

**The Long-Term Effects of Conditional Cash Transfer Programs on Health:  
An Analysis of Mexico's Oportunidades**

by

Adrienne Joy Newcomer

BS Mathematics-Economics, University of Pittsburgh, 2017

Submitted to the Graduate Faculty of  
Dietrich School of Arts and Sciences in partial fulfillment  
of the requirements for the degree of  
Bachelor of Philosophy

University of Pittsburgh

2017

UNIVERSITY OF PITTSBURGH

Dietrich School of Arts and Sciences

This thesis was presented

by

Adrienne Newcomer

It was defended on

December 1, 2017

and approved by

Michael Gecther, Assistant Professor, Department of Economics, Penn State University

Osea Giuntella, Assistant Professor, Department of Economics

Alistair Wilson, Associate Professor, Department of Economics

Committee Chair: Rania Gihleb, Assistant Professor, Department of Economics

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# **The Long-Term Effects of Conditional Cash Transfer Programs on Health:**

## **An Analysis of Mexico's Oportunidades**

Adrienne Newcomer, BPhil

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Mexico's conditional cash transfer program Oportunidades first began in 1997 in highly-impooverished rural communities. Since then, the program has expanded throughout Mexico and has been copied by governments worldwide. The program aims to interrupt the intergenerational transmission of poverty by providing cash transfers to parents for sending their children to school, receiving regular check-ups, and complying with various other co-responsibilities. Initial evaluations of the program were positive, but research on its long-term impacts has, thus far, been limited. This paper uses the Mexican Family Life Survey to analyze the long-term impact of Oportunidades on the health of young adults who have aged out of the program. Difference in difference estimators and the fixed-effect regression model are employed to measure the difference in health caused by increased exposure to the program. It is found that longer exposure to Oportunidades does have a statistically significant, positive impact on the health of young adults. These findings suggest that Oportunidades continues to impact former recipients after they age out of the program and support the theory that the program could help break the intergenerational cycle of poverty.

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## 1.0 INTRODUCTION

Conditional cash transfer (CCT) programs are an anti-poverty measure designed to break the intergenerational transmission of poverty by encouraging parents to invest in the human capital of their children. Since Mexico began the first major conditional cash transfer program Oportunidades<sup>1</sup> in 1997, governments around the world have followed suit. In Latin America CCT programs have been implemented by 19 countries and now cover around 19% of the region's population<sup>2</sup> (Cecchini and Madariaga 2011). CCT programs target poor households and offer them cash transfers if they follow certain conditions. These conditions generally include health, education, and nutrition components that are designed to increase the physical and mental capacity of participating children.

Oportunidades began in rural communities with high levels of poverty in 1997 and gradually expanded throughout Mexico. As the program expanded, both communities with lower overall poverty levels and communities with larger populations have been incorporated. Today, it operates under the name Prospera and covers 6 million families. The program includes health, education, and nutrition components such as a cash transfer for school attendance and in-kind transfers such as nutrition supplements for young children and pregnant mothers. Transfers

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<sup>1</sup> Oportunidades was originally called PROGRESA and is now called Prospera. These names are used interchangeably throughout this paper.

<sup>2</sup> Approximately 113 million people as of 2010.

are conditional on the completion of familial co-responsibilities such as children maintaining an 85% school attendance rate, mothers attending training workshops, and all family members receiving regular health check-ups.

Initial investigations into the effectiveness of Oportunidades yielded positive results, as have investigations into other CCT programs across Latin America.<sup>3</sup> However, there are concerns over the long-term effectiveness of such programs and their ability to interrupt the intergenerational transfer of poverty. Studies on the long-term effects of Oportunidades on education have shown positive results, but studies on the long-term effect on health are limited. This paper uses the Mexican Family Life Survey (MxFLS) to analyze the long-term impact of Oportunidades on the health of young adults who have aged out of the program. Difference in difference estimation is used in tandem with the fixed effects regression model to analyze the effect of increased exposure to Oportunidades on health. Findings show that longer exposure to the program does have a positive effect on health, especially in communities with populations larger than 2,500 people.

The remainder of this paper is divided into sections two through six. Section two describes the theoretical base, conditions and benefits, targeting and expansion, and political history of Oportunidades. Then, section 3 reviews previous studies on the impacts of Oportunidades on education, health, and nutrition. Section 4 details the choice of dataset for this study and describes the sample that is used. Section 5 discusses the empirical strategy of this paper, the empirical results, and the limitations of said results. Finally, section 6 highlights the implications of this study and possibilities for future research.

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<sup>3</sup> See Schady *et al* 2008, Atanasio *et al* 2005, and Glewwe and Olinto 2004.

