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Cash Transfers and Adult Mortality: Evidence from Pension Policies

by

Kevin Feeney

A dissertation submitted in partial satisfaction of the

requirements for the degree of

Doctor of Philosophy

in

Health Policy

in the

Graduate Division

of the

University of California, Berkeley

Committee in charge:

Professor William Dow, Chair
Professor Lia Fernald
Professor Paul Gertler
Professor Aprajit Mahajan

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Abstract

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Doctor of Philosophy in Health Policy

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Professor William Dow, Chair

I examine the impacts of (unconditional) cash transfers on adult mortality, exploiting eligibility rules for a universal pension income program in Mexico for identification. Using differences-in-differences estimates with the universe of vital statistics data between 2002 and 2011, I estimate a 5% increase in mortality associated with participation in the universal pension program, driven by changes in deaths attributable to cardiovascular/circulatory disease. The positive income-mortality elasticity contrasts with recent work from low and middle income countries that show decreases in mortality in response to income transfers in later life, but is consistent with other evidence on cash transfers and risk factors for chronic disease. I hypothesize the findings may be explained by increase in food consumption, changes in diet, and retirement transitions. The results have important implications for the design of welfare programs, particularly those targeted towards aging populations, and add nuance to our understanding of socioeconomic determinants of health.

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Chapter 1

Introduction

Cash transfer programs aiming to improve welfare and inefficiencies in human capital investment are popular policies in many countries. Evaluations of these programs form a large piece of economic and public health literature, but there are important gaps to be addressed. For example, many programs that recognize the importance of early life conditions for human development target young children and mothers, but are cash transfers effective at targeting economic and health disparities among adult populations? What are the long run impacts of such welfare programs, and do these relationships add nuance to our understanding about socioeconomic gradients in health and human capital production? To shed light on these questions, I analyze a large cash transfer program in Mexico that formed the basis of a universal (non contributory) pension program beginning in 2007 and its effect on adult mortality.

Aging populations present a challenge for many countries: as individuals live longer, their health and economic security remains tenuous as most lack access to health insurance and social security, or face reductions in existing benefit levels from various social safety nets. Non contributory pension programs are increasingly popular policy options to address such disparities in countries with high levels of informal workforce participation. Similar pension programs to the one I analyze here exist in Peru, Bolivia, China, and notably South Africa among several others, but there is little research to support future implementation. [1] [2]

Rigorous evaluations of these programs are lacking, and current research about cash

[1]South Africa's pension program has been the subject of research from economists Ann Case and Esther Duflo. While the universal pension program has existed since the 1930s, it excluded blacks until the 1990s. The expansion of the program provided a natural experiment to study the impact of this program on well being. Work from Case has studied the impact on self reported outcomes among the age eligible population while Duflo focused on spillover effects of the grant on young children within the household.

[2]While questions about the effects of such policies are particularly important for low income countries where experimentation with these programs is growing, their effects among high income populations are also germane. In the United States, proposals to raise retirement age and cut Social Security benefits may have important ramifications for the financial wellbeing and health of aging populations. Social Security usually refers to the Old Age, Survivors, Disability Insurance (OASDI) program, financed through a payroll tax. Financed separately is the Supplemental Security Income (SSI) which is available to individuals meeting certain income or disability restrictions.

transfers more generally suggests the potential for both beneficial and adverse health effects. The few studies of cash transfers and old age mortality from low income settings show improvements in adult mortality outcomes, but other studies have documented dramatic changes in morbidity (e.g., weight and BMI) and chronic disease risk factors (e.g., consumption of sugars, fats, and nutrient poor calories). Whether these changes attributable to income transfers have meaningful impacts on mortality outcomes is not well understood. Universal pension programs assist individuals with retirement transitions, which may also have important health consequences. However, there is little consensus about the magnitude or direction of effect of retirement on health behaviors, morbidity, and mortality and in particular how these transitions occur in a low income settings.

To measure the impact of (cash transfer) income on adult mortality, I exploit eligibility requirements for a noncontributory pension in Mexico, colloquially known as "70 y Más", so called because it targeted individuals 70 years of age and older (in addition to other eligibility requirements) in its initial implementation in 2007. I use a differences-in-differences approach comparing mortality over a ten year period between communities eligible for the pension program between 2007 and 2009 and those that were not eligible until 2012, making use of the universe of death certificates available in the Mexican vital statistics registry. I find that the program lead to a 5% increase in mortality on average, driven by increases in deaths linked to cardiovascular disease in more economically disadvantaged communities. Further, using data from household surveys, I hint at two possible mechanisms that may explain this increase in mortality: retirement transitions and dramatic changes in consumption. Retirement has been linked to large and relatively short run increases in mortality, as has increase and changes in food consumption.

The results have important implications for both academic and policy circles. Concretely, this study contributes to the understanding of cash assistance programs, such as non contributory pension programs or universal income programs: given the adverse consequences described in the paper, what changes to the design of the program (e.g., conditionality, benefit level and schedule) can be made to ensure positive outcomes in the future? While I cannot be definitive about these recommendations within the scope of the paper, the study dovetails with recent work studying ways to smooth consumption among poor populations. The findings also add to our knowledge about the relationship between income and health. A growing strand of literature has documented the positive association between income and mortality, such as countercyclical associations between unemployment and mortality and short run spikes in mortality following payment schedules for various welfare program such as Social Security in the United States. These studies have for the most part been limited to high income populations, however, and my findings highlight their relevance to low income populations.

I proceed as follows: in Chapter 2, I review studies of the effect of income transfers (pension or otherwise) on adult mortality and health, with particular emphasis on evidence from other programs in Mexico. Chapter 3 presents a simple theoretical model, adapting the canonical Grossman model to understand how changes income affect optimal consumption and leisure, and in turn how these may affect health production. I discuss the institutional details of social security and health insurance in Mexico in Chapter 4, as well the program details of "70 y Mas". In Chapter 5, I present my empirical differences-in-differences strategy and introduce the vital statistics data that I use to analyze the impact of the program on mortality. Chapter 6 presents results from the vital statistics data and in Chapter 7 I explore a household data set from Mexico to understand the roll that changes in diet and labor supply may play in explaining the increase in mortality. Finally in Chapter 8 I discuss the implications of the results for policy and the external validity of the study before concluding in Chapter 9.

Chapter 2

Background Literature

2.1 Cash Transfers and Adult Mortality

Relationships between socioeconomic status and health are well documented, and economists have focused on rigorous causal estimations of the effect of income on health with mixed conclusions. These studies come from both the United States and low/middle income countries such as Russia and China. The magnitude and direction of the income-mortality elasticity from a selection of these studies (Table 2, below) vary. Some estimates are large and positive (Evans & Snyder 2004), while others large and negative (Cheng et al 2016). Research from low and middle income countries and the early twentieth century United States support reductions in mortality with respect to income; studies from contemporary United States tend to support positive income-mortality elasticities. [1]

In China, Cheng et al (2016) find a 14 % reduction in mortality under the country's New Rural Pension Scheme (NRPS). This reduction also coincided with improvements in disability, hypertension/blood pressure control, quality of life, and cognitive outcomes. The authors argued higher incomes improved nutritional intake and access to healthcare. [22] Cheng's study yields an income-mortality elasticity of -1.2, which equates to a 42% reduction in mortality for the average income increase observed under "70 y Más". Jensen and Richter (2004) study mortality in response to pension cuts in Russia. The authors find a 5 percentage point increase in mortality, or 23% increase. (The authors also argue that Russians were able to offset the reduction in income from by returning to the labor force, suggesting a potentially larger effect on mortality.) [40] Salm (2011) studies policy changes in the 20th century U.S. that granted pensions to Union Army veterans, reducing mortality by 11.5 % and then 30 % in the subsequent expansions. [55] Balan-Cohen (2008) finds similar results with the Old Age Assistance (OAA) program in the U.S., attributable to better treatment of infectious diseases (access to antibiotics, which at the time were quite expensive) and mental

[1] This table does not represent the universe of studies that tackle the relationship between income and adult mortality. There are many other rigorous analyses where it is not possible to calculate an elasticity, often because the baseline mortality rate was omitted from the publication or not available in the study sample.

