THE PENNSYLVANIA STATE UNIVERSITY
SCHREYER HONORS COLLEGE


DEPARTMENT OF ECONOMICS


ARE CONDITIONAL CASH TRANSFERS AN APPROPRIATE TOOL TO REDUCE THE
RATE OF CHILDHOOD OVERWEIGHT AND OBESITY IN MEXICO?


MACKENZIE BELTZ
SPRING 2018


A thesis
submitted in partial fulfillment
of the requirements
for baccalaureate degrees
in Economics and Women's Studies
with honors in Economics


Reviewed and approved* by the following:

Bee Yan Roberts
Professor of Economics and Asian Studies
Thesis Supervisor

Russell Chuderewicz
Senior Lecturer of Economics
Honors Advisor

* Signatures are on file in the Schreyer Honors College.

# ABSTRACT

Previous studies have indicated that there may be a causal relationship between conditional cash transfers (CCTs) and overweight and obesity rates. This research builds upon the existing literature by conducting an empirical study of Prospera CCT implementation and overweight and obesity rates in Mexican youth using data from the Mexican Family Life Survey (MxFLS). Based on the results of this study we cannot accept the alternative hypothesis, which could mean that there is no relationship, that the data collection was not sufficient, or that there are confounding variables not accounted for in the MxFLS. This could signify that Prospera, at least in its current iteration, does not have an effect on childhood overweight and obesity. Regardless of these results, future incarnations of Prospera could benefit from prenatal micro and macronutrient supplements, nutrition education, food stipends, and food stamps for healthy items. While some of these directives go against the base nature of CCTs, something must be done to combat the growing overweight and obesity rates among Mexico's vulnerable youth population.

*Keywords:* Conditional Cash Transfers, Mexico, Prospera, Obesity

# TABLE OF CONTENTS

# LIST OF TABLES

# ACKNOWLEDGEMENTS

Dr. Bee Yan Roberts,
For inspiring and encouraging my passion for development economics
and guiding me through writing this thesis.


My Family,
For your constant love and support throughout my life and academic career.

**Chapter 1**

**Introduction**

In 1997, Mexico introduced Prospera, the first conditional cash transfer program in the

world. Today, it covers 24 percent of Mexico's population and virtually all households living in

extreme poverty, and serves as a model for 52 other countries in Latin America, Asia, and

Africa. Conditional cash transfer (CCT) programs offer cash transfers to poor households on

conditions relating to health, education, and nutrition. They boast low monitoring costs and are

intended to replace and complement existing welfare programs by legitimizing the agency of

poor households. Reports indicate that funds are spent disproportionately on children and that

CCTs improve the lives of the poor, are well targeted to poor households, increase consumption

and reduce poverty.

The empirical research in this paper is focused on the relationship between poor

children's' enrollment in Prospera and overweight and obesity. This research builds upon the

Leroy, Gadsden, De Cossio and Gertler 2013 study, "Cash and in-Kind Transfers Lead to Excess

Weight Gain in a Population of Women with a High Prevalence of Overweight in Rural

Mexico," and Andalón's 2011 study, "Oportunidades to reduce overweight and obesity in

Mexico?" These conflicting studies informed my decision to delve deeper into the topic. While

both aforementioned studies focus on adult women of childbearing age, this study follows

children of both genders under age 16.

Data was sourced from the Mexican Family Life Survey (MxFLS), which follows 35,000

individuals, 8,400 households, and 10,847 children under age 16. The dependent variable is child

sex and age-adjusted BMI, and the independent variables are education level, total household income, child height, child weight, Prospera status, and cost of household food consumption spent on industrial products, including potato chips, sodas, cookies, and candy. My hypothesis is that like the communities from the Leroy, Gadsden, De Cossio and Gertler 2013 study, "Cash and in-Kind Transfers Lead to Excess Weight Gain in a Population of Women with a High Prevalence of Overweight in Rural Mexico," the Prospera cash transfers would increase the rates of overweight and obesity in the vulnerable Mexican youth population.

Ultimately, this paper seeks to answer the question: are conditional cash transfers an appropriate tool to reduce the rate of childhood overweight and obesity in Mexico? The null hypothesis is that there is no causal relationship between Prospera participation and youth overweight and obesity. To reject the null hypothesis would mean that significant policy research needs to be done in order to limit overweight and obesity rates correlated with youth Prospera participation. Limitations of this experiment are the inconsistent reporting in the MxFLS which reduced the number of available instances and lead to less rigorous results. Additionally, while the MxFLS asks an impressive amount of questions, it cannot factor in every influence on child propensity towards overweight and obesity, including community attitudes towards junk food, prenatal care, birth weight, stunting effects, and biological predisposition towards obesity.

**Chapter 2 Literature Review**

**Conditional Cash Transfers**

A conditional cash transfer (CCT) is a program that transfers cash, typically to poor households, on the condition that families make human capital investments, generally health or education-focused. Cash is typically granted to a female head of house, and common conditions include full vaccinations for children, 80-90 percent school attendance, and perinatal care for mothers. These programs are extremely popular in Latin America and increasingly common in Asia and Africa. In some Latin American countries, including Mexico and Brazil, CCTs are the largest social welfare program, covering millions of poor and low-income households. Reports indicate that CCTs improve the lives of poor people, are well targeted to poor households, increase consumption levels, and reduce poverty (Fiszbein, Schady, & Ferreira, 2009).