## **2.0 PROGRAM BACKGROUND**

### **2.1 THEORETICAL BASE**

Conditional cash transfer programs are designed to interrupt the intergenerational transmission of poverty in two ways. First, by providing an income effect in the short run, the programs provide parents with temporary relief. Second, by tying transfers to health and education requirements, they should help increase the human capital of the children of recipients and increase the odds that those children will overcome poverty in the future. This framework is supported by research linking human capital and poverty reduction. For instance, several studies have found correlation between health and education levels, and others have found that level of education is a significant factor in the determination of income.<sup>4</sup> These studies support the idea that increasing the human capital of children in poor families could disrupt the intergenerational transfer of poverty to those children.

Oportunidades employs cash transfers because of the assumption that poor families underinvest in their children's health and education not because they do not want to, but because the costs of doing so are too high (Poder Ejecutivo Nacional 1997). For instance, the opportunity

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<sup>1</sup> See Alderman *et al* (1997), Becker (1993), Behrman (1993), Boissiere, Knight and Sabot (1985), Hoddinott *et al* (2013), Glewwe (1996), and Glewwe, Jacoby and King (1999), among others.

cost of children attending school, i.e. the income the students could have been earning were they working, is higher for low-income families than it is for high-income families. It is likely that poor families would need to rely on their children's income and thus, pull them out of school to work. Ideally, Oportunidades would be a substitute for the children's earnings, allowing them to attend school (Parker 2003).

Additionally, cash transfers, as opposed to in-kind transfers, are a more flexible form of social assistance that allow parents to meet their children's changing needs. However, some have argued that cash is an ineffective transfer because, unlike in-kind transfers, it can be spent on non-essential goods like cigarettes or alcohol. Oportunidades addresses this concern by only allowing female heads of households to receive cash transfers. This practice is supported by the research of Hoddinott and Haddad (1995) and Thomas (1990), which found that women are more likely than men to use the resources under their control to improve the well-being of their children. Evaluations of the Oportunidades show that the majority of cash transferred is actually spent on improving food availability in the household (Hoddinott and Skoufias 2000).

Because its goal is to increase usage of education and health care, Oportunidades is considered a demand-side intervention. However, the rollout and expansion of Oportunidades did coincide with some auxiliary supply-side interventions designed to increase the availability and quality of health care and education (Skoufias and McClafferty 2001). These interventions were infrequent and occurred mostly in poor rural areas that originally lacked social services (Cecchini and Madariga 2011).

## 2.2 TARGETING METHODS

Targeting appropriate beneficiary families is key to the efficiency of conditional cash transfer programs. The intergenerational transfer of poverty is likely unaffected if cash transfers are made to parents who would have sent their children to school and provided them with adequate nutrition and healthcare in absence of the transfers. Thus, Mexico utilized a rigorous combination of community-level geographic targeting and household-level proxy means testing<sup>5</sup> to effectively determine which households have the highest level of need (Skoufias, Davis and Behrman 1999).

First, the index of marginality was used to rank overall community poverty levels. This indicator focused on factors including illiteracy rates, average education level, access to electricity, water and drainage, average level of income, and housing conditions (Ávila, Fuentes and Tuirán 2001). Access to education and health care were also considered, as residents need to access such resources in order to comply with the requirements of PROGRESA (Flores Romero 2010). Next, proxy means testing occurred on the household-level, which focused on indicators such as parental education level, the dependency ratio, the size of the home relative to the number of occupants, the type of floor in the home, and the ownership of assets like appliances (2010). In eligible rural communities, program employees visited homes to collect information and determine household eligibility, but in urban areas, households had to sign up for a worker to visit and collect information (Parker 2003). Thus, in urban areas, results may be influenced by self-selection into the program.

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<sup>5</sup> Proxy means testing uses a household's observable characteristics to approximate their income or expenditures when other forms of financial documentation are difficult to obtain or inaccurate.

Once selected for Oportunidades benefits, families are eligible for three years. They may stop receiving benefits before the end of this three-year period if their children age out of the program or if they do not comply with familial co-responsibilities. At the end of the three-year period, families are re-evaluated to determine if they are eligible to re-enroll.

## **2.3 CONDITIONS AND BENEFITS**

Oportunidades involves both conditions and benefits with regards to health, nutrition, and education. These conditions and benefits have changed slightly over time as the program has evolved and expanded. For instance, the size of schooling transfers has increased over time as have the grades for which transfers are available. However, the main tenants remain the same with families receiving benefits and facing co-responsibilities in the areas of education, health, and nutrition.