Table 2.1: Income Elasticities for Mortality

Author	Program	Country/Sample	% $\triangle Income$	% $\triangle Mortality$	$\varepsilon_{m,i}$
Cheng	Pension	China(2008/12)	12.00	-14.10	-1.18
Jensen	Pension	Russia(1995/6)	-24.00	23.60	-0.94
Salm	Pension	USA(1900/17)	51.98	-29.60	-0.57
	Pension	USA(1900/17)	36.02	-11.50	-0.32
Balan	Pension	USA(1930/55)	75.00	-22.00	-0.29
Bahram	CCT	Mexico(1997/2000)	22.00	-4.00	-0.18
Evans	CT	USA (2001)	0.29	0.053	0.18
	CT	USA (2000/6)	0.35	0.065	0.19
Evans	Pension	USA(1979/93)	4.00	2.40	0.60

Note: CT=Cash Transfer; CCT = Conditional Cash Transfer. For Jensen, elasticity calculated using mortality data published by WHO to estimate baseline mortality risk since not published in article. %△ Income represents percent change in income and %△ Mortality the percent change in mortality; $\varepsilon_{m,i}$ is income-mortality elasticity, equivalent to $\varepsilon_{m,i} = \frac{\%\triangle \text{Mortality}}{\%\triangle \text{Income}}$ "Sample" year refers to the years analyzed in the study data, not the year of publication. All estimates statistically significant at p<0.10.

health (fewer suicides). [11] [2]

Snyder and Evans (2002) examine changes to social security payments in the United States exploiting the social security "notch" and find larger social security payments induced from exogenous changes in benefit calculation increased mortality. [60] The effect is numerically small but economically meaningful, yielding an income-mortality elasticity of 0.60. By these calculations, a 35% increase in income (roughly the average income increase I observe under "70 y Mas") would lead to a 20 % increase in mortality. The authors attribute the results to changes in lifestyle and health behaviors (e.g., decreases in co-residency and and earlier transitions out of the labor force).

Retirement transitions are one channel to explain the relationship between pension income and mortality. I detail the results from several studies below in Table 3, which show both large and imprecise reductions in mortality and large increases. [3] Kuhn et al (2013; Austria) finds a 13% (or 2.4 percentage point) increase in mortality in response to earlier retirement. Research on retirement and morbidity corroborate these adverse effects: Moon et al find a 50 % increase for cardiovascular disease prevalence just one year after retirement. [47] Studies have also shown effects of "mental retirement", or declines in cognitive and emotional health post labor market transitions at older ages which may also contribute to mortality. [51] These adverse affects could be caused by shifts in diet, exercise, and socializing that lead to more sedentary and isolating lifestyles. The tables also suggests possible protective effects of retirement. Brockman et al and Lalive et al find statistically significant decreases in mortality. These changes in mortality are predominantly driven by changes in cause specific mortality related to chronic, cardiovascular diseases.

[2] However, other research on the expansion of the Old Age Assistance program finds conflicting results. Stoian and Fishback (2013) find little change in mortality from the establishment of the program. [62]

[3] Studies reviewed here make some attempt to address the endogenous relationships between labor market exit and health.

Table 2.2: Retirement and Mortality

Author	Country/Sample	% $\triangle Mortality$
Lalive	Sweden, Women - First Reform	-16%
	Sweden, Women - Second Reform	-33%
Brockman	Germany, Men	-12%
	Germany, Women	-23%
Hernaes	Norway, Ages$\leq$ 70	6%
	Norway, Ages 71-78	15%
Wu	USA (HRS)	11%
Borgschulte	USA (UC System)	12%
Kuhn et al	Austria, Men	13%

Notes: HRS indicates data from the Health and Retirement Survey. Lalive examines two pension reforms: the first raises early retirement ages from 62 to 63 and the second raises standard retirement ages from 65 to 66, for which he finds increases in mortality. I flip the sign on the estimate to be consistent with other studies in the table. Hernaes examines retirement's effect on mortality by age: for those who retire before age 70 and those who retired between ages 71 and 78. All outcomes statistically significant at p-value < 0.10.

2.2 Evidence from Mexico

Research from Mexico is inconsistent regarding how cash transfers from a universal pension may affect mortality and morbidity. Exploiting the randomized roll out of the *Progresa/Oportunidades* program, Barham and Rowberry (2013) find a 4% decrease in mortality between 1998 and 2003 among adults 60 years of age and over. [13] [4] The authors find mortality reductions are driven by reductions in chronic disease mortality (rather than reductions in infectious disease, for example). With an average increase in income of 20% under the program, this yields an income-mortality elasticity of -0.2, implying a similar 7% decrease in mortality under "70 y Mas". Further, Berhman and Parker (2013) find the *Progresa/Oportunidades* programs benefited the health of older Mexicans residing among eligible households. The authors observe a 24% increase in doctor visits, 6.8 % reduction in self reported diabetes prevalence, a 3.4 day reduction in number of sick days per month, and 20% decrease in hypertension among women 50 and older. The effects are limited for older men: a 18% increase in clinic visits and a 3% reduction in self reported diabetes, with negligible and insignificant changes for other outcomes. [16] [5]

Other research however from *Progresa/Oportunidades* finds increases in risk factors for chronic diseases among adults in eligible households. Fernald et al (2008) find increases in body mass index (BMI) and obesity associated with higher cash payouts among adults

[4] The study analyzes the effect of the *Progresa/Oportunidades* program on old age mortality before the implementation of the pension component of the same program in 2006. Studies of older, state-specific pensions programs have not focused on mortality outcomes or mortality risk factors explicitly.

[5] It's important to note that the sample in Berhman and Parker includes adults 50 years of age and older in household eligible for the program. Households were eligible if they had young children or young mothers, who were the focus of many of the conditional requirements of the transfer such as school attendance and antenatal visits.

participating in the program. [30] These results confirm what is seen observationally in rural Mexico: a positive correlation between socioeconomic status and morbidity. [29] [59]. Comparable findings are present elsewhere in Latin America (Table 4). Attanasio et al (2005) finds a remarkable increase in BMI among participants in a program in Colombia: a 27% increase in obesity in response to a 20% increase in income within one year. The authors trace these adverse outcomes to dramatic changes in consumption. Leroy at al (2008) finds diets include more processed starches and carbohydrates, sugars, and fats. [43] These physiological and behavioral changes increase risk for chronic diseases, such as diabetes and hypertension.[6]

Table 2.3: Income and Chronic Disease Morbidity

Author	Program (Yr)	Outcome	% $\triangle Income$	% $\triangle Outcome$	ε
Galiani/	70 y Mas	BMI (obese only)	38.0	-1.42	-0.04
Gertler	Mexico(07/9)	Hypertensive		18.21	0.48
Attanasio	CT	Obesity	20.0	27.00	1.35
	Colombia(06)				
Fernald/	CCT	BMI	–	3.32	0.03
Gertler	Mexico(03)	Overweight		19.30	0.19
		Obese (I)		30.35	0.30
		Obese (II)		54.60	0.55
		Dia BP		1.50	0.02
		Hypertensive		11.30	0.11

Notes: CT=Cash Transfer; CCT = Conditional Cash Transfer. Galiani, Attanasio, Fernald report ITT. Obesity (I) is BMI over 30; Obesity (II) is BMI over 35. Studies excluded if not possible to calculate elasticity with sample statistics in paper. Exception is Galiani, Gertler evaluation of "70 y Mas" where elasticities were used with income reported in ENIGH 2006. Galiani & Gertler limit their analysis to households eligible for the program in 2007. Fernald & Gertler standardize estimates for a 100% increase income in their paper. Only statistically significant outcomes (p-value $\leq$ 0.10) included in the table.

The *Secretaria de Desarrollo Social* (SEDESOL) in Mexico, the agency responsible for the conception and implementation of the "70 y Más" program, conducted a preliminary evaluation of the pension program among a subset of localities eligible in 2007. [7] The evaluation analyzed self-reported health, disability, adult vaccination, health service utilization (private or public), preventive care, emotional wellbeing/depression, satisfaction with life, and chronic disease morbidity (blood pressure, body mass index) and diet (caloric consumption, protein, fruits, vegetables, and food security). Despite improvements observed in both the SEDESOL report and peer reviewed publications for self reported health and mental

[6] An important question is whether these increases in obesity and hypertension are clinically meaningful for mortality. It is of course impossible to randomize these adverse physiological affects among a population. Among the studies that do observe these changes, it is difficult to measure mortality because of short evaluation windows and for the fact the deaths can be relatively rare among non elderly adult populations. Methodological constraints aside, epidemiologists have studied this question with a wide variety of estimates about weight gain and mortality.

