ANALYSIS

5.1 Data Source

The data for this analysis comes from a quantitative impact evaluation carried out by the International Food Policy Research Institute (IFPRI) in conjunction with the Inter-American Development Bank and the Nicaraguan government^z. Although the RPS program ran from 2000 – 2005, only data from phase one (which ended in 2002) will be used for this analysis because it is the only data set publicly available on this program. As mentioned in section 2.3 the pilot program was targeted at *comarcas* with high poverty levels in the rural regions of Matagalpa and Madriz. The 42 *comarcas* selected for participation were randomized into treatment and control groups. For the OLS regression, this analysis will use data from the last follow up interview of phase one which took place in 2002. From the 1,397 households that completed the interview a subsample of consisting of 458 women with children born between 2000 and 2002 was constructed^{aa}. For the difference in difference analysis a subsample of 932 observations was added to the 2002 sample for comparison for a total of 1,390 observations.

5.2 Analysis

The model is run separately for four distinct dependent variables representing: ***Adequate prenatal care***, defined using World Health Organization guidelines that recommend a minimum of four prenatal visits. This variable is constructed using responses to a question about

^z Data available here: <http://www.ifpri.org/dataset/nicaragua>.

^{aa} The survey for 2002 had a question about when the most recent child was born, Baseline surveys from 2000 did not have this question. The 2000 survey asked whether a woman had a child in the past 5 years, so results for the difference in difference analysis may be underestimating program effect (if any) as they include babies born in 1998 and 1999, before the program started.

how many prenatal visits a woman had and takes a value of one if the woman had at least 4 prenatal visits, and a value of zero if the woman had less than four prenatal visits.

Presence of a skilled attendant at birth, was constructed in response to the question “who attended your last birth?” Women that respond that a gynecologist, doctor, or nurse attended their birth were given a value of one, and women reporting any other type of attendant at birth such as midwife or other, were given a value of zero. For this analysis midwives were not considered part of the skilled presence at birth category not because they are thought to be inappropriate birth attendants but rather because there is no information in the survey about whether the midwives received formal training (in order to be considered skilled) or whether they are traditional indigenous midwives or midwives without formal training.

Birth in a medical facility, was created in response to the question “where did you give birth?”.

Women that responded that they gave birth in MINSA (health ministry) hospital or private hospital were categorized as having given birth in a medical institution and assigned a value of one. Women that respond that they gave birth at a health center, an NGO in a midwife’s house or in their own house were categorized as not having given birth in a medical institution and given a value of zero.

Adequate postnatal care, was constructed using the answer to a question about whether the baby had a medical checkup within 40 days of being born. Respondents who answered that the baby had a medical checkup within 40 days were assigned a value of one; women who responded that the baby had not had a medical checkup within 40 days were assigned a value of zero. This

question only appears in the 2002 questionnaire, and as such will only be addressed in the OLS regression, not in the difference in difference estimation.

6. DESCRIPTIVE STATISTICS

Before running the models to determine program impact, the treatment and control groups (from both the 2000 and 2002 surveys) are compared across a range of characteristics to assess whether there were any significant differences across two groups that could account for any differences in program impact. The results are found in Tables 6 and 7 below:

Table 6: Descriptive Statistics on Sample used for Difference in Difference Analysis

Variable	RPS Control	RPS Treatment	P value on difference of means test
<i>Dependent Variable</i>			
Adequate prenatal care	78%	79%	0.622
Skilled presence at birth	40%	37%	0.561
Institutional birth	32%	26%	0.118
<i>Independent Variables</i>			
mean age	28.34	27.9	0.448
percentage ever married	45%	41%	0.245
average log per capita annual income	7.86	7.88	0.781
average community poverty index	80.66	81.09	0.85
average number of children born in the past five years	4.28	4.16	0.595
average number of prenatal appointments	4.79	4.88	0.689
mean poverty level index of community	80.72	81.7	0.850
house has electricity	21%	22%	0.710
owns home	19%	26%	0.066
observations	458	474	932