### **2.3.1 Education**

Education benefits and co-responsibilities are an integral part of the theory of Oportunidades. Parents receive these benefits if their participating children attend at least 85% of school days for 10 months of the year. Attendance is verified with the schools and if the child does not attend the necessary amount of days in a month, their families do not receive their education-related monetary transfer that month (Flores Romero 2010). The size of the cash transfer is dependent on the age and gender of the student. Transfers are larger for high school students because they have a higher opportunity cost of attending school, a cost that Oportunidades is designed to

mitigate. For instance, monthly transfer in 2003 could be as much as 660 pesos (\$66) for a girl in high school, 580 pesos (\$58) for a boy in high school, and 210 pesos (\$21) for children in primary school (Table 4).

Additionally, girls receive higher transfers<sup>6</sup> than boys because of the bias of parents against girls when deciding which children to send to school (Adato and Hoddinott 2010). This bias has been observed in rural areas, where girls have higher dropout rates after primary school than boys (Parker 2003). Education benefits were originally available for students grades 3-9 (ages 8-15), but in 2001 they were extended to grades 3-12 (ages 8-21) (Parker 2003). The size of transfers is also adjusted every six months for inflation. Benefits are collected by a female head of household every two months, and the overall amount of benefits that can be collected by a single family are capped.

Additional education benefits were added as Oportunidades evolved. A school supplies grant is also available to mitigate the costs of schooling.<sup>7</sup> This small grant is available to families when they enroll their children in school at the beginning of the year and again halfway through the school year. A high-school completion grant was also added, which is a one-time transfer upon high school graduation. This grant was enacted to encourage progression to higher education levels.

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<sup>6</sup> Transfers for girls are about 10-15% higher than transfers for boys (Parker 2003).

<sup>7</sup> Oportunidades beneficiaries have free access to public schools, so the costs described here are limited to school materials.

### **2.3.2 Health and Nutrition**

Health benefits include regular check-ups for all family members with a focus on preventative care.<sup>8</sup> These services are provided free of charge to the families by public facilities. Health care providers track usage and report back to program operators. Nutrition benefits include a cash transfer for each family member, designed to allow the family to buy more, higher-quality food. Additionally, nutritional supplements are provided for children under the age of 2, malnourished children between the ages of 2 and 4, and pregnant and lactating mothers (Parker 2003). To receive benefits, all family members must comply with the regulated number of health care visits and female heads of households must attend information sessions designed to teach good health, hygiene, and nutrition habits.

## **2.4 POLITICAL HISTORY AND EXPANSION**

Oportunidades began in Mexico in 1997 under the name PROGRESA when it was piloted in several rural areas in the country. The initial phase of the program involved a quasi-experimental evaluation: 506 of the eligible communities were randomly assigned to treatment and control groups, with the treatment groups receiving benefits immediately and the control group being delayed until after 2000 (Gertler 2000). Expansion of the program in rural areas continued during this time, and the program covered about 2.6 million families, or 40% of all rural Mexican families by the end of 1999.

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<sup>8</sup> See Table 5 for the frequency of health check-ups required of different age groups.

The program was expanded even further after the quasi-experimental evaluation yielded positive results. In 2001, urban communities were added to the program and benefits were expanded to children in grades 9-12. In 2002, the name of the program changed to Oportunidades after the election of President Vicente Fox. There was initial concern that the program would be significantly altered by the new government (Parker 2003), but the key elements of the program were maintained, and expansion continued throughout Mexico (Yaschine and Orozco 2010). By 2006, Oportunidades was available in most rural and urban areas, and covered one quarter of Mexican households (2010).

In 2014, Oportunidades was rebranded again as Prospera (Dávila Lárraga 2016). Once again, the main tenants of health, nutrition, and education remained in place as well as the use of proxy means testing for targeting and the completion of health and education co-responsibilities to receive benefits (2016). The program has continued to expand under the name Prospera; by the end of 2014, it benefitted over 6 million families in Mexico (2016).

### **3.0 LITERATURE REVIEW**

Overall, studies on the effects of Oportunidades on education, health, and nutrition have yielded positive results. Studies have found that boys and girls with exposure to Oportunidades have increased levels of schooling, decreased levels of stunting and anemia, increased height, and decreased adolescent labor force participation. However, it is not yet known whether the positive results will transfer into a disruption of the intergenerational transfer of poverty. Further years of data collection would be required to measure such an effect.

#### **3.1 EFFECTS ON EDUCATION**

The initial quasi-experimental evaluation of PROGRESA yielded encouraging results with respect to education (Parker 2003). Specifically, participation in PROGRESA corresponded with an increase in school enrollment for all students but especially for girls in secondary school (Skoufias and McClafferty 2001). It was estimated that enrollment for secondary school girls increased by over 20% and enrollment for boys increased by over 10% (Parker 2003). It was also estimated that children would gain, on average, 0.7 additional years of education because of PROGRESA (Skoufias and McClafferty 2001). Effects on primary school enrollment were small, which is probably because over 95% of children in rural areas were already enrolled in primary school before the rollout of PROGRESA (Schultz 2000).