[7] Separate studies of the program's affect on labor supply and mental health have also been published in academic journals. [54] [32] [41]

health, there were significant increases in morbidity that suggests such large cash transfers have adverse health effects. Systolic blood pressure increased by 11 percentage points and diastolic blood pressure increased by 6 points, leading to a 13.3% increase in hypertension. There was an improvement in overall food security, but no statistically significant changes in the prevalence of being underweight, overweight, or obese. [57] [8]

2.3 Summary

This section highlights several outstanding questions in the literature about cash transfers and adult heath. First, what is the direction and magnitude of the effect of cash transfers on old age mortality? Studies from low middle income settings and Mexico show improvements in mortality outcomes, but there may be significant differences between these programs (e.g., *Progresa/Oportunidades*) and "70 y Mas" which would moderate or modify these results. Relatedly, under what conditions might the positive income mortality elasticities from the United States be externally valid for the population I study in Mexico? Low literacy/educational attainment, rural living arrangements, low incomes, and lack of access or low quality access to healthcare services make comparisons between the "70 y Mas" population and those in other low or middle income settings obvious, yet Mexico's high chronic disease burden among aging individuals suggests relationships between income and mortality among countries with comparable disease profiles (eg, United States) may also apply.

Second, is there some interaction between cash transfers and Mexico's high chronic disease burden that could lead to clinically meaningful changes in mortality? If the increases in obesity and blood pressure noted elsewhere in Mexico and Latin America replicable among the "70 y Mas" population, are these changes sufficient to significantly increase mortality risk? Are there other mechanisms besides changes in food consumption and diet that could be contribute to these adverse physiological changes and lead to increases in mortality like what is observed in high income settings? Retirement transitions may be one pathway linking pension income to mortality, but extant research is not clear about the size or direction of the effect, much less whether the results from United States and Europe would apply to low and middle income countries where old age employment trajectories are understudied. Finally, could these mechanisms help reconcile the different effects we observe across countries in Table 2.1 and can policy be altered to ensure the benefits of such cash welfare programs are reproducible elsewhere?

[8] As mentioned previously, some individual Mexican states have experimented with their own pension policies in addition to the federal "70 y Mas" program. Aguila et al (2014) study state specific variations in the Yucutan and find qualitatively similar results regarding improvements to quality of life and consumption. [2] [5]

Chapter 3

Theoretical model

3.1 The Grossman Model

How will income from a universal pension affect mortality? The Grossman model is the workhorse economic model for deriving comparative statics on health capital investment. [36] Health enters an individual's utility indirectly, as health stock produces more healthy days on the labor market or higher wages (to compensate higher marginal product of labor), increasing (earned) income and consumption. Health can also enter the utility function directly if agents derive utility from being healthy. Individual maximize utility, not health, and the effect of income transfers on health capital investment is ambiguous. Optimal labor supply may be lower, implying lower investment in health or lower levels of health capital. At the same time, investment in health stock may be cheaper. Death occurs when the health stock reaches zero. [1]

Consumption increases with income, but this can have both positive and negative effects on health stock. Consumption of medical care and health services can rise, potentially boosting health stock, but substantial evidence exits that unhealthy consumption (e.g., cigarettes, alcohol, nutrient deficient calories, etc) also increases. [2] If these goods factor into the health production, the effect of income is ambiguous and depends on individuals tastes, information, and time discounting factors. These parameters all add nuance to the model, but do not move us towards any firm(er) conclusions about the effect of income on health *vis-a-vis* a cash transfer. Similarly, including retirement decisions complicates the model but the comparative statics are still ambiguous. When individuals retire (as they might be encouraged to do with a noncontributory pension), there is limited return to healthy days from the labor market, but investment in the health is also less costly. Thus, whether and how income transfers effect mortality is a question answered empirically. Below I derive the comparative

[1] Regarding mortality, the Grossman has some peculiar features. Death is deterministic: in maximizing utility, individuals can choose theoretically when health capital stock depreciates to zero at which point they die.

[2] In the Grossman model, health services are an input in health production. Whether or not access to and utilization of healthcare actually improve health outcomes is debatable within the literature.

statics behind these statements.

3.2 Comparative Statics

Consider an individual who makes decisions in a single period and all returns to investments are realized instantaneously. [3] Define an individual's additively separable utility in a given period as a function of leisure l, and consumption of good n, c_n, $U = u(c_n, l)$. The following conditions hold: $\frac{\partial U}{\partial c_n} > 0$, $\frac{\partial U}{\partial l} > 0$, $\frac{\partial U}{\partial c_n \partial l} = 0$, $\frac{\partial U^2}{\partial l \partial l} < 0$, $\frac{\partial U^2}{\partial c_n \partial c_n} < 0$. [4] Individual receive non labor income Y, face prices p and wages w. An individual allocates labor supply across T hours in a given time period. Consistent with a model of health production, I allow consumption choices to yield returns on the labor market via parameter λ which is modeled as a wage premium or penalty. The intuition behind this is that some types of consumption may have a premium on the labor market (they have a high ratio of nutrition to caloric intake), while others may have an additional cost on the labor marker (high caloric intake via sugars, fats, etc that leave individuals with poor nutritional intake and energy deficient). The budge constraint can be written:

$$Y + (w + \lambda c_n)T = pc_n + 2(w + \lambda c_n)l$$

To model how a large cash transfer such as the one received by participants in the "70 y Mas" program will change consumption and labor supply, I characterize in the following propositions how optimal choices of consumption c_n^* and leisure l^* vary with exogenous increases in unearned income Y and how these optimum affect health production.

Proposition 1. *Increases in un earned income Y will increase consumption of c_n^* and l^*, regardless of the sign of λ, under particular conditions.*

Using the Implicit Function Theorem, I derive equations for optimal consumption and leisure:

[3] The model can be extended to analyze optimal decisions across multiple time periods with similar conclusions. Some additional nuance from a multi period model comes from how individuals respond to risk - health or economic - in old ages. If individuals are prone to save in the face of expensive health risks or costly economic shocks, their consumption and leisure may increase not only in response to an income effect, but also an "insurance" effect. The pension program provides a consistent stream of additional income for the remainder of their lives which can "insure" against costly shocks.

[4] A richer model might have the following property: $\frac{\partial U}{\partial c_n \partial l} \neq 0$. However, these cross partial effects are usually small and positive.

$$\frac{\partial c_n^*}{\partial Y} = -\frac{\partial U^2}{\partial c_n \partial Y} \cdot \frac{\partial U^2}{\partial c_n \partial c_n}^{-1}$$

$$= -\frac{u_{ll}\left(\frac{-pw-Y\lambda}{2(w+\lambda c_n)^2}\right)\left(\frac{1}{2(w+\lambda c_n)}\right) + u_l \frac{-\lambda}{2(w+\lambda c_n)^2}}{u_{c_n c_n} + u_{ll}\left(\frac{pw+Y\lambda}{2(w+\lambda c_n)}\right)^2 + \lambda u_l\left(\frac{pw+Y\lambda}{2(w+\lambda c_n)^3}\right)}$$

The expression above will be positive under certain conditions, e.g. the optimal consumption of good c_n will increase as long as $\frac{-u_{ll}}{u_l} > 2\lambda \frac{w+\lambda c_n}{pw+\lambda Y}$, or individuals are sufficiently risk averse.

$$\frac{\partial l^*}{\partial Y} = -\frac{\partial U^2}{\partial l \partial Y} \cdot \frac{\partial U^2}{\partial l \partial l}^{-1}$$

$$= -\frac{u_{c_n c_n}\left(\frac{-2wp-2\lambda y}{(p-\lambda(T-2l))^3}\right) + u_{c_n}\frac{-2\lambda}{(p-\lambda(T-2l))^2}}{u_{ll} + u_{c_n c_n}\left(\frac{2wp+2\lambda y}{(p-\lambda(T-2l))^3}\right)^2 + u_{c_n}\left(\frac{8w\lambda p+8\lambda^2 Y}{(p-\lambda(T-2l))^3}\right)}$$