Table 7: Descriptive Statistics for 2002 Sample for OLS Regression

Variable	RPS Control	RPS Treatment	P value on difference of means test
<i>Dependent Variable</i>			
Adequate Prenatal Care	73%	75%	0.761
Skilled Presence at Birth	53%	46%	0.367
Birth in a Medical Facility	34%	29%	0.408
Postnatal Exam Within 40 days	24%	24%	0.989
<i>Descriptive Statistics</i>			
mean age	26.38	27.23	0.257
percentage ever married	49%	43%	0.131
percentage no education	35%	38%	0.692
percentage primary education	60%	59%	0.856
percentage secondary education	5%	3%	0.440
percentage can read/write	57%	52%	0.400
percentage cannot read/write	42%	45%	0.620
average log per capita annual income	7.61	7.95	0.008
average community poverty index	80.72	81.69	0.70
average number of children born in the past five years	3.69	3.74	0.888
average number of prenatal appointments	4.79	4.88	0.815
mean poverty level index of community	80.72	81.7	0.702
house has electricity	17%	23%	0.438
owns home	22%	23%	0.813
observations	248	210	458

An analysis of the descriptive statistics for subsample of 458 women for the OLS regression shows that treatment was effectively randomized, based on the p values on the test of a difference of means for variables of interest. The only exception is the percentage of respondents that own their own home. This difference could be due to titling requirements and regulations or other outside factors. Table 6 does not include certain variables because the 2000 sample is missing data for many observations for education and literacy information. However, this is not a significant concern as most of the women in the sample are past the phase in their life when they obtain education so the 2002 education and literacy statistics can be generalized as representative of the 2000 sample and are dropped from the difference in difference model as they would fall out of the model as a fixed effect anyway.

An analysis of the subsample of 932 women used for the difference in difference analysis shows that the treatment and control groups are similar as well. The difference between treatment and control group for the key maternal health care utilization outcomes of interest is not significantly different from zero. The only exception is the log per capita income variable, but this would be expected to vary between control and treatment groups in the post treatment sample as one group received cash transfers, thus increasing income, while the other did not.

A cursory comparison of the maternal health care indicators for 2000 and 2002 shows that being in the treatment group did not appear to have a significant effect on the maternal health service utilization. This will be further explored in the next section.

7. RESULTS

First, the data from the 2002 follow up survey is used to test whether the RPS program had any impact on maternal health, while controlling for other explanatory factors, through running four separate OLS regressions on the outcomes of interest. The results on Table 9 show that RPS did not have statistically significant impacts on any of the outcomes of interest.

Table 9: OLS estimation results

VARIABLES	(1) Prenatal	(2) Institutional birth	(3) Skilled presence	(4) Postnatal
Treatment	-0.0176 (0.0399)	-0.0396 (0.0574)	-0.0570 (0.0591)	-0.0335 (0.0508)
Log per capita consumption	0.0620** (0.0283)	0.00585 (0.0413)	0.0483 (0.0420)	0.114*** (0.0376)
Completed primary school	0.0284 (0.0480)	0.115*** (0.0391)	0.123*** (0.0446)	0.0448 (0.0319)
Completed secondary school	0.0927 (0.0934)	0.416*** (0.143)	0.273*** (0.101)	0.347*** (0.105)
Age (years)	0.0107* (0.00583)	0.00930* (0.00513)	0.0102 (0.00647)	0.00738** (0.00340)
Ever married	0.0179 (0.0486)	-0.0500 (0.0388)	-0.0242 (0.0390)	0.0257 (0.0354)
Number of live children born in past five years	-0.0112 (0.0143)	-0.0287** (0.0127)	-0.0369** (0.0158)	-0.0115 (0.00794)
Free prenatal care	-0.125 (0.0877)	-0.0765 (0.150)	-0.167 (0.106)	0.0542 (0.123)
Poverty index	-0.00381 (0.00287)	-0.00896*** (0.00320)	-0.0136*** (0.00281)	-0.00520 (0.00390)
Constant	0.426 (0.403)	0.889* (0.503)	1.269*** (0.446)	-0.474 (0.472)
Observations	469	466	469	469
R-squared	0.034	0.087	0.115	0.080