Like other transfer programs, CCTs require a client targeting system and a mechanism to pay their benefits. In addition, they require a means to monitor household compliance with conditions and to coordinate with institutions involved with the program. It is also good practice to implement a monitoring and evaluation system. One successful method to target households is community vetting or community-based targeting. CCT program development has created comprehensive poverty maps, which have moved forward the standard for all targeted programs.

CCT programs promote long-term investments, such as children's education, as well as provide short-term social assistance. They are market-oriented demand-side interventions that directly support the poor, and complement traditional supply-side mechanisms, which include investments in or subsidies for health centers and schools (Rawlings & Rubio, 2005). They legitimize the agency of poor households by giving them the necessary funds to consume and

invest in areas that they deem important. Research has shown that when transfers are delivered to female heads of household, usually mothers or grandmothers, transfers are disproportionately spent on children, including on tuition, school uniform costs and health interventions. Funds are also spent on general familial food security and health, as well as on business and household investments. Typically, households spend a small percentage on other consumables and entertainment.

Because food intake, nutrition, health and education are linked, programs that target each component are less effective than holistic programs like CCTs. Health problems like diarrhea can make increased food supply ineffective. High infant mortality and high fertility lead to decreased economic activity due to dispersion of resources, decreased health of mothers and less individual attention by parents to their children's education. Poor children may be unable to attend school due to illnesses, malnutrition, need to work to sustain the family, or high school costs. Therefore, programs that target educational quality and quantity may not be sufficient interventions for poor children. When female children go to school, they delay their first birth, which results in better health and nutrition for families. Additionally, poor families are typically risk-averse. Ensuring food security could motivate them to engage in riskier productive projects or invest in a long-term investment, like children's education (Levy, 2007).

## Overview of Mexican Poverty and the History of Prospera

In the mid-1990s, 30% of Mexico's population was living in extreme poverty. When non-income indicators of poverty were used, including nutritional status, illiteracy rates, access to health and education, and infant mortality rates, similar results were observed (Levy, 2007).

Latin America is historically one of the most income unequal regions of the world, and the

Mexican economy has become more unequal (Reyes, Teruel, & López, 2017). This rising

inequality began in 2010 and has continued to today; today, the income-distribution inequality is

very close to what it was in 1968. Wage inequality is not the sole component of general income

inequality in Mexico, capital and labor inequality are also factors (p. 133). According to The

Guardian, "Gini index is the most widely used measure of inequality. It looks at the distribution

of a nation's income or wealth, where 0 represents complete equality and 100 total inequality"

(Barr, 2017). In 2017, Mexico had a Gini Index of 48.2. For reference, in 2017 the United States

had a Gini Index of 41.0, Canada had a Gini Index of 34.0, and Sweden had a Gini Index of 27.2

(World Bank, 2017).

Progresa was not the first welfare program adopted by Mexico. In the mid-1990s, the

government ran fifteen food subsidy programs. These were divided into two different schemes:

four of them were generalized, and eleven targeted specific rural and urban populations.

Problems faced with these programs included difficulty delivering food subsidies due to

population dispersion, an imbalance in funds targeted towards rural and urban households with

urban households receiving 75% of the subsidies, the fact that food and other welfare subsidies

were run independently of each other, that a significant share of the total budget was utilized for

administration, and that there was little accountability from program managers and agencies.

These programs were a step in the right direction to battle rampant income inequality, but they

fell short of reaching sustainable outcomes.

Mexico's poor were worse off in educational and health outcomes in addition to nutrition.

In 1996, roughly one in five poor children did not attend school, with girls attending significantly

less often than boys. The infant mortality rate was 165 percent higher in rural areas than in urban

areas, and reproductive health service distribution was uneven, with 56 percent of poor women versus 71 percent of non-poor women using some method of birth control. This inequality of access resulted in an average of 5.1 children for poor women and 2.5 children for non-poor women. Additionally, research showed that when mothers were uneducated, family care and family eating habits suffered (Leroy, 2017).

Policy research in the 1980s and 1990s suggested that increases in nutrition, food intake, health and education were complementary. This research indicated that an integrated approach could be more effective than isolated nutritional, educational and health programs. Political unrest and a 6 percent drop in GDP in 1995 led to widespread agreement that Mexico's poor would suffer as result of the economic crisis. The aforementioned research motivated policymakers to implement a national, long standing, wide reaching and comprehensive program. President Ernesto Zedilla, who had been the minister of budgeting and planning during the previous administration and an economist by trade, worked towards budgetary efficiency.

Together, the government decided that the new program would replace, not supplement, previous welfare programs. This ensured that multiple transfers to families would not create perverse incentives against work and that management costs would remain relatively low. In 1997, the first conditional cash transfer program in the world, Progresa (Progress), was created. Its initial coverage included 300,000 families in 6,344 localities in twelve states with a budget of US$58.8 million. By the end of 2005, under President Vicente Fox's administration, the program covered 5 million families, operated in more than 86,000 localities in all thirty-one states, and had a budget of US$2.8 billion. It covers 24 percent of Mexico's population and practically all households living in extreme poverty (Fiszbein, Schady, & Ferreira, 2009).