The expression above will be positive be under certain conditions e.g. the optimal leisure will increase as long as $\frac{-u_{c_n c_n}}{u_{cn}} > \lambda \frac{p-\lambda(T-2l)}{wp+\lambda Y}$, or individuals are sufficiently risk averse. [5]

These expressions are more nuanced than we might derive from a model without health production ($\lambda = 0$). Changes in income introduce substitution effects: as leisure increases in response to income, the marginal cost of consumption changes as well. This not only shifts the budget constrain outwards, but also changes the slope, introducing changes in the

[5] The Grossman model also allows for health to factor directly into utility. In health "consumption" models, we can derive the same conclusions regarding increases in optimal consumption and leisure. Define the utility function $U = u(c_n, l) + H$ where H is health capital as defined on the following page. I collapse a multi period model to a single period for technical simplicity, but models where health gains from current consumption, leisure (health investments) are realized in the next period yield similar results. Now the results also depend on the relative signs and magnitudes of $\{H_l, H_{c_n}\}$, which could be positive or negative depending on whether retirement and consumption are good or bad for health production.

$$\frac{\partial c_n^*}{\partial Y} = -\frac{[u_{ll} + H_{ll}]\left(\frac{-pw-Y\lambda}{2(w+\lambda c_n)^2}\right)\left(\frac{1}{2(w+\lambda c_n)}\right) + [u_l + H_l]\frac{-\lambda}{2(w+\lambda c_n)^2}}{H_{c_n c_n} + u_{c_n c_n} + [u_{ll} + H_{ll}]\left(\frac{pw+Y\lambda}{2(w+\lambda c_n)}\right)^2 + \lambda[u_l + H_l]\left(\frac{pw+y\lambda}{2(w+\lambda c_n)^3}\right)}$$

$$\frac{\partial l^*}{\partial Y} = -\frac{[u_{c_n c_n} + H_{c_n c_n}]\left(\frac{-2wp-2\lambda y}{(p-\lambda(T-2l))^3}\right) + [u_{c_n} + H_{c_n}]\frac{-2\lambda}{(p-\lambda(T-2l))^2}}{u_{ll} + H_{ll} + [u_{c_n c_n} + H_{c_n c_n}]\left(\frac{2wp+2\lambda y}{(p-\lambda(T-2l))^3}\right)^2 + [u_{c_n} + H_{c_n}]\left(\frac{8w\lambda p+8\lambda^2 Y}{(p-\lambda(T-2l))^3}\right)}$$

composition of the consumption bundle outside of what we might observe from pure income effects in models where $\lambda = 0$.

Proposition 2: *Changes in λ ambiguously affect c_n^*.*

How do changes in the magnitude of the wage premium ($\lambda > 0$) or penalty ($\lambda < 0$) affect the optimal consumption and leisure decisions? Will individuals who are retiring increase their consumption more or less if the wage penalty is more severe? These effects are ambiguous for the reasons discussed above. With a higher wage penalty, for example, consumption has a higher cost, offset by reductions in labor supply but earned income is reduced. I compute the comparative statics below separately for the numerator and denominator derived above for $\frac{\partial c_n^*}{\partial Y}$.

$$\frac{\partial}{\partial \lambda}\left(u_{ll}\left(\frac{-pw - Y\lambda}{2(w+\lambda c_n)^2}\right)\left(\frac{1}{2(w+\lambda c_n)}\right) + u_l \frac{-\lambda}{2(w+\lambda c_n)^2}\right) =$$
$$= u_{lll}\left(\frac{-c_n(Y - pc_n)}{2(w+\lambda c_n)^2}\right)\left(\frac{-pw - Y\lambda}{2(w+\lambda c_n)^2}\right)\left(\frac{1}{2(w+\lambda c_n)}\right) + u_{ll}\left(\frac{-Y}{2(w+\lambda c_n)^3} + \frac{pw + Y\lambda}{2(w+\lambda c)^4}3c_n\right) + \ldots$$
$$\ldots + u_{ll}\left(\frac{-\lambda}{2(w+\lambda)^2}\right)\left(\frac{-c_n(Y - pc_n)}{2(w+\lambda c_n)^2}\right) + u_l\left(\frac{-1}{2(w+\lambda c_n)^2} + \frac{c_n\lambda}{(w+\lambda c_n)^3}\right)$$

and

$$\frac{\partial}{\partial \lambda}\left(u_{c_n c_n} + u_{ll}\left(\frac{pw + Y\lambda}{2(w+\lambda c_n)}\right)^2 + \lambda u_l\left(\frac{pw + Y\lambda}{2(w+\lambda c_n)^3}\right)\right) =$$
$$= u_{lll}\left(\frac{-c_n(Y - pc_n)}{2(w+\lambda c_n)^2}\right)\left(\frac{pw + Y\lambda}{2(w+\lambda c_n)}\right)^2 + 2u_{ll}\left(\frac{pw + Y\lambda}{2(w+\lambda c_n)}\right)\left(\frac{Y}{2(w+\lambda c_n)} - \frac{c_n(pw + Y\lambda)}{2(w+\lambda c_n)^2}\right) + \ldots$$
$$\ldots + u_{ll}\lambda\left(\frac{-c_n(Y - pc_n)}{2(w+\lambda c_n)^2}\right)\left(\frac{pw + Y\lambda}{2(w+\lambda c_n)^3}\right) + u_l\left(\frac{pw + 2Y\lambda}{2(w+\lambda c_n)^3} + 3c_n\lambda\frac{pw + Y\lambda}{2(w+\lambda c_n)^4}\right)$$

Proposition 3: *Relative changes in health induced by un earned income will be larger for individuals with lower health stock (unhealthy individuals).*

How do such changes in $\{c_n^*, l^*\}$ affect health and risk of mortality ($H = 0$)? If consumption and leisure are harmful for health, the increase in income will lower health stock. These changes will be relatively larger for individuals with lower health stock: unhealthy individuals will experience larger reductions in health stock, bringing them closer to $H = 0$. Define health according to a depreciation rate δ and investments in health I:

$$H_t = (1 - \delta)H_{t-1} + I_t$$
$$I_t = I(c_{nt}, l_t)$$

where $I(\cdot)$ is a function of both consumption of type n c_n (inputs such food rich in fats, sugars, and cholesterols) and leisure time l (rest, exercise) l The effect of income on health can be expressed as :

$$\begin{aligned} \frac{\partial H_t}{\partial Y_t} &= \frac{\partial I_t}{\partial Y_t} \\ &= \frac{\partial I_t}{\partial c_{nt}} \frac{\partial c_{nt}}{\partial Y_t} + \frac{\partial I_t}{\partial l_t} \frac{\partial l_t}{\partial Y_t} \end{aligned}$$

Thus the effects on health depend on the sign of partials $\{\frac{\partial I}{\partial c_n}, \frac{\partial I}{\partial l}\}$ and their relative magnitudes. This comparative static also shows that changes in health in response to income will vary by health stock in the previous period, H_{t-1}. Define $\triangle H$ as the change in health induced by income relative to health stock below and differentiate by health stock H_{t-1}:

$$\begin{aligned} \triangle H &= \frac{\partial H_t}{\partial Y_t} \cdot \frac{1}{H_{t-1}} \\ &= \frac{\partial I_t}{\partial Y_t} \cdot \frac{1}{H_{t-1}} \\ \frac{\partial}{\partial H_{t-1}} \triangle H &= -\frac{\partial I_t}{\partial Y_t} \cdot \frac{1}{H_{t-1}^2} \end{aligned}$$

If income is overall harmful to health (consumption of c_n^* leads to excess calorie consumption and crowds out nutritious diets and leisure l^* leads to sedentary behavior, for example), then $\frac{\partial}{\partial H_{t-1}} \triangle H > 0$, implying that the magnitude of the negative change in health is smaller for healthier individuals and larger for unhealthy individuals. Income will thus induce larger, negative changes in health for individuals with low health stock, increasing the probability of death ($H_t = 0$). If income is beneficial to health (consumption of c_n^* leads to nutritious diet rich in vitamins and leisure l^* reduced cognitive and physical stress, for example), $\frac{\partial}{\partial H_{t-1}} \triangle H < 0$, implying that the magnitude of the positive changes in health will be smaller for healthier individuals and larger for individuals with low health stock.