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Prenatal Care: The analysis shows that age and wealth have a positive relationship with seeking prenatal care. However, in contrast to Wong (2010) this analysis did not show marital status, education, or previous live births having any effect on seeking prenatal care. Omitted variable

bias could explain these differing results as Jewell (2009) found that wantedness of pregnancy had a relatively large effect in his model and there was insufficient data to include it in this analysis^{bb}. If this is the case then the coefficients would likely have some upward bias if wantedness was also positively correlated with other independent variables in the model.

Hospital Births: The model shows that education and marginality of the *comarca* have a highly significant effect on hospital births. The education coefficients show a positive impact (ranging from 0.115 to 0.416). The marginality index shows a negative and very small impact, interpreted as women who live in *comarcas* with high levels of marginality would on average be less likely to give birth in a medical facility. Age has a small and positive effect, possibly explained by the tendency of older women to have more complicated pregnancies. Number of pregnancies in the past five years had a small negative effect, in line with previous studies and the theory that as women have successful live births they are less likely to birth in a hospital.

Skilled Presence: The coefficients in education are highly significant and have a positive effect (ranging from 0.146 to 0.286) on skilled presence at birth. Age has a small positive impact on skilled presence, and as in the hospital births regression likelihood of having a skilled doctor present at birth decreases with number of live births in the previous five years. Finally, on a very small scale of magnitude, women living in *comarcas* with relatively higher levels of marginalization are less likely to have a skilled presence at birth. In contrast with Wong (2010) this analysis did not find that marital status had a significant impact on medical provider during delivery.

^{bb} The World Bank's 2008 Poverty Assessment for Nicaragua reported that roughly one in three children that are born were unplanned, a number that is comparatively high for the region.

Postnatal Care: Secondary education (but not primary) had a significant and large positive effect on whether a newborn received care within 40 days of being born. Age and income also had positive, albeit smaller impacts on likelihood of receiving care within 40 days.

Next the analysis uses a difference in difference estimation to evaluate the program impact. This technique allows the treatment effect to be estimated not by comparing the outcomes, but by comparing the difference in outcomes between groups over time. This type of analysis should control for any differences that might remain between treatment and control groups after randomization and controlling for other factors. There will only be three regressions for this analysis as the adequate prenatal data was collected for the first time in 2002 so there was no baseline data to compare it to for this regression. All three of these equations using the difference in difference analysis show that there is still lack of a significant impact of the RPS program on maternal health care utilization outcomes of interest. Results are presented in Table 9.

Prenatal Care: In the prenatal equation only the income and age variables were significant (age is positively correlated with seeking adequate prenatal care as was income) but the order of magnitude is small.

Hospital Birth: The hospital birth equation shows that income, age, number of live births in the past year and marginality index of a village significantly impact the outcome.

Skilled Doctor: For hospital birth income, age, number of live births in the past year and marginality index significantly impact the outcome, as does the variable for 2002, indicating that there was a change in seeking a skilled practitioner from 2000 to 2002, a significant change occurred due to time effects.