Over the years, its name has changed: in 1997, Progresa, in 2001, Oportunidades (Opportunities), and in 2014, Prospera (Prosperity), but its basic components have remained. Like other similar CCT programs, it aims to integrate education, health and nutrition interventions, support and enhance children's' education, redistribute incomes to extremely poor families, and encourage responsibility and active participation of parents and families. One of Prospera's great successes is its well-defined targeting mechanism. Chosen households are ensured benefits for three years and are selected based on household demographics, assets, and other measurable characteristics. Additionally, it conducts comprehensive program evaluations, which have improved the program significantly over time. Prospera has served as a model for 52 other countries in Latin America, Asia, and Africa ("A Model from Mexico for the World," 2014).

Prospera has enjoyed a number of key successes over its lifetime. Consumption, which is mostly food intake, has increased by 22 percent. The enrollment in secondary school increased by 11 percent for girls and 7.5 percent for boys. Regular health visits have increased by 30 to 60 percent among children under age five. The proportion of malnourished children has decreased by 17.2 percent. Disease has decreased by 12 percent among children aged two and younger. Prenatal care visits have increased by 8 percent among pregnant women ("Poverty Reduction," 2011). Prospera's dedication to ensuring basic social services to the poor has contributed to Mexico's GDP annual average GDP growth of 2.51 percent from 1994 to 2017 ("Mexico GDP Annual Growth Rate 1994-2017," 2017).

**Obesity and Economics**

Individual food choices can be viewed as a supply and demand problem. People can choose to purchase raw foods, like carrots, or processed foods, such as chips. When food prices fall, individuals buy larger quantities of these foods, ceteris paribus. Change in tastes or income will also affect a given product's demand. Firms supply food goods based on cost of production and technology. When technology improves or resource costs change, the food supply will be affected. Today, the quantity of food has increased and the prices have fallen due to modern farming and processing technology. Nutritious food costs significantly more than non-nutritious food, which leads to increased demand for non-nutritious food (Hojjat & Hojjat, 2017).

Conditional cash programs seek to remedy malnutrition through cash transfers, but many programs do not have a nutrition education component. Thus, programs that provide cash transfers can increase consumption without promoting intake of healthy micro and macronutrients. In some ways, eradicating malnutrition and preventing obesity are conflicting goals. According to the World Health Organization, malnutrition is defined as:

> "deficiencies, excesses of imbalances in a person's intake of energy and/or nutrients. The term malnutrition covers two broad groups of conditions. One is 'undernutrition'—which includes stunting (low height for age), wasting (low weight for height), underweight (low weight for age) and micronutrient deficiencies or insufficiencies (a lack of important vitamins and minerals). The other is overweight, obesity and diet-related non communicable diseases (such as heart disease, stroke, diabetes and cancer)," ("What Is Malnutrition?").

Nutrition programs that address the prevention of malnutrition, including CCTs, may easily promote excess food intake, which increases obesity. Without conscious measures to

prevent obesity, malnutrition-focused programs may do more harm than good. Undernutrition rates have been significantly reduced in many countries thanks in part to nutrition assistance programs, but stunted height remains a problem, and there is a rising obesity trend in poor children (Uauy & Kain, 2002).

Obesity is a public health and economic concern. Diabetes, stroke, hypertension, coronary heart disease, certain cancers and osteoporosis are comorbid with obesity. These issues used to be seen only in adults, but medical professionals report seeing more children with obesity-related illnesses (Linz & Lee, 2005). Technological, economic and social changes in the past 30 years have fostered an environment that is conducive to weight gain by altering the opportunity costs for energy intake and expenditure behaviors. In 2008, roughly one third of the world's adult population was overweight. Obese people have reduced life expectancy, a lower quality of life and increased incidence of disease, which cuts earning potential and productivity and leads to overuse of healthcare services (Lehnert, Sonntag, Riedel-Heller, & König, 2013).

## Obesity and Mexico

Today, Mexico has the highest proportion of obese and overweight people in the world, with 32 percent of the adult population obese and 39 percent overweight, encompassing a total of 48.6 million individuals. 10 percent of children under five years old, 31 percent of children aged 5 to 11, and 33 percent of teenagers in Mexico are overweight. Some of this can be attributed to strong advertising campaigns aimed at children peddling sugary sweets, and some is the result of parents providing unhealthy options. Traditional Mexican foods featuring corn, beans, chili peppers and other vegetables and spices have been replaced by fast foods, and Mexican drinks

like agua fresca have been replaced by commercial carbonated beverages. These changes have

been spurred by rapid globalization and urbanization and the plummeting costs of processed,

calorie-dense foods (Astudillo, 2014).