Several studies used these initial results to extrapolate the possible results of the program in the long-run. For instance, Behrman, Sengupta, and Todd (2005) uses two years of data to estimate that if children were to enroll in Oportunidades at age six and participate in the program for eight years, they would gain, on average, 0.7 additional years of schooling and the number of children who attend some secondary school would increase by 21%. Meanwhile, Schultz (2004) extrapolates even further, using the two initial years of data to estimate lifetime levels of schooling and expected adult wages. However, there are legitimate concerns that studies based on extrapolation may not be useful in this context (King and Behrman 2009).

Further studies used additional data to analyze the long-term effects of Oportunidades on education. For instance, Behrman, Parker and Todd (2011) utilize the original 18-month difference in program exposure to analyze the impact of Oportunidades on education after five and a half years of the program. They found that the groups with the additional year and a half of exposure had completed more grades than the control group, with an increase of about 2.4% for boys and 2.7% for girls (2011). Overall, these results corroborate the results from short term studies on school enrollment that also utilized the year and a half delay in program exposure during PROGRESA's initial expansion.

One potential qualification to Oportunidades' success lies in achievement test scores. Behrman, Sengupta, and Todd (2000) found no significant increase in achievement test scores for participating children one year after exposure began, and Behrman, Parker, and Todd (2009) found no significant differences in test scores between the initial exposure group and the delayed exposure group for mathematics, writing, and reading. On one hand, these results are disappointing because Oportunidades could have improved academic achievement in several ways. First, participating children must maintain a certain level of attendance to receive benefits,

which could increase learning in the classroom. Additionally, initial impact results showed a decrease in stunting and an increase in nutritional status for young beneficiaries. This increase in health could also result in higher learning capacities and increased test scores. However, it is also possible that the increase in enrollment caused by Oportunidades put additional strain on school's resources, decreasing the quality of education provided. This could negate any positive impacts on achievement scores and explain the lackluster results of these studies.

Finally, it is important to examine labor force participation for young adults and how they are related to the effects of Oportunidades on education. Behrman, Parker, and Todd (2011) looked at labor force participation in 2003 for young adults who received PROGRESA benefits in 1998 during the randomized expansion and compared them to young adults who did not receive benefits until 2000 or later. They found that the additional exposure did correspond with a 4.1% decrease in the proportion of boys who were working in 2003, but there were no significant effects for girls (2011). This suggests that more young men were staying in school instead of dropping out and seeking employment, which matches the expectations that Oportunidades will decrease labor force participation for children while they are of schooling age but possibly increase their labor force participation in adulthood.

### **3.2 EFFECTS ON HEALTH AND NUTRITION**

When Oportunidades began, the International Food Policy Research Institute (IFPRI) was commissioned to run an official investigation into its effects. This evaluation yielded highly positive results (Parker 2003). A controlled, randomized experiment was built into the initial expansion of PROGRESA, with some eligible communities receiving benefits in mid-1998 while

others had to wait 18 months until 2000. Gertler (2000) utilized this randomized experiment and found that both health and health care usage were higher in communities who received benefits in 1998 than those without Oportunidades benefits. Usage of public health services for adult check-ups, child nutritional monitoring, and pre-natal care increased, while the number of inpatient hospitalizations decreased. This, combined with the fact that the level of private health care usage remained constant, suggests that PROGRESA increased the usage of preventative care and decreased the rate of severe illness. This hypothesis is supported by statistically-significant reductions in the incidence of severe illness for PROGRESA children age 0-5 and PROGRESA adults age 18-50 (Gertler 2000).

Further studies of the impacts of Oportunidades on health include Hoddinott and Skoufias (2004), which also used the experimental rollout of Oportunidades but focused on its nutritional impacts. This study found that PROGRESA households increased their caloric intake as compared to controls, specifically increasing calories from fruits, vegetables, and animal products. This implies that PROGRESA both helped families to eat more and to eat healthier (Hoddinott and Skoufias 2004).

Rivera *et al* (2004) studied the impact of PROGRESA on the growth rates and rates of anemia in infants and young children in poor, rural households. This study also utilized the randomized expansion of PROGRESA between 1998 and 2000. It followed children age 0-12 months in 1998 for two years, comparing those who received benefits in 1998 to those who received benefits in 1999. After one year (when the 1998 group had received benefits but the 1999 group had not), the rates of anemia were significantly lower in the 1998 treatment group than in the 1999 group. However, this difference lessened and became insignificant by 2000, when both groups had received program benefits. The study also found that PROGRESA was

associated with height increases, especially for infants less than 6 months old at the baseline from the poorest households (Rivera *et al* 2004).