Chapter 4

”70 y Mas” & Institutional Background

4.1 Pension Systems in Mexico

Institutional support for aging populations has been limited in Mexico. Several systems of formal social security are in place, but they often exclude older Mexicans who do not have experience in the formal labor market. These institutions provide both retirement pensions and health care/insurance. The main system is *Instituto Mexicano del Seguro Social* (IMSS), which covers approximately 30% of the population. (Individuals under IMSS can also use it to support adult dependents, such as older adults, regardless of the work history of these older adults.) Other systems of pension and health insurance include a specific fund for state employees *Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado* (ISSSTE), specific funds for state oil enterprise employees (*Petroleos Mexicanos*, or PEMEX) and the military and maritime services. These systems were established originally as defined benefits plans, but transitioned to a defined contribution system in 1997 (IMSS) and 2007 (ISSSTE). [65] [3] [1]

Until recently, individuals who lacked access to a pension also generally lacked access to health insurance. In 2002, this changed with the introduction of *Seguro Popular* (SP). This program aims to increase individual coverage and strengthened systems capacity in marginalized regions. For individuals in the lower five deciles of income, enrollment in the program was free (no enrollment costs, and zero premium charge). Under SP, services (inpatient/outpatient care and prescription drugs) for most conditions and diseases are fully covered. A few studies have sought to evaluate the expansion of this health insurance program on older populations, but have found limited effects on health. [15] Additionally, recent work has suggested that there are still shortcomings in the provision of medical services under SP, such as prescription drugs stock outs and supply side labor shortages/absenteeism.

[1] To be eligible for IMSS social security payments in 2007, individuals need to have contributed to the fund for 1250 weeks. Retirement ages for men and women are 65. Employees (not self employed) contribute 1.75% of wages, employers contribute 6.9%. The gauranteed minimum monthly pension is MX$ 1,754.

[42] [58] Further, the introduction of free healthcare could also lead to moral hazard, where individuals invest less in their health since they are shielded from bearing the full costs of adverse health shocks in the future. There is some suggestion that moral hazard may be driving the decrease in preventative care among eligible beneficiaries. [61] [14]

Mexico's aging population has grown rapidly in the last three decades, reflecting demographic trends in many low and middle income countries. Mortality at younger ages has fallen and life expectancy has increased. Life expectancy at birth (e_0) in 1921 (shortly following the Mexican Revolution) was 32.9 years, compared with 76.0 years in 2012.[2] Between 2000 and 2025, the proportion of the population aged 65 and older was projected to increase 82 % for Latin American and Caribbean countries overall. For Mexico specifically, the population ages 60 and older will grow from just 6 % of the total population in 2000 to 15 % of in 2027. It has taken the United States 70 years to achieve that growth (1943-2013) and Japan 40 years (1947 to 1985). [65] During the this demographic shift, Mexico witnessed a decrease in mortality related to infectious diseases, and an increase in chronic disease mortality. The shift reflects not just an a demographic shock but also a need to address the determinants of chronic diseases with effective policies. Table 1 shows how the profile of cause specific mortality has changed over time in Mexico. [49]

Table 4.1: Cause Specific Mortality in Mexico, 1990-2013

Ranking	1990	2013
1	Diarrheal Diseases	Ischemic Heart Disease
2	Lower Respiratory Infections	Chronic Kidney Diseases
3	Preterm Birth	Diabetes
4	Road Injuries	Road Injuries
5	Congenital Anomalies	Violence
6	Violence	Congenital Anomalies
7	Neonatal Encephalopathy	Lower Respiratory Infections
8	Ischemic Heart Disease	Cerebrovascular Diseases
9	Diabetes	Preterm Birth
10	Malnutrition	Alcohol Related Diseases

Source: Pan American Health Organization. All cause mortality for all ages.

4.2 70 y Más

To address the economic security and wellbeing of the aging population in Mexico - many of whom are not part of the formal workforce eligible for social security and health insurance through IMSS or ISSSTE - the Mexican Secretariat of Social Development (SEDESOL) implemented a noncontributory pension scheme, *Pension para Adultos Mayores* in late 2007.

[2]Current (2013) life expectancy conditional on survival to age 60 (e_{60}) is 22 years in Mexico. For comparison, life expectancy in the United States e_0 is 79 years and e_{60} is 23 years. For Russia, e_0 is 69 and e_{60} is 17; in China e_0 is 75, and e_{60} is 19. I discuss studies of pension income and old age mortality in these countries in a subsequent section.

Individuals who initially qualified for this program were 70 years of age or older and colloquially the program was referred to as "70 y Más" in reference to this age eligibility. Additionally, recipients were only eligible if they resided in communities (*localidad*, or locality) of a certain size/population. In addition to age and residency eligibility requirements (the later discussed in detail below), individuals were ineligible if they participated in the *Progresa/Oportunidades* program. [3]

The program made payments equivalent to a monthly cash transfer of MX$ 500, roughly equal to US$ 40 (during the study period), delivered every two months. [4] This represents a substantial portion of household income for aging individuals in rural Mexico. Using household survey data, I estimate that this represents between 20-40 % of per capita total household monthly income among eligible households.[5] Individuals can sign up for the pension program with a current, government issued identification card that displays date of birth and address. Surviving family members of deceased participants were also awarded a lump sum transfer equivalent to several months of the stipend, an important issue I return to later. The program is financed by the federal government at 0.6 % of GDP. [41] The first stage of the program roll out was evaluated by SEDESOL and I discuss the results and their limitations in the following section.

The initial population limit for participating localities was 2,500 individuals or fewer at the start of the program in the second half of 2007, but expanded to localities with

[3]While "70 y Más" has been the largest program both in scale and contribution amount to address pensioners outside of the formal system, it has not been the only one. Since 2001, select individual Mexican states and Distrito Federal have also implemented state specific noncontributory pensions with varying eligibility requirements. These states are: Baja California Norte, Sinaloa, Jalisco, Tabasco, Chiapas, Quintana Roo, and Yucutan. Additionally, the *Progresa/Oportunidades* program instituted a social pension in 2006 also targeted at individuals 70 years and older who lived in households already qualifying for the the *Progresa/Oportunidades* program. However, the stipend amount was about half of what was offered by "70 y Más." This program was eventually rebranded under a new president as "70 y Más," with notable changes in benefit structure and eligibility, including baring dual enrollment in both *Progresa/Oportunidades* and "70 y Más". The program administrators believed that the pension payment under "70 y Más" was high enough so that individuals 70 years of age or older were incentivized to dis-enroll in *Progresa/Oportunidades* and instead register with "70 y Más".

[4]SEDESOL partnered with BANSEFI bank to distribute these payments, the same banking organization used to distribute payments for *Progresa/Oportunidades* program. The exact benefits schedule is not fixed, and often changed: participating individuals in different localities received cash on differences days of the month all across the two month payment period. The disbursement was well publicized by local organizations, newspapers, and was available through a telephone hotline. Consistent with the program feature, we do not see changes in mortality accumulating in certain months or days of the months for eligible localities.

[5]As part of a SEDESOL evaluation I discuss further down, age eligible persons in recipient households were asked how they would spend the income transfer. Eighty percent of households said they would spend the money on food; 35% said they would use the transfer to buy prescription drugs they could not afford; 20% said they would buy clothing, and 12% said they would spend it on water and electric utilities. These responses are revealing: while Mexico has made the transition to a middle income country, there are still serious financial barriers facing the aging population with regard to access to healthcare and food security.

populations of up to 20,000 individuals in 2008 and 30,000 in 2009.[6,7] In the first phase of the program, enrollment reached almost 1.03 million beneficiaries, which SEDESOL equates with almost 100 % take up and 89 % of respondents received the cash transfers as scheduled. [8] [6] These high take-up rates continued with further expansions of the program: by 2008, the number of beneficiaries across all eligible localities (populations $\leq$ 20,000) reach 1.7 million, and in 2009 the third expansion of coverage brought the total enrollment to 2.2 million. With approximately 4.03 million individuals aged 70 and over in the 2005 Mexican census, the program covered just over half the age eligible population in the country. Additional means testing was incorporated in 2012 applicable only to new beneficiaries when the program expanded to cover all Mexican localities. New participants were ineligible if they received other social security payments in excess of a certain amount, such as those from IMSS or ISSSTE. In 2014, the program expanded yet again by reducing the age eligibility to 65 years. (My analysis, however, will focus on outcomes using a differences-in-differences approach with data through 2011.)