Theoretically, CCTs should be better equipped to combat obesity rates because they take

a more holistic approach to health, nutrition and education issues than do food stamp or stipend

based nutrition programs. However, previous research in the field indicates that there may be a

link between CCT program implementation and rising obesity rates, although the evidence is

sparse. Leroy et. al.'s 2013 study on the Mexican food supplementary program, Programa de

Apoyo Alimentario, indicated that when provided cash or in-kind transfers, households increased

their consumption of fruits and vegetables, but also significantly increased their overall food

consumption. This led to an increase in adult overweight and obesity rates, particularly in adult

women who were already overweight (p. 765)

## Chapter 3 Research Objectives and Methodology

### Introduction

To answer the question of whether or not conditional cash transfers are an appropriate tool to reduce the rate of overweight and obesity in Mexican children, we must first establish a relationship between CCTs and weight. Traditionally, CCTs provide cash stipends to afford families sufficient funds to purchase nutritious food, among other benefits. CCTs have proven effective in combating undernutrition, which is a form of malnutrition that includes stunting, wasting, underweight, and micronutrient deficiencies. However, there is evidence that CCTs may contribute to overweight and obesity through the income effect. With the income effect, ceteris paribus, when a household's income increases, it demands more normal goods and services. Therefore, a program designed to remedy undernutrition through increased funds for food, in late stages, could potentially promote excessive weight gain.

This issue was exacerbated when Mexico joined the North American Free Trade Agreement (NAFTA) in 1994. This agreement eliminated tariffs, duties and quantitative restrictions on goods in Canada, the United States, and Mexico ("North American Free Trade Agreement"). As a result, the United States had a willing new market for its industrial processed foods, for example, candy, sodas, and chips. Prior to NAFTA, Mexico purchased approximately $1.8 billion of food imports each year. In 2016, post-NAFTA Mexico annually spends about $24 billion on food imports, many of them obesogenic goods. While NAFTA is not the only contributor to Mexico's ongoing obesity crisis, experts indicate that it is likely the most

influential factor (Siegel, 2016). This new proclivity to purchase high-sugar and high-carbohydrate foods will factor into my model.

My empirical research focuses on the relationship between CCTs and weight. This research question was inspired by the Leroy, Gadsden, De Cossio and Gertler 2013 study, "Cash and in-Kind Transfers Lead to Excess Weight Gain in a Population of Women with a High Prevalence of Overweight in Rural Mexico," as well as Andalón's 2011 study, "Oportunidades to reduce overweight and obesity in Mexico?" The Leroy et. al. study concluded that CCTs led to weight gain for women, and the Andalón study found that CCTs reduced overweight and obesity rates in women. After reading these two conflicting papers, I chose to utilize longitudinal panel data that surveyed an impressive variety of factors to determine if Oportunidades participation is correlated with overweight and obesity in Mexican children. A main difference between my study and Leroy et. al. and Andalón's studies is that both of their papers were focused on the effects of CCT programs on the weight of women of childbearing age in rural areas, while mine follows children of both genders under age 16 in rural and urban areas. This research on children is important because childhood obesity levels in Mexico are reaching alarming rates.

**Data Collection**

I chose to utilize longitudinal data from the Mexican Family Life Survey (MxFLS). This survey follows 8,400 total households. These 8,400 households comprise 35,000 individuals in Mexico at large. There were 10847 children under age 16 surveyed. The MxFLS comprises a 10-year period in three rounds: 2002 (MxFLS-1), 2005-2006 (MxFLS-2) and 2009-2012 (MxFLS-3). The MxFLS-2 and MxFLS-3 were able to reinterview almost 90 percent of the original

sampled households. The MxFLS is managed by researchers from the Iberomerican University and the Center for Economic Research and Teaching, and supported by the National Institute of Statistics and Geography, the National Institute of Public Health, and the Universities of California, Los Angeles, and Duke in the US, making it a reputable database. It received the World's Bank Regional Award for Innovation in Statistics.

Additionally, the MxFLS is multi-thematic, collecting information on a wide range of socioeconomic and demographic indicators at the household and individual level. These measures are as broad as individual level of education and as narrow as household soda consumption. The revolutionary survey data is reinforced by anthropomorphic health measures taken in-person by researchers. The longitudinal design follows the same cohort through ten years and three sampling periods, which allows us to observe the change in relationship between weight, age, diet, and government assistance at the individual and household level. The MxFLS provides qualitative and quantitative data that are essential to determining the response to this paper's question.

Prospera also has its own government-run dataset for evaluating the efficacy of the program. This data provides bimonthly longitudinal panel data on Prospera beneficiaries and communities stratified by state. Ultimately, I found that the Prospera data, while helpful in informing my initial research, did not provide the detailed measures that the MxFLS dataset did. In particular, while the Prospera data follows individuals' educational attainment, disability and morbidity and social and community inclusion, it did not provide the weight and height measurements, consumption details, or gross household income that were essential to my model. This made it difficult to assess CCT's direct impact on overweight & obesity. The MxFLS's

focus on association among different factors affecting well-being provided the holistic data collection needed to accurately gauge Prospera's effect on childhood overweight and obesity.