Leroy *et al* (2008) focused on the nutritional component of Oportunidades with respect to early childhood growth. The study followed 432 children from urban areas who were less than 24 months old from 2002 to 2004 to measure their growth. Difference in differences with propensity score matching was used to assess the outcomes of child growth via height, child height-for-age Z-scores, and child weight-for-height Z-scores. It was found that Oportunidades was effective in increasing infant growth in poor, urban households (2008).

Fernald *et al* (2009) focused on the effects of the cash-transfer component of Oportunidades on child health. Once again, it utilized the experimental rollout of PROGRESA to compare those who first received benefits to those who received them 18 months later. The study isolated the effect of the cash transfers, as opposed to the health and educational conditions of participation. Results showed that cash transfers were associated with increased height-for-age z-scores, decreased anemia (measured through hemoglobin concentration in the blood), decreased levels of stunting, and decreased levels of children being overweight. Thus, this study suggests that the cash transfer element of Oportunidades has a positive effect of the health and development of participating children (Fernald *et al* 2009).

Farfán *et al* (2011) utilizes long term data from the Mexican Family Life Survey (MxFLS) and program information about the expansion of Oportunidades to compare children who received benefits since birth, those who received benefits before age five, and those who received benefits after the age of five or never received them. These age groupings were selected to measure the impact of Oportunidades on the nutritional development of children. The

study focused on child height and found that Oportunidades is associated with an increase in height among children in the poorest, rural communities (Farfan *et al* 2011).

## 4.0 DESCRIPTION OF DATA

### 4.1 DATA SOURCE

Much of the research on Oportunidades utilizes the Survey of Household Conditions (ENCAESH) in combination with Mexico's rural household evaluation survey (ENCEL). ENCAESH data has been collected since 1997 and is used to determine Oportunidades eligibility. ENCEL data was designed to measure the effect of the quasi-experimental expansion of PROGRESA and was collected every six months from 1997 to 2000, with follow-ups in 2003 and 2007. While these datasets are used in tandem to effectively evaluate the short and middle run effects of Oportunidades, there is concern over their use for long-term evaluation of the program. Specifically, the ENCEL data suffers from a 60% attrition rate by its 2007 collection (Molina *et al* 2016). Additionally, the attrition rate varies between the initial control and treatment groups, which could threaten the internal and external validity of results found using this data (2016). Finally, impacts found using the ENCEL data do not represent the overall impact of Oportunidades because it only includes rural recipients in the poorest communities and the program has since expanded to urban recipients and rural recipients in communities with lower levels of poverty overall (2016).

Thus, this study uses the Mexican Family Life Survey (MxFLS) instead, a multi-thematic survey covering individual, household, and community level data. The MxFLS is a nationally

representative survey, so it addresses the concerns about geographical and economic specificity of the ENCEL data (Rubalcava and Teruel 2006). Additionally, the MxFLS has a significantly lower attrition rate than the ENCEL data because of its emphasis on tracking down and collecting responses from migrants (Molina *et al* 2016). The 2009 MxFLS data includes 90% of the individuals surveyed in 2002. Finally, the MxFLS follows respondents until 2009, two years after the last collection of the ENCEL data (Rubalcava and Teruel 2006).

Two significant drawbacks exist when using the MxFLS data to analyze the long-term results of Oportunidades. The first is that while PROGRESA began in 1997, the first round of the MxFLS occurred in 2002. Typically, researchers would try to overcome this by pairing the MxFLS with other data sources, but the identifying information necessary to trace the MxFLS communities back to 1997 is not available for use due to confidentiality concerns. Thus, analysis of the MxFLS cannot result in a true pre-program baseline. Additionally, the MxFLS has a significantly smaller sample size than the ENCEL data (Molina *et al* 2016). Despite these limitations, the MxFLS serves as a useful means of evaluating the long-term effects of Oportunidades.

## **4.2 SAMPLE DESCRIPTION**

This paper analyzes the effects of Oportunidades on community-level data from the MxFLS. This strategy addresses concerns about the accuracy of household reporting of PROGRESA benefits in the MxFLS data. For instance, in the 2002 data, 41.7% of households in rural communities involved with PROGRESA reported that they are enrolled in PROGRESA (Table 1). However, according to program records, enrollment rates in rural communities in 2002 were

much higher. Thus, using community level as opposed to individual level data measures an intent-to-treat effect. Additionally, spillover effects may exist within Oportunidades communities due to changing social attitudes about the importance of education and health. Analyzing the impact of Oportunidades at the community level instead of the individual level captures such effects.