[6] This limit refers to the localities *total* population, not the size of the pension eligible population over 70.

[7] The *Progresa/Oportunidades* pension program only covered those households eligible in 2007 under the first phase of the roll out, e.g. households in localities with 2,500 persons or fewer.

[8] Using data from several household surveys, I construct much more conservative estimates of take up, although it is difficult to put too much weight on these estimates since the samples may not be representative of the eligible population.In these estimates, I calculate a 40-70% take up rate across ENSANUT, MxFLS, and MHAS surveys and across communities eligible in either 2007, 2008, or 2009.

Chapter 5

Empirical Strategy and Data

5.1 Vital Statistics and Census Records

The two main sources of data for the analysis are individual death certificates covering years 2002 to 2011 and locality level census data from the 2005 and the 2010 census and inter-census records, all available from from *Instituto Nacional de Estadistica y Geografia* (INEGI) in Mexico.[1] Mortality files include key information on the deceased: state, municipality, and locality of residence, birth year, gender, and insurance status. I use these variables to count the number of deaths by gender and insurance status for uninsured (no insurance or only *Seguro Popular* coverage) individuals who die at age 70 or older. [2] Due to restrictions in the data, I cannot match deaths in the vital system registry to localities in the census for deaths that occurred in localities with small populations, so I focus on the expansion of the program in 2007-2009 with a limited sample of localities eligible in 2007 (populations of 1,500 persons or more). As part of my estimation strategy detailed below, I construct a set of control localities with populations between 30,001 and 100,000 persons not incorporated until after 2011. [3]

Using the vital systems registry and census records, I construct mortality rates at the locality level for each year between 2002 and 2011. I cannot construct the exact sex- and insurance-specific population counts of individuals who are 70 years and older in each year. Instead, I rely on sex-specific population at the locality level for individuals 60 and older, the oldest age at which population counts are available in both the 2005 and 2010 census.

[1]The date range from 2002 to 2011 was chosen so that there are more or less an equal number of years in the treatment period and pre-treatment period. Due to data limitations, the study horizon can't be extended backwards to years prior to 2002 because locality specific identifiers were not made available in public use data from INEGI until 2002.

[2]Although the pension was available to all individuals regardless of insurance or pension status in its first five years, I limit the sample to individuals who were not covered by IMSS, ISSSTE, or other formal/private pensions systems. This is for two reasons. First, it ensures some comparability across treatment and control localities. Second, I argue persons without access to formal pensions are the policy relevant population.

[3]100,000 was chosen as the cutoff according to power calculations. The results are not sensitive to this cutoff point. Additionally, 100,000 is the cut off for localities considered to be "urban" according to INEGI.

This population is not disaggregated by insurance status, but I take steps to account for any bias this may introduce.

Further, since census data is not available every year (unlike the vital statistics records), I linearly interpolate locality specific population growth rates to derive year-specific, sex-specific population counts of the population 60 years and older in intervening census years (2002-2004, 2006-2009, 2011). This potentially introduces measurement error into the dependent variable (mortality rate), which could bias estimates if this is correlated with program takeup, e.g. smaller localities that received the program are also more likely to have systematic measurement error in their dependent variables compared to larger localities that did not receive the program. A second problem with this data limitation is that descriptive statistics of the mortality rate for individuals age 70 and over will be underestimates. The locality level census files also include a number of other variables which I use to control for time varying changes at the locality, municipality, and state level that could affect mortality rates and correlate with the pension roll out (see discussion of the construction of these control variables in Section 4). Since some these variables may only be available in 2005 and 2010, I rely on a similar interpolation strategy as above. [4]

5.2 Vital Statistics Reporting Quality

An important issue to address is the quality of the vital statistics data in Mexico, especially for older individuals in rural localities where contact with medical personnel is unreliable. Deaths may go unreported or cause of death may be misreported. The "70 y Mas" program may have introduced incentives that affected these reporting patterns. [5] Better monitoring from administration officials and financial incentives to surviving family members to report deaths of participating pensioners could improve issues of underreporting and the accuracy of cause of death determination, particularly if there is any additional income affect on health care utilization and contact with doctors. [6] Changes in patterns of (under/mis) reporting may cause spurious changes in mortality rates that are in fact not due to true (behavioral, physiological, or other) changes in mortality risk. Prior literature has suggested that welfare programs such as this one may have similar affects on reporting.

[4] Later I make some attempts limit this bias. In addition to the preferred specification I detail below, I estimate alternate models with locality-year fixed effects exploiting the age-cut off of the program thus controlling for all factors at the locality level in a given year that would affect population growth.

[5] Recall that as part of the program, surviving family member of "70 y Más" recipients who passed away were incentivized to report deaths to program administration to receive a lump sum payment equivalent to some months worth of the program stipend. This payment counters incentives for social security fraud (continuing to collect payments after an individual has died. The WHO actually *recommends* that eligibility for certain programs be tied to vital statistics reporting systems to ensure full and accurate reporting. [66]

[6] When an individual dies outside of a medical facility, the family may often have to call a private doctor who may charge a fee to complete an official death certificate and determine cause of death. When this stage is complete, the family calls the funeral home which fetches the body. This is also the process that starts the administrative registry. A relative must then go to the office of civil registration and exchange the certificate for the "acta de defuncion" and the death certificate is passed along to the ministry of health.

To limit potential bias from changes in reporting quality among localities, I restrict the sample to localities with indicators of good reporting practices taken from the literature. [13] [66] I develop an index of reporting quality based on meta data available from the death certificates: (1) the time lag between the date the death occurred and the date the death was registered, (2) the percentage of death certificates signed by a medical doctor, and (3) the percentage of deaths with undetermined cause. [7] Despite differences in death reporting quality, localities with good reporting scores and those with poor scores are similar with respect to most demographic and economic variables. Localities with high quality reporting tended to have smaller indigenous populations, and be more economically developed with higher proportion of households having access to water and fewer illiterate individuals, but these differences are small in magnitude. While the mortality rate does differ across good and poor reporting quality observations, which could be attributable to underreporting, the composition of mortality by cause does not vary by reporting quality designation. [8] This suggests there is not a selection effect on cause of death among good reporting localities, a key feature of my analysis I discuss in the next section.

In Appendix Tables A8 I provide some evidence of the change in reporting standards for deaths in Mexico. Using the same differences-in-differences framework I used for my main estimates of interest, I examine changes in reporting quality score and each component of the score as well (percentage of death certificate signed by a medical doctor and the lag time in days between a death occurring and registration of the death). For localities eligible in 2007 and 2008, we see significant improvements in the reporting standards around deaths on the order of magnitude of 0.10 standard deviations. We do not see significant changes for localities eligible in 2009, which have significantly better reporting practices than the smaller and poorer localities eligible early on. The improvement in reporting practices is notable since the control localities seem to experience a decline in reporting standards, equivalent to a one quarter of a one standard deviation change. For localities eligible in 2007, there are significant reductions in the lag time between the date the death occurred when when it was registered in the surveillance system and the percentage of death certificates signed off by a medical doctor. The lag in registration improved by 0.75 days, or 13% reduction in lag time. The percentage of death certificates signed by a doctor improved by 3.6 percentage points, or 9.7%. Similarly for localities eligible in 2008, there was 0.6 day reduction in the registration lag time (12 % improvement) but a smaller 4% increase in death certificates signed off by a

[7] I normalize each variable to mean 0 and standard deviation 1 and sum them together for a composite "reporting quality" score. I define "good reporting quality" as observations that fall above the median composite score. I also test the sensitivity to the inclusion of two other variables: the fraction of deaths that occurred in a health facility and the fraction of the deceased seeking medical attention at the time of death. I find no affect of the program on the prevalence of deaths occurring in hospitals or fraction of deceased seeking medical attention before death.