**Relevant Variables**

After reading journal articles from both the fields of health economics and nutrition and reading through each MxFLS data book, I narrowed down the crucial variables that influence a child's weight. The variable most important to my research is whether a given child is enrolled in the Prospera program. At the time of the last data collection in 2012, the MxFLS still referred to Prospera as Oportunidades. My dependent variable is child age and sex-adjusted BMI. I have also chosen to include in my model the independent variables: education level, total household income, child weight, child height, Prospera status, and cost of household food consumption spent on industrial products, including potato chips, sodas, cookies, and candy. Age and sex-adjusted BMI, total household income, weight, height, and cost spent on industrial products are continuous variables, Prospera status is a dummy variable, and education level is a discrete variable.

First, I isolated from the larger datasets data relevant to children aged 9-15; I found that data collected for children under age 9 was sparse. Next, I calculated the body mass index (BMI) for each child, using the formula $BMI = kg/m^2$, where kg is a person's weight in kilograms and $m^2$ is their height in meters squared. A BMI of over 25.0 is considered overweight, a BMI of over 30 is obese, the healthy range is 18.5 to 24.9, and a BMI of under 18.5 is considered underweight. Typically, BMI applies to most adults 18-65 years, excluding pregnant women and athletes. It is not always an appropriate measure to use for children due to their low muscle

content. Therefore, I chose to adjust for age and sex using the sex-age-specific BMI utilized in the Cole et al. 2005 study. In this study, BMI was adjusted for age and sex by subtracting the sex–age-specific median BMI from the 2000 CDC Growth Charts for the United States from the BMI of the individual (Kuczmarski et al, 2000).

**Table 1. 2000 CDC Growth Chart for Age-Sex-Specific Median BMI**

| Age | Boys | Girls |
|-----|------|-------|
| 9 | 16.16712 | 16.30609 |
| 10 | 16.64614 | 16.86231 |
| 11 | 17.1039 | 17.46907 |
| 12 | 17.70892 | 18.10149 |
| 13 | 18.35989 | 18.73643 |
| 14 | 19.04191 | 19.35257 |
| 15 | 19.7406 | 19.93057 |

By incorporating these variables, we have the multivariate regression equation:

$\hat{Y}$(age and sex-adjusted BMI) = $b_0$ + $b_1$(education level) + $b_2$(total household income) +$b_3$(weight) + $b_4$(height) + $b_5$(Prospera status) + $b_6$(household food consumption spent on industrial products) + $\varepsilon$

**Analysis**

My hypothesis is that, like in rural Mexican communities from the Leroy, Gadsden, De Cossio and Gertler 2013 study, "Cash and in-Kind Transfers Lead to Excess Weight Gain in a Population of Women with a High Prevalence of Overweight in Rural Mexico," the cash transfers from the Prospera program will increase overweight and obesity rates in the already

vulnerable Mexican youth population. After using statistical methods to better understand the actual relationship between Prospera and childhood overweight and obesity, I use insights from the fields of health economics and nutrition to propose CCT policy solutions to remedy or mitigate the obesity epidemic in youth populations.

Because this study focuses on children under age 16, it avoids the potential issues seen in the Andalón and Leroy et al. papers regarding excess weight gain in adult women during pregnancy and childbirth. A potential confounding variable not accounted for in this study is the presence or absence of nutrition education. Because nutrition education was not a question on the MxFLS, it cannot be built into the model. Therefore, the study proceeds assuming that the households have not received nutrition education.

Additionally, because the amount of money spent on processed foods is a household indicator, not an individual indicator, it does not necessarily mean that the child is the individual consuming the processed foods. The study continues under the assumption that children learn their eating habits from their parents, and that parents who purchase industrial foods teach their children to eat them as well. In addition, because malnourished children often experience stunting, which is impaired growth and development, they are more likely to suffer excessive weight gain and short height, which may also influence results ("Stunting in a Nutshell"). Stunting, especially before age one, can also affect cognitive development and educational attainment, which means that it may be connected to the educational level built into the model.

# Chapter 4

## Findings

## Definition of Variables

Table 2. Definition of Variables

| Variable Name | Definition |
|---|---|
| agebmi | Age and sex-adjusted BMI. Calculated by subtracting the sex–age-specific median BMI from the 2000 CDC Growth Charts for the United States from the BMI of the individual. |
| edachv | The last level of education that the child attended.<br>1: Without instruction<br>2: Preschool or Kindergarten<br>3: Elementary School<br>4: Secondary/Technical Secondary<br>5: Distance Second<br>6: High School |
| hincome | Household income.<br>This includes income earned from main and secondary jobs, income earned from selling assets, and transfers received from government aid programs. |
| weight | Child's weight in kilograms. |
| height | Child's height in meters. |
| opp | Whether or not child was enrolled in Oportunidades (Prospera).<br>1: Yes<br>3: No<br>8: Don't Know |
| costindpr | Amount spent per month on industrial food products. |