**Table 1.** Households Reporting the Receipt of PROGRESA, Rural Communities, 2002

PROGRESA	Frequency	Percent
No	1,472	58.3
Yes	1,053	41.7
Total	2,525	100

The sample used in this study includes 128 communities of varying sizes and income levels (Table 2, Table 3). In 2002, 102 of the communities are enrolled in PROGRESA. By 2005, all communities have been enrolled. Thus, the effect being studied here is a difference in exposure, not a pure treatment verses control effect.

**Table 2.** Population and Oportunidades Benefits of Communities in 2002

Population	No Benefits	Benefits	Total
> 100,000 people	8	25	33
15,000-100,000 people	1	12	13
2,500-15,000 people	1	16	17
< 2,500 people	16	49	65
Total	26	102	128

**Table 3.** Population Wealth and Oportunidades Benefits of Communities in 2002

Population Wealth	No Oportunidades	Oportunidades	Total
Poorest = 1	3	15	18
2	8	24	32
3	14	43	57

**Table 3 (Continued)**

4	1	16	17
Richest = 5	0	3	3
Total	26	101	127

The outcome of interest is the average health of community members ages 22-28, young adults who are no longer receiving Oportunidades benefits. Their health is measured using a self-ranked scale with 1 representing poor health and 5 representing excellent health. The health rankings of all eligible community members are averaged to create the community-level outcome. Young adults age 21 and below are not included in the construction of the community measure because they are still eligible to receive Oportunidades transfers and could still be receiving free health care.

For Oportunidades to interrupt the intergenerational transmission of poverty, the human capital of former participants would have to be increased. Several studies have shown that the self-ranking of health is an accurate measurement of human capital. For instance, McCallum, Shadbolt, and Wang (1994) found that self-ranked health variables are related to mortality in elderly Australians, a result that coincides with similar studies in North America. Additionally, Idler and Stanislav (1995) found that self-ranked health variables predict the future functional mobility of individuals. Appels *et al.* (1996) furthered confirmed that the correlation between self-health ranking and mortality persists across samples from different cultures. Thus, a self-ranking of health is used here to measure the actual health and thus, human capital.

## 5.0 EMPIRICAL STRATEGY, RESULTS, AND LIMITATIONS

### 5.1 EMPIRICAL STRATEGY

This paper utilizes difference in difference estimation to evaluate the impact of exposure to Oportunidades in childhood on the health of young adults. In recent years, the difference in differences estimation (DD) has become an increasingly popular tool for evaluation in observational studies and has been implemented in several studies about Oportunidades.<sup>9</sup> In this method, the effect of an intervention, such as Oportunidades, is measured using two groups, a treatment group affected by the intervention and a control that is not. They are compared by taking the difference between the post and pre-intervention levels of the treatment group and subtracting the difference between the post and pre-intervention levels of the control. This double difference is both easy to understand and helps reduce many endogeneity problems that are typical to observational studies (Bertrand, Duflo and Mullainathan 2003). Mathematically, the outcome of interest for the treatment group  $Y^T$  is compared to the outcome for the control group  $Y^C$  in 2002 ( $t=0$ ) and 2009 ( $t=1$ ). Thus, the DD equation is as follows:

$$(1) \quad DD = (Y_{T1} - Y_{T0}) - (Y_{C1} - Y_{C0})$$

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<sup>9</sup> See Behrman *et al* 2010, Leroy *et al* 2008, Skoufias 2005, Todd and Winters 2011

Here, the outcome of interest is the average health of community members ages 22-28, young adults who are no longer receiving Oportunidades benefits. Their health is measured using a self-ranked scale with one representing poor health and five representing excellent health. Individual health rankings are averaged across communities to create the indicator variable, health (See Table 8). It is predicted that exposure to Oportunidades will have a positive effect on health. Young adults ages 22-28 in 2002 are compared to young adults ages 22-28 in 2009 from the same communities. Ideally, the treatment group would only be exposed to the treatment at time  $t=1$  and the control group would never be exposed. Constructing such groups in this context proves impossible because Oportunidades began in 1997 and the first round of the MxFLS was taken in 2002. Thus, the treatment communities were already exposed to the program in the first round of the survey. However, until 2001, benefits were only available through age 15. In 2001, they were extended through age 2. It is unlikely that anyone age 22 in 2002 received one year of benefits in 2001 because most young adults are finished high school or have dropped out by the age of 21. Thus, while it is impossible to get a true pre-treatment estimate for the treatment group without data from 1997, the age group of interest and the timeline of the expansion of Oportunidades allow us to approximate one using 2002 data.