[8] Among 2007 eligible localities, the share of mortality attributable to circulatory disease is 45.7% in poor reporting quality localities and 46.3% in good reporting quality localities; 47.1% vs. 47.4% among (poor/good reporting quality) localities eligible in 2008; 48.9% vs. 49.2% among (poor/good reporting quality) localities eligible in 2009; and 48.7% vs. 48.5% among (poor/good reporting quality) localities in the control group.

doctor. For localities eligible in 2009, we see changes of comparable magnitudes, but these are not statistically significant due to small sizes. [9]

5.3 Differences-in-Differences Estimation

Identification from Locality Size

To estimate the effect of pension income on locality level mortality rates, I estimate a differences-in-differences model, exploiting variation in program eligibility requirements. [10] The strategy is designed to address the missing data problem at the heart of causal models: I observe the mortality outcomes for localities that receive the program, but I do not observe mortality in the treatment period had they not received the pension. Since this counterfactual is not realized, I estimate it. Two assumptions are necessary for a causal interpretation of the estimate. The first is no other contemporaneous changes correlating with the roll out of treatment and the outcome. The second and more critical assumption is commonly referred to as "parallel trends": I assume the mortality rate parallels that of the control localities in the pre program period and would have continued to do so in the absence of treatment.[11]

The preferred model I estimate is a locality fixed effect linear regression model of the following specification:

$$\begin{aligned} Y_{tl} = \quad & \lambda_l + \sum_{t=2002}^{2011} \gamma_t YEAR_t + \sum_{t=2003}^{2011} \gamma_t^{2007} YEAR_t \times Eligible07 + \dots \\ & \dots + \sum_{t=2003}^{2011} \gamma_t^{2008} YEAR_t \times Eligible08 + \sum_{t=2003}^{2011} \gamma_t^{2009} YEAR_t \times Eligible09 + \varepsilon_{tl} \end{aligned}$$

[9] In the Appendix, I present estimates for the change in mortality attributable to the program *unadjusted* for vital statistics reporting quality. The increases in mortality from the unadjusted models are up to twice what we observe when the data is adjusted for changes in quality of death certificates and underreporting, suggesting the reporting incentives account for half of the increase in *reported* mortality observed in the data

[10] Regression discontinuity designs are also theoretically possible given the design of the program presents two potential running variables: age and locality population size. However, differences in differences is a more logical starting point for several reasons. First, *a priori* we cannot determine if changes in mortality will be observable with a short time frame (less than a year) for localities eligible in 2007 and 2008. This makes using a regression discontinuity design with locality population for the running variable unattractive. Second, for localities eligible in 2009 and even for those incorporated earlier into the program, I lack power for a regression discontinuity design with population size as the running variable. Since design effects for such studies can be quite large, I require several times the number of observations I have in the data for a convincing regression discontinuity. Additionally, regression discontinuity designs using age as the running variable may not be ideal if changes in mortality unfold over time: we may not expect to see large changes in mortality immediately at age 70. A regression kink discontinuity design would be more appropriate to exploit age eligibility under this hypothesis. [20] [56]

[11] It is possible to test formally/statistically the strength of the parallel trends assumption in the pre program period, which I discuss in the results section below.

where Y_{tl} is a measure of mortality for year t in locality l and λ_l a locality fixed effect.[12]

The coefficients of interest are the sets $\{\ \gamma_t^{2007}\}$, $\{\ \gamma_t^{2008}\}$, and $\{\ \gamma_t^{2009}\}$ which are the interactions between eligible locality status (either eligible in 2007, 2008, or 2009) and individual year dummies used to identify the intent to treat (ITT) effect of the program on mortality among treatment localities. [13] This specification deviates from typical differences in differences strategy, which imposes more parametric structure over pre and post treatment period trends. The error term ε_{tl} is a locality specific time varying error that I assume to be distributed independently of the fixed effects in the model; it is heteroskedactic robust and clustered at the locality level, the level of program implementation. [19] [18] Finally, the model is weighted by the count of the population age 60 and over in a given locality to reflect the overall mortality rate. I estimate the model separately for all cause mortality, circulatory mortality, and non circulatory mortality. Analysis of cause of death is not just for descriptive purposes. Rather, it provides an important placebo check. While results collected from contemporary studies of income transfers during adult or old age mortality show both increases and decreases in mortality risk, they find such changes are largely attributable to variation in the cause specific mortality rate for circulatory or cardiovascular diseases rather than non circulatory diseases like cancers, infections, respiratory illnesses, violence/accidents, etc. Large changes on these margins are difficult to find in the literature and would be difficult to justify among the extant research. [14]

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[12] I set $Y_{tl} = log(MR_{tl})$. I define MR_{tl} as the mortality rate per 1000 $= 1000 \times \frac{\text{Number of deaths age 70+}}{\text{Pop. aged 60+}}$ Log scale is less sensitive to outliers and I avoid comparisons across levels in my estimates across localities with different population sizes. I add a small constant to include locality-year observations where zero deaths are reported. In later sections, I test the sensitivity of the estimates to a variety of alternate fixed effect specifications.

[13] In particular, we are interested in comparing these coefficients in the treatment period (either 2007-2011, 2008-2011, or 2009-2011 depending locality eligibility) to the pre-treatment period (either 2002-2006, 2002-2007, 2002-2008) to assess the magnitude of the change in mortality in response to the program. A complication arises for those localities eligible in 2007 who were also exposed to a similar non contributory pension program that began in 2006 under *Progresa/Oportunidades*. There are several ways to deal with this issue. For this paper, I leave the estimate $\gamma_{t=2006}^{Eligible=2007}$ in graphs, but exclude it from calculations of the treatment effect for localities eligible in 2007.

[14] It is possible that the same risk factors for cardiovascular or circulatory disease mortality also affect non circulatory disease mortality as well. A 2009 *Lancet* study of 900,000 individuals of cause specific mortality and obesity found that most excessive morality at higher indices of body mass is attributable to cardiovascular and circulatory conditions, rather than cancers. [64] Thus, if the income transfers increase risk factors like obesity through higher calorie consumption, higher sugar and fat intake, and more sedentary behavior, we would expect these to manifest in increases in circulatory/cardiovascular diseases rather than causes attributable to infections, accidents, cancers, and respiratory diseases. However, this does not rule out that risk factors for cardiovascular and circulatory diseases exacerbate cause specific mortality attributable to cancer. Obesity and weight gain have been cited to cause 15-20% of cancers, but this is often measured over a long study horizon spanning anywhere from decades to the life course: to the best of my knowledge, there is little evidence to suggest that short run changes in risk factors for circulatory or cardiovascular diseases increase short run cancer incidence. Cardiovascular and circulatory disease risk factors could also affect cancer prognosis and progression (rather than incidence), which could increase the cancer mortality rate. Extant research on this particular questions tends to focus on long time horizons, so it is unclear whether we would expect such short run increases in cancer and other non circulatory/non cardiovascular

I test the robustness of my estimates to several alternate specifications. First, in place of a locality fixed effect, I include state-year fixed effects and separately the combination of locality and state-year fixed effects to control for all time invariant factors at the locality level and all time variant factors at the state level. Second, I test the sensitivity of estimates in my preferred locality fixed effects model to the inclusion of select time-varying locality, municipality, and state level controls that may correlate with program roll out and mortality trends. Third, I estimate effects separately for men and women, as well as separately for states with high and low chronic disease mortality risk factors, determined from representative survey data on health in Mexico (*Encuesta Nacional de Salud y Nutricion*). While men tend to have higher mortality rates than women, cardiovascular/circulatory causes of death compose a greater share of mortality burden for women, so results may be asymmetric across gender. Further, if income affects mortality risk, these effects maybe stronger among populations with low baseline health stock.

Identification from Age Eligibility

To make use of the additional variation in eligibility across ages I do two analysis. The first is to examine the effect of program implementation at the locality level on age ineligible populations, which I define as adults ages 18 to 60 years. Individuals in this age range are ineligible for the grant, and would only be affected by the program through transfers between households or among individuals within households. These effects are likely to be small. Prior research shows that similar cash transfers pension programs implemented in Mexico City tended to crowd out extra-household transfers to recipients and there was limited capture by other household members, breaking with unitary household models.

Further, we may be particularly concerned that the timing of the program with the recession could confound our estimates and lead us to falsely attribute a change in mortality to the pension transfer. The effect of the recession could be positive or negative: studies from the United States find countercyclical associations with mortality, but one study from Mexico shows these to be procyclical. While I control directly for the effects of recession with a rich vector if time varying locality, municipality, and state variables, analyzing the change in age ineligibles can help us bound the effects of the recession or other time variant confounders. Comprable changes in mortality among this population would suggest that our findings may be due to other economic shocks, not the roll out of "70 y Mas."