Table 9: Difference in difference estimation results

VARIABLES	(1) Prenatal	(2) Institutional birth	(3) Skilled presence
Treatment group	0.0228 (0.0298)	-0.0669 (0.0424)	-0.00396 (0.0524)
Year 2002	-0.0221 (0.0252)	0.0261 (0.0353)	0.163*** (0.0452)
treat_y2002 Treatment and Year 2002	-0.0206 (0.0349)	0.00112 (0.0498)	-0.0814 (0.0608)
Log per capita consumption	0.0359* (0.0205)	0.0506* (0.0253)	0.0868*** (0.0266)
Age (years)	0.00768*** (0.00212)	0.00613** (0.00293)	0.00514 (0.00325)
Ever married	0.0296 (0.0254)	0.000688 (0.0202)	-0.0227 (0.0336)
Number of live children born in past five years	-0.00605 (0.00651)	-0.0212** (0.00810)	-0.0251*** (0.00827)
Free prenatal care	0.0182 (0.0744)	-0.00369 (0.0566)	-0.0367 (0.0565)
Poverty index	-0.00507** (0.00204)	-0.00643*** (0.00232)	-0.0103*** (0.00226)
Constant	0.679** (0.254)	0.365 (0.308)	0.595** (0.293)
Observations	1,387	1,383	1,387
R-squared	0.027	0.035	0.074

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Neither an OLS estimation nor a difference in difference estimation found that the RPS program had any significant impacts on any of the maternal health service utilization variables of interest. Many of the variables in the model that other researchers have found to have significant impact on maternal health service utilization were significant with the exception of whether a woman has ever been married and some of the education variables, suggesting that overall the model is well specified and lending credibility to the results. Conclusions, limitations and policy implications will be discussed in the following section.

8. CONCLUSIONS AND POLICY IMPLICATIONS

CCT programs are a widely accepted social safety net in the developing world, especially in Latin America. These programs have succeeded at increasing primary school enrollment rates and improving nutrition and growth in children, important steps to promote human capital acquisition and alleviate poverty. Recent research has turned to exploring the possible spillover effect these programs have on maternal health care utilization. de Brauw and Peterman (2011) found that participation in a CCT program in El Salvador had robust impacts on health outcomes surrounding birth (presence of a skilled attendant and birth in a medical facility) but that pre- and post- natal health seeking behavior was unaffected. This analysis did not find the same results. As outlined in the result section, the data showed that the RPS program had no impact on any of the maternal health indicators that were examined.

What accounts for the differences in findings on maternal health indicators between Nicaragua and El Salvador? One possible explanation lies in the design of the conditionality components of the program. There was only one condition that related to maternal health in the RPS program; a bimonthly education workshop that covered various topics, including reproductive health, breastfeeding, household sanitation, hygiene, nutrition, and related topics. In contrast, all of the other CCT programs listed in Tables 1 and 2 had conditionality components for pregnant or breastfeeding women. Another possible explanation for the difference in findings was the extent of the supply side intervention. For example, as part of the CSR program in El Salvador the government simultaneously implemented a series of infrastructural improvements, including water and sanitation projects and health systems investments. In

comparison, in Nicaragua the RPS program dealt with increased demand by hiring private health care providers to fill the gaps in service provision, but did not invest in an overall health systems improvement program. A third explanation for the differing results lies in the targeting used by the programs. The CSR program in El Salvador excluded women that were pregnant, and women that had children aged five or younger, at the time the target population was being defined. The RPS program randomly selected households from targeted municipalities in an impoverished rural region in central Nicaragua, and the baseline sample included families without children and families with children of all ages. The difference in findings could be due to sample selection bias.

Additional limitations of this analysis relate to the targeting of the program. In the overview of the RPS data Maluccio and Flores (2005) point out that by selecting these regions with existing capacity the program avoided spending a disproportionate share of resources on expanding health and education services. The implications of this relate to the external validity of the results. If this region was uniquely situated to implement the program the results may not be transferable to regions with less capacity. Another limitation with this study is the small sample size and the survey design. The sample size was small because this analysis had to draw a subsample of women that had pregnancies within a three to five year window. The initial sample was large enough to provide statistical power and significant results for an impact evaluation, but it was not designed to measure maternal health care utilization. The survey also lacked questions on specifics relating to maternal health care and made it difficult to gather accurate information about both explanatory and dependent variables that are of interest for this

analysis. The survey design impacted the construction of variables that may not have accurately operationalized the concepts that the analysis was trying to measure.