It is similarly difficult to construct a control group that has never been exposed to Oportunidades because all communities in the sample were exposed by 2005. This is due to the program's gradual expansion and final goal of covering all sufficiently-poor Mexican families. Thus, the difference in difference estimation explores the impact of health of different amounts of exposure. The members of the treatment group in 2009 were all exposed to the treatment at some point and could have up to 12 years of exposure. Meanwhile, the control group ages 22-28 in 2009 might not have experienced treatment at all, and those who were exposed had at most 6

years of treatment. Thus, the difference in difference estimator here measures the effect of up to 6 years of additional exposure to Oportunidades.

In this study, difference in difference estimation is combined with the fixed-effect regression model. The fixed-effect model eliminated the possibility of omitted-variable bias by only considering variation within communities over time, as opposed to variation between communities. For omitted-variable bias to be completely eliminated, it must be assumed that all unobservable factors that influence both health and program exposure are time-invariant. Here, the fixed-effect model is chosen over mixed models that also consider variation between communities because they can experience bias when unmeasured time-invariant factors impact both program exposure and health (Gunasekara *et al* 2014). Such correlation might occur in this context because of the gradual and strategic expansion of Oportunidades. Most rural communities were already exposed to the program before 2002, and rural communities that were delayed until after 2002 either did not meet the program's overall community poverty requirements or were lacking other resources required for treatment<sup>10</sup>. It is widely recognized that a connection between poverty and health exists. Thus, unmeasured time-invariant factors could be both related to exposure and to health and the fixed effects model should be chosen over mixed models.

When used to analyze panel data like the MxFLS, fixed-effects models represent the difference between each community's average health at time t and the average value of community health over all periods. The model is:

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<sup>10</sup> Rural communities with a high level of overall poverty were offered treatment earlier. As the program expanded, communities with higher populations and lower overall poverty levels were also offered treatment.

$$(2) \quad Y'_{it} = \beta_{0t} + \beta_1 X'_{it} + \varepsilon'_{it}$$

Here,  $Y'_{it} = Y_{it} - Y''_i$ , and  $Y''_i$  is the mean of health,  $Y_{it}$  over time. Similarly,  $X'_{it} = X_{it} - X''_i$  and  $X''_i$  is the mean of Oportunidades exposure  $X_{it}$  over time. A corresponding definition applies for the measure of random error,  $\varepsilon'_{it}$ . Difference in difference estimation and the fixed effects model are combined to create the final model:

$$(3) \quad Y'_{it} = \beta_{0t} + \beta_1(\text{treat})'_{it} + \beta_2(\text{opcom})'_{it} + \beta_3(\text{post})'_{it} + \varepsilon'_{it}$$

This model utilizes three dummy variables (See Table 8). Opcom identifies members of the treatment and control group, post identifies whether the observation is pre-treatment or post-treatment, and treat is the product of opcom and post.  $\beta_1$  represents the difference in differences estimator and is predicted to be positive. In order to obtain the aggregate outcome of Oportunidades on average health, the model weights communities by the number of young adults whose health scores were used to calculate the community average. This weighting reduces the probability of one person's health skewing results.

## 5.2 EMPIRICAL RESULTS AND LIMITATIONS

The model yields a positive and significant effect of increased exposure on the average health of young adults across communities. When just considering the difference in difference between 2002 and 2005 data, the treatment group's increased exposure to Oportunidades is associated with an increase in average health of 0.15 when measured on a scale of 1 to 5 (Table 6). This positive effect can also be seen in the difference in difference between 2002 and 2009 data, in which case, increased exposure is associated with a 0.10 increase in average health (Table 7).

These effects indicate that Oportunidades is reaching its goal of producing long-term increases in the human capital of its former participants.

While these results are statistically significant, they are relatively small in magnitude. Their size could be limited for several reasons. First, for the difference in differences estimator to be valid, two assumptions must be satisfied—the common shocks assumption and the parallel trends assumption (Ryan *et al* 2015). The former assumes that the treatment and comparison groups will be affected equally by economic shocks and policy events from the time the intervention begins until the collection of the post-intervention data (2015). This assumption is not directly testable, but there is reason to believe that it might not be satisfied in this study. The MxFLS consists of communities throughout various urban and rural sectors of Mexico. Changes of regional economic policies and macroeconomic shocks are not likely to affect all communities across all regions in the same way (Meyer 1995).