**Results**

| Equation | Obs | Parms | RMSE | "R-sq" | F | P |
|---|---|---|---|---|---|---|
| agebmi | 507 | 11 | .7867575 | 0.9704 | 1628.272 | 0.0000 |

| agebmi | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. Interval] | |
|---|---|---|---|---|---|---|
| edachv | | | | | | |
| 1 | -1.15548 | 1.115454 | -1.04 | 0.301 | -3.347077 | 1.036116 |
| 3 | -.165552 | .7910484 | -0.21 | 0.834 | -1.719771 | 1.388667 |
| 4 | -.5474151 | .7916914 | -0.69 | 0.490 | -2.102897 | 1.008067 |
| 5 | -.8297534 | .8021711 | -1.03 | 0.301 | -2.405826 | .7463189 |
| 6 | 0 | (omitted) | | | | |
| | | | | | | |
| hincome | 8.03e-07 | 6.70e-07 | 1.20 | 0.232 | -5.14e-07 | 2.12e-06 |
| weight | .4139543 | .0032797 | 126.22 | 0.000 | .4075103 | .4203982 |
| height | -28.52844 | .4963196 | -57.48 | 0.000 | -29.50359 | -27.55329 |
| | | | | | | |
| opp | | | | | | |
| 1 | .261819 | .4614257 | 0.57 | 0.571 | -.644771 | 1.168409 |
| 3 | .232344 | .4575629 | 0.51 | 0.612 | -.6666564 | 1.131344 |
| 8 | 0 | (omitted) | | | | |
| | | | | | | |
| costindpr | .000171 | .0009639 | 0.18 | 0.859 | -.0017229 | .0020649 |
| _cons | 25.76382 | 1.130864 | 22.78 | 0.000 | 23.54195 | 27.9857 |

With an $R^2$ of .9704, this model explains significant variability of the response data around the mean. We expect to see this because BMI is a derived variable, so much of the variance in BMI can be explained by height and weight. In earlier regressions that included all other variables but did not include height and weight, the $R^2$ value was .0086. The coefficient for children enrolled in the Prospera program, written as "1" under variable "opp," is .26, but these results are not statistically significant at a p-value of .57. Surprisingly, the coefficient for household income is 8.03e-07, which is much lower than expected. However, this also has a p-value that is not statistically significant at .232. Although the results are not statistically significant for any instance of the educational achievement categorical variable, we see that the

coefficients are negative, which is what we expect; as children obtain more education, they engage in healthier practices and gain less excess weight. To note, although it is defined in the variable section, there were no instances in which a child received solely a "2": "Preschool or Kindergarten" in educational achievement. Any child that attended any school attained at least an elementary school education.

<div align="center">**Shortcomings**</div>

Ultimately, many factors influence child propensity towards overweight and obesity. While the MxFLS survey asks an impressive amount of questions, it could not factor in biological predisposition towards obesity, and did not include information on nutritional education, both of which could have made the model more accurate. Other potential confounding variables include community attitudes towards junk foods, prenatal care, birth weight, and stunting effects.

Additionally, the MxFLS reporting is spotty. In order to receive accurate results, I eliminated any instances that did not have the information necessary to calculate age and sex-adjusted BMI (height, weight, sex, and age), which narrowed the number of instances from 10,874 to 789. This drastic reduction in instances lead to less rigorous results. I originally planned to incorporate into the model birth weight, particularly for younger children considering that the original MxFLS study was in 2002. However, this metric was so infrequently reported that I had to eliminate it from the model. Future studies would benefit from more consistent reporting.

In a future study, I would employ a difference in differences statistical technique using Prospera status as a treatment. In the MxFLS data, children enrolled in Prospera in years 2009-12 tended to have been enrolled in 2002. Therefore, a follow-up study would either use a dataset

that had a group of children who were enrolled in Prospera during the study and those who were not, or would employ a different treatment to the 'treatment group,' such as nutrition education or a healthy food stipend.

## Policy Implications

The purpose of this paper is to establish whether or not conditional cash transfers are an appropriate tool to reduce the rate of childhood overweight and obesity in Mexico. Ultimately, the empirical results were not statistically significant to establish a correlation between childhood BMI and Prospera status. This could mean that Prospera, at least in its current iteration, does not have an effect on childhood overweight and obesity. However, future incarnations of Prospera could include prenatal micro and macronutrient supplements, nutrition education, food stipends, and food stamps for healthy items.

Conditional cash transfer programs offer cash stipends when qualifying households complete certain conditions: typically, fully vaccinating all children and having all children attend school 80% of the time or more. While CCT's strength often lies in its simplicity, low monitoring costs and effective evaluation methods, adding a nutritionally based element may be necessary considering the new health issues the country is facing. This could come in the form of a condition requiring families to attend a nutrition training in their town in order to continue to receive benefits. This option comes with a couple of setbacks: poor families may not be able to handle the opportunity cost of lost wages while attending the seminar, workers will have to be hired, trained and paid to conduct the training, and accountability measures will have to be implemented to ensure that the worker conducts the training, and that the beneficiaries attend.