This analysis suggests implications for policymakers who want to design CCT program to improve maternal and child health indicators. First, general CCT programs should not be held accountable for maternal health. This analysis has shown that the RPS program in Nicaragua had no significant impact on maternal health outcomes; there was no spillover effect into maternal health care utilization. Another implication of this study is that CCT program design is very important. Providing occasional educational workshops that sometimes covered reproductive health issues did not create increased demand for maternal health care in Nicaragua and this lesson can be translated to future program design. Properly implemented, well-targeted programs such as JSY have the potential to increase maternal health service utilization. Adding specific conditionality components to address each of the four maternal health outcomes explored in this analysis might be necessary as it is evident from a comparison of CCT programs in Latin America on Table 1 that not all programs with conditionality components related to pregnant women have the same outcomes.

Areas for future research include an analysis of the RPS II scale up that did include required prenatal visits, and continued analysis of components of CCT programs that have the potential to stimulate maternal health care service utilization. Another area for research is estimating the benefits of supply side expansion and demand stimulation through CCT programs from a cost benefit standpoint. Is there an optimal policy mix of demand and supply side interventions that most efficiently achieves maternal health outcomes? Do complementary supply side interventions enhance the demand that CCT programs create? Finally, a CCT

program testing the effectiveness of different conditionality components for pregnant women in a randomized controlled trial setting would provide solid data on which types of interventions have the biggest impacts on maternal health outcomes.

APPENDIX A

Social Safety Nets

Governments in both developed and developing countries have historically used social safety net programs to provide infusions of cash or resources to economically vulnerable segments of the population. These types of programs, also called entitlement programs or social welfare programs allow governments to target populations in need based on a measure of economic well-being. In the United States means tested transfer programs have focused on providing medical care to the elderly or impoverished, unemployment insurance, childcare, food, and housing subsidies, and supplementing income. These programs typically are targeted at those who meet minimum income requirements for their family size. Sometimes these programs are crafted to encourage investment in human capital, for example food stamps can only be spent on certain food items and not on alcohol or tobacco possibly promoting nutritional food choices. While program participants must meet administrative requirements to continue receiving benefits, there typically are no other conditions to program participation.

In contrast, the conditional cash transfer (CCT) program adds a strict conditionality component to the means tested program design in order to incentivize human capital acquisition among poor families. This model was first implemented in Mexico with the *Progresa* program (later renamed *Oportunidades*) and in the *Bolsa Familia* program in Brazil and has since been replicated throughout the developing and developed world. Nearly every country in Latin America has a CCT program and there are large scale programs in Bangladesh, Indonesia, Turkey, South Africa, Malawi and elsewhere and recently CCT programs have been implemented in Washington, DC and New York.

The driving force behind these programs is the idea that parents and children have misaligned incentives: parents will prioritize any contributions that children can make to household income over education acquisition, especially if attending school carries a cost. The idea is that if governments can incentivize the acquisition of human capital in children through providing cash infusions conditional on school attendance and health and nutrition programs^{cc}, then they will have an effective tool to combat poverty and inequality and promote macroeconomic stability.

^{cc} Specific conditionality components vary by program.

APPENDIX B

According to the RPS Impact Evaluation (Maluccio and Flores 2005), the marginality index was constructed based on information from the 1995 National Population and Housing Census. The score was calculated for 59 *comarcas* in the chosen municipalities. The index was a weighted average of a set of indicators at the *comarca* level, known to be highly associated with poverty (Arcia, 1999; Maluccio 2005). The indicators (and their corresponding weights) are:

1. Average family size (0.1)
2. Percentage of households in the *comarca* without piped water in the home or yard (0.5)
3. Percentage of households in the *comarca* without a latrine (0.1)
4. Percentage of persons living in the *comarca* over age 5 who are illiterate (0.3)

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