The second assumption, the parallel trends assumption, states that although the treatment and control groups may have different outcome levels before the intervention, their trends in pre-treatment outcomes should be the same. This assumption is testable if there are several years of pre-treatment data available (Ryan *et al* 2015). Unfortunately, this type of analysis is not possible in this case because the 2002 pre-intervention data is the earliest year of data available in the MxFLS. Thus, it is possible that the first assumption is not satisfied, and it is impossible to know if the second is. Although the fixed effects model addresses some of these concerns, the fixed effects model can be less accurate than regular regression or mixed models (Gunasekara *et al* 2014).

The results of this study are also impacted by the data limitations of the MxFLS. Only three years of data are available in this survey, none of which occur before PROGRESA began in

1997. Because of this, the difference in difference estimation compares communities with two different ranges of exposure time. Because these ranges are large, one cannot accurately estimate the effect of a single year of additional program exposure. If information identifying the communities in the MxFLS was available, communities could be matched to Oportunidades program data detailing when exactly each community was exposed and what its socioeconomic conditions were before exposure. If this were the case, a more accurate estimation of the impacts of Oportunidades on health could be performed.

## 6.0 CONCLUSION

This paper finds that increased exposure to Oportunidades does have a positive impact on the health of young adults who have aged out of the program. This effect is statistically significant, but small in size. The magnitude of the result is likely limited by the limitations of the MxFLS and the resulting, unideal construction of the treatment and control groups. Despite their small magnitude, these results indicate that the short-term impact of Oportunidades on the health of its participants does continue after the participants have aged out of the program. This refutes concerns that the effects of Oportunidades might dissipate over time and supports the continuation of the program by Mexico's government.

It remains to be seen if the increase in health associated with Oportunidades will result in the disruption of the international transmission of poverty. For this question to be properly answered, researchers must continue to collect data that follows former Oportunidades participants further into adulthood. The question of Oportunidades' impact on the health of former child participants could also be better answered if more data were available. However, despite the data limitations that plague this study, the results support the theoretical claim that conditional cash transfer programs can have long-term impacts on the human capital of children, which might help them overcome poverty as adults.

## APPENDIX

### 6.1 OPORTUNIDADES CONDITIONS AND BENEFITS

**Table 4.** Monthly Amount of Education Grant (Pesos), Second Semester 2003

Grade	Boys	Girls
<b>Primary</b>		
3 <sup>rd</sup> year	105	105
4 <sup>th</sup> year	120	120
5 <sup>th</sup> year	155	155
6 <sup>th</sup> year	210	210
<b>Secondary</b>		
1 <sup>st</sup> year	305	320
2 <sup>nd</sup> year	320	355
3 <sup>rd</sup> year	335	390
<b>High School</b>		
1 <sup>st</sup> year	510	585
2 <sup>nd</sup> year	545	625
3 <sup>rd</sup> year	580	660

Note: 10 pesos is \$1 USD

Source: Parker 2003

**Table 5.** Annual Frequency of Health Care Visits Required by Oportunidades

Age Group	Frequency of Check-Ups
<b>Children</b>	
Less than 4 months	3 check-ups: 7 and 28 days, and at 2 months
4 months to 24 months	8 check-ups: 4, 6, 9, 12, 15, 18, 21, and 24 months with 1 additional monthly weight and height check-up
2 to 4 years old	3 check-ups a year: 1 every 4 months
5 to 16 years old	2 check-ups a year: 1 every 6 months

**Table 5 (Continued)**

<b>Women</b> Pregnancy During postpartum and lactation	5 check-ups: prenatal period 2 check-ups: 1 in immediate postpartum and 1 during lactation
<b>Adults and Youths</b> 17 to 60 years old Over 60 years old	One check-up per year One check-up per year

Source: Parker 2003

## 6.2 FIXED EFFECT DIFFERENCE IN DIFFERENCE MODEL

**Table 6.** Difference and Difference for 2002 & 2005

	(1)	
	health	
treat	0.149***	(14.16)
post	0.0555***	(5.80)
opcom	0	(.)
_cons	2.581***	(909.70)
N	4094	

t statistics in parentheses  
\* p<0.05, \*\* p<0.01, \*\*\* p<0.001

**Table 7.** Difference in Difference for 2002 & 2009

	(1)	
	health	
treat	0.102***	(11.14)
post	0.105***	(12.61)
opcom	0	(.)
_cons	2.581***	(1054.35)
N	4084	

t statistics in parentheses  
\* p<0.05, \*\* p<0.01, \*\*\* p<0.001

**Table 8.** Description of Variables in Fixed Effects Difference in Difference Regression

Variable	Description
Treat	Post*Opcom, difference in difference estimator
Post	0 if year=2002, 1 if year=2005, 2009
Opcom	0 if control group, 1 if treatment group
Estrato	Community population, 1 = over 100,000, 2 = between 15,000 and 100,000, 3 = between 2,500 and 15,000, 4 = below 2,500

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