Another policy option is to implement a health food stamp program. Potential setbacks include higher monitoring costs to maintain and evaluate the program, and the possibility that food stamps will be trafficked, which means traded for a cash value instead of being used to purchase healthy food. Food stamps ultimately undermine the core assumption of CCTS: that poor families know best what they need, and utilize the cash benefit to invest in human capital while keeping governmental monitoring costs low. Food stamps limit the versatility of the CCT program, but are a viable solution to ensure that families invest in healthy foods. Another option is to introduce food subsidies to beneficiary families, where healthy traditional ingredients, foods and drinks like tomatillos, nopal, tortillas, chiles, beans and agua fresca are offered to beneficiary families at a discount.  While worthy of consideration and possible experimentation by the Prospera program, subsidies may not be effective in the many communities where processed junk foods are considered a luxury good and a status symbol.

**Chapter 5**

**Conclusion**

The relationship between conditional cash transfers and obesity is yet unclear, despite the efforts of Andalón, Leroy et. al., and this thesis. This thesis proposed that CCTs may contribute to childhood overweight and obesity through the income effect, and thus could increase overweight and obesity rates in a way similar to that seen in the 2013 Leroy et. al study. This thesis filled a gap in the field of health and development economics by utilizing an age and sex adjusted BMI to analyze the effects of Prospera implementation on the rates of overweight and obesity among Mexican youth. Ultimately, the results were not statistically significant, due to insufficient data collection, confounding variables unaccounted for in the MxFLS, and possibly the lack of a causal relationship between CCTs and overweight and obesity rates.

Conditional cash transfers apply a holistic approach to the pressing issue of poverty in Mexico and Latin America as a whole. Mexico's groundbreaking Prospera CCT program addresses nutrition, education and health by providing a cash stipend to a typically female head of household on the condition that the family complies with routine health checks including vaccines for children and perinatal care for mothers and that all children attend school on a regular basis. Prospera and other CCT programs promote human capital investments in children and are market-oriented demand-side interventions that directly support the poor and complement traditional supply-side mechanisms. Today, Prospera covers 24 percent of Mexico's population, including nearly all families living in extreme poverty. It has enjoyed key successes,

including increased secondary school enrollment by 11 percent for girls and 7.5 percent for boys and a 12 percent reduction in disease for children aged two and younger.

Obesity is both a public health and economic concern. Today, Mexico has the highest proportion of overweight and obese people in the world, with 10 percent of children under five, 31 percent of children aged 5-11 and 33 percent of teenagers overweight. This problem needs to be remedied; diabetes, stroke, hypertension, coronary heart disease, certain cancers and osteoporosis are comorbid with obesity, and medical professionals report that these issues previously only seen in obese adults are now seen in children. Undernutrition and malnutrition are still great concerns in Mexico, and programs that address these issues may run the risk of promoting overconsumption. Technological, social and economic changes in the past 30 years have only made the global environment more conducive to weight gain, which leads to an overweight population with reduced life expectancy, a lower quality of life, and increased incidence of disease, which leads to overuse of healthcare services and cuts lifetime earning potential and productivity.

Using the Mexican Family Life Survey, I ran a multivariate regression using age-sex adjusted BMI as the dependent variable and gender, education level, total household income, and cost of household food consumption spent on industrial products as independent variables. This study avoided the pitfalls of the Andalón and Leroy et al. papers in that it does not include adult women, whose weight gain during pregnancy and childbirth can obscure results. The results of the regression analysis were not statistically significant, so no conclusions can be drawn from the results. However, it is evident that Mexico could benefit from an intervention that tackles the issue of childhood overweight and obesity.

I recommend better data collection in order to effectively analyze the impact of CCT programs on rates of overweight and obesity. More research needs to be done on the effect of welfare programs, including CCTs, on nutrition, activity level, and weight. Future health and economic research could benefit from controlled trials experimenting with food stamps, nutrition education, food stipends and food stamps. Although some of these proposals go against the careful simplicity of the CCT model, Prospera is Mexico's largest and most effective welfare scheme and a good place to start when considering policy solutions to overweight and obesity in Mexico.

**BIBLIOGRAPHY**

A Model from Mexico for the World. (2014, November 19). Retrieved November 18, 2017, from

http://www.worldbank.org/en/news/feature/2014/11/19/un-modelo-de-mexico-para-

elmundo

Andalón, Mabel. "Oportunidades to reduce overweight and obesity in Mexico?" Health

Economics 20, no. S1 (August 01, 2011): 1-18. Accessed April 12, 2017.

Astudillo, O. (2014). Country in focus: Mexico's growing obesity problem. The Lancet. Diabetes

& Endocrinology, 2(1), 15.

Barr, C. (2017). Inequality index: where are the world's most unequal countries?

Retrieved November 28, 2017, from https://www.theguardian.com/inequality/

datablog/2017/apr/26/inequality-index-where-are-the-worlds-most-unequal-countries

Cole, T., Faith, M., Pietrobelli, A., & Heo, M. (2005). What is the best measure of adiposity

change in growing children: BMI, BMI %, BMI z-score or BMI centile? European

Journal of Clinical Nutrition, 59(3), 419-425.

[Datos Abiertos de México: Prospera]. (2016).

Fiszbein, A., Schady, N. R., & Ferreira, F. H. G. (2009). Conditional cash transfers: Reducing

present and future poverty. Washington D.C: World Bank.

Hojjat, T. A., Hojjat, R. (2017). The Economics of Obesity: Poverty, Income Inequality and

Health. Singapore: Springer Singapore.

Kuczmarski, R. J., National Health and Nutrition Examination Survey (U.S.), & National Center

for Health Statistics (U.S.). (2002). 2000 CDC Growth Charts for the United States:

    Methods and development. Hyattsville, Md: Dept. of Health and Human Services,

    Centers for Disease Control and Prevention, National Center for Health Statistics.

Lehnert, T., Sonntag, D., Konnopka, A., Riedel-Heller, S., & König, H. (2013). Economic costs

    of overweight and obesity. Best Practice & Research. Clinical Endocrinology &

    Metabolism, 27(2), 105.

Leroy, Jef L., Paola Gadsden, Teresa Gonzalez De Cossio, and Paul Gertler. "Cash and in-Kind

    Transfers Lead to Excess Weight Gain in a Population of Women with a High Prevalence

    of Overweight in Rural Mexico." Journal of Nutrition 143, no. 3 (January 23, 2013): 378-

    83. Accessed April 10, 2017.

Levy, S. (2007). Progress against poverty: Sustaining mexico's progresa-oportunidades

    program. Washington, D.C: Brookings Institution Press, 5-11.

Linz P, Lee M, Bell L. Obesity, poverty, and participation in nutrition assistance programs.

    Alexandria (VA): U.S. Department of Agriculture, Food and Nutrition Service, Office of

    Analysis, Nutrition and Evaluation; 2005.

Mexico GDP Annual Growth Rate 1994-2017. (n.d.). Retrieved November 20, 2017, from

    https://tradingeconomics.com/mexico/gdp-growth-annual

North American Free Trade Agreement (NAFTA). (n.d.). Retrieved January 24, 2018, from

    https://ustr.gov/trade-agreements/free-trade-agreements/north-american-free-trade-

    agreement-nafta#

"Poverty Reduction Scaling Up Local Innovations For Transformational Change." United

    Nations Development Programme. November 2011. Accessed April 14, 2017.

Rawlings, L. B., & Rubio, G. M. (2005). Evaluating the impact of conditional cash transfer

programs. The World Bank Research Observer, 20(1), 29-55.

Reyes, M., Teruel, G., & López, M. (2017). Measuring true income inequality in Mexico. Latin American Policy, 8(1), 127-148.

Siegel, A. D. (2016). NAFTA largely responsible for the obesity epidemic in Mexico. Washington University Journal of Law and Policy, 50(1), 195.

Stunting in a Nutshell. (n.d.). Retrieved January 5, 2018, from http://www.who.int/nutrition/healthygrowthproj_stunted_videos/en/

Teruel, G., Rubalcava, L., Thomas, D., & Frankenberg, E. (2012). [Mexican Family Life Survey (MxFLS-2)] [Dataset].

Uauy, R., & Kain, J. (2002). The epidemiological transition: Need to incorporate obesity prevention into nutrition programmes. Public Health Nutrition, 5(1), 223-9.

What is malnutrition? (2016, July 8). Retrieved November 2, 2017, from http://www.who.int/features/qa/malnutrition/en/

World Bank. (2017). World Development Indicators: Gini Index.

Academic Vitae
# Mackenzie E. Beltz
Email: mackenzie.e.beltz@gmail.com

## EDUCATION

**The Pennsylvania State University**                                    University Park, PA
Schreyer Honors College, College of the Liberal Arts                        Class of May 2018
Bachelor of Science in Economics, Bachelor of Science in Women's Studies
Minor: Spanish

## EMPLOYMENT

**Human Impacts Institute**                                               Brooklyn, NY
*Development Manager*                                              August 2017 - Present
- Developing environmental and arts education programs and funding portfolios
- Coordinating grant calendars and writing funding proposals

*Environmental Leadership Intern*                              June 2017 – August 2017
- Developing and updating of environmental leadership curriculum and outreach plans and materials for "Impact Hub" and artists roster programs
- Providing programmatic support for the Restructuring Committee
- Outreaching to other local, national and international partners for involvement and follow-up, and writing relevant blog entries for HII

**Eco Reps**                                                            University Park, PA
*Assistant Program Coordinator*                                   August 2016 - Present
- Leading a team of eight students to coordinate fun, engaging and informative events and activities related to sustainability for freshmen students
- Initiating behavior change among Penn State students and teaching fellow students how and why to make more sustainable choices
- Connecting and collaborating with other students, faculty, student organizations and staff and gaining leadership experience in the growing field of sustainability

## LEADERSHIP

**Springfield For the Kids, THON Fundraising Organization**            University Park, PA
*Active Member, Merchandise Designer*                          September 2014 - Present
- Designing merchandise for club of 200+ students in order to create a cohesive brand and reinforce the organization's goals
- Raising $192,000 in 2017 for the Penn State IFC/PanHellenic Dance Marathon, the largest student-run philanthropy in the world.

**Phi Beta Lambda**                                                     University Park, PA
*Active Brother*                                               September 2015 - Present
- Participating in co-ed business fraternity that combines professionalism, education and philanthropy
- Providing career-building services, hosting charitable functions, and encouraging competition and collaboration between brothers