Effects of cash transfer may be heterogenous, or non monotonic, across age groups. "Younger" individuals close to the eligible threshold (individuals 70-74) may be affected by the income windfall differently than those individuals who are much older (over 80, for example). This can be for a variety of reasons. Certainly, there are biological differences in these age groups that could lead to non monotonicity although this can be difficult to sign a priori: older individuals may have a higher chronic disease and disability burden, but there may be positive selection into old age on health as well. The type of disability or diseases prevalent among older ages may also be a factor. Cognitive decline may be more salient

diseases.

among the oldest eligibles, while treatable chronic circulatory diseases may burden those closer to 70. There are also important economic differences in these populations regarding income, labor supply, and consumption. Individuals closer to age 70 are more likely to be at the retirement margin, living in smaller households or live alone, and consuming more than these oldest individuals as well. To analyze affects across age groups, I estimate the following triple differences model for each group of eligible localities:

$$\begin{aligned} D_{gl(t)} = \quad & \tau_{l(t)} + \gamma_g + \sum_g \beta_g^1 ELIGIBLE \times \mathbb{1}(Age = g)_{gl(t)} + \dots \\ & \dots + \sum_g \beta_g^2 POST \times \mathbb{1}(Age = g)_{egl(t)} + \dots \\ & \dots + \sum_g \beta_g^3 ELIGIBLE \times POST \times \mathbb{1}(Age = g)_{gl(t)} + \varepsilon_{gt(l)} \end{aligned}$$

for locality-year fixed effect $\tau_{l(t)}$, age group fixed effect γ_g and number of deaths $D_{gl(t)}$ for a given age group g in locality l and year t. The coefficients of interests are $\{\beta_g^3\}$, which are the differences-in-differences-in-differences estimates. I divide the age group into four categories: ages 60 to 69, which serves as a second placebo check for age ineligible members, ages 70 to 74, ages 75 to 79, and ages 80 to 90. The omitted age group are individuals who died aged between 50 and 59. Individuals who died at age 90 or above are excluded from the analysis. One advantage to these models is that the locality specific year fixed affect absorbs the population exposure (number of individuals in a given age group in a given year in locality by insurance status) which is information not otherwise available in the census. The results from these models should confirm that approximating the eligible population with individuals 60 years of age and older does not bias our estimates.

5.4 Household Surveys

Encuesta Nacional de Ingresos y Gastos de los Hogares

I analyze data from household surveys to shed light on the mechanisms driving the relationship between income and mortality. Data for household consumption and labor supply come from the *Encuesta Nacional de Ingresos y Gastos de los Hogares* (ENIGH). The survey is a nationally representative survey of Mexico, conducted every two years with some exceptions. I make use of the survey in years 2004, 2005, 2006, 2008, and 2010. Consumption is measured at the household level and covers food, health, and all other nonfood expenditure for the previous *trimestre*, or four months. Individual data on consumption is not available. I limit my analysis to per capita consumption of food and specific food groups: cereals, grains, and starches ("cereals"), any animal protein or dairy ("meat"), fruits and vegetables ("veg"), and all other consumption which includes expenditures on sodas, alcohol, sweets and pastries, tobacco, and food purchased outside the home. These food grouping were selected to understand crudely how changes in household consumption affect nutritional intake. Expenditures on "other" goods carry little nutritional value and have high sugar and calorie content. Meat and dairy are usually expensive goods for many poor households in Mexico and is an important source of protein and vitamins and minerals such as iron, but can contain high fat and cholesterol as well, particularly lesser quality cuts of meat and pork. Cereals and starches are a large staple of consumption, and fruits and particularly vegetables can be an important source of vitamins and fiber in the diet.

It's important to note that the food consumption variables are measured at the household level, rather than the individual level. This can present a limitation to the argument that the cash transfers impacted the diet of individual pension eligible members. Household capture by other members present in the household may mean that non eligible members (those under 70) are changing patterns consumption instead of or different from those receiving the pension, distorting the household-level measures. Further, changes in household size in response to the program could also spuriously drive up or down consumption. Unfortunately, individual measures are difficult to come by in most surveys. ENSANUT includes individual consumption measures, but only in 2012, and the cross sectional data limits any causal inference to be gained from quasi experimental roll out of the program. A few empirical solutions present themselves. The first is to adjust for household size and or control for it on the right had send of the regression model. I do both by calculating a per capita measure with each members equally weighted and testing the sensitivity of my estimates to controls for household size and composition, which I discuss further below. (More sophisticated approaches could weight household members differentially by age using the OECD equivalency scales, for example, which downweight younger household members.) Second, I repeat the analysis among households of size 2, including at least one age eligible person. If the presence of other household members is driving consumption, these estimates should be smaller and or different from what we observe in the full sample.

Labor supply (individual survey component) is solicited by asking if the respondent if s/he has worked at all for at least one hour in the previous month. This differs from other household surveys about labor supply which ask about any work over the prior week. I do not attempt to differentiate between paid or unpaid work, work inside or outside the home, or work in the formal versus informal sector, partly due to changes in the sequence of these questions as they appear in the ENIGH survey in the middle of the time series. I also measure three other types of consumption: health expenditure, non food (non health) expenditure, and any savings. In early pilot evaluations of the program, 30% of age eligible respondents reported they would spend money on prescription drugs. [15] Health expenditures are uncommon in the ENIGH survey: only 14% of households with an "70 y Mas" eligible members reported positive heath expenditures. I create a binary measure of any health expenditure (summing over prescription drugs, primary care, and hospitalization) as well as a dummy variable for any prescription drug spending. Non food (non health) expenditures includes all other expenses, such as clothing, utilities, and durable goods and assets. Information on savings is limited in ENIGH, so I use whether the household has any savings in any sort of formal or informal account (bank, *tandas*, etc.) It will be important to determine whether

[15] While not explicitly addressed in my theoretical model above, several noteworthy papers have commented on how income might effect optimal health spending. [38] [1]

individuals consume their income and what they spend it on, or if they increase savings to smooth consumption.

Two additional indicators relate to household composition are: household size and marital status. Research suggests that living arrangements may be important for health, although it is difficult to guess how they might change with the cash transfer. This depends on whether living alone or in smaller households is a normal good for the target population. Children or other family members may also move into pension-eligible households to benefit from the additional income, particularly if aging individuals are more prone to retire and have time to look after children or help with household production. In Snyder and Evans' (2006) study of mortality and the Social Security "notch" in the United States, the authors suggest that decreases in intergenerational co living arrangements may play a role in mortality risk, particularly coupled with rising disease and disability burden and retirement transitions that leave older individuals vulnerable to health shocks and socially isolated.

Similarly, marital status my be affected by the transfer as documented in Argentina's non contributory pension program. [17] Specifically, women who have access to the transfer may choose to leave their husbands and live with other family members or live alone. If the cash transfer has positive effects on health on the other hand, the transfer may improve mortality outcomes and married couples may be more prevalent through a reduction in widowhood. Literature suggests marital status can be protective for health and may be an important source of social support in old age.

Descriptive Statistics (ENIGH)

I present some descriptive statistics on these variables in Chapter 7 Table 7.1 and Figure 7.1, limiting the sample to household with at least one member eligible for "70 y Mas" (ages 70 and over) in the pre period (pooled across surveys in 2004, 2005, 2006). These compliment those presented in Table 3 in Chapter 6. I also limit the sample to households where the household head does not have access to formal social security in order to match the sample used in the vital statistics. Household eligible in 2007 were similar to households in localities eligible in 2008 and 2009 and our control localities not eligible until 2012 with regard to household size (average of 3.4 persons), prevalence of living alone (households of 2 or fewer adults age 60 and over, about 22 % of the sample) or prevalence of households with any young adults or children (person under 18 years of age), and the number of working age adults (men and women ages 18 to 60). However, households in localities with populations of 2500 or fewer eligible in 2007 were marginally more likely to have a higher number of co-residing persons ages 70 and over ("dual" eligible households). Also, the household head was less educated than among those in localities eligible later on in the study period.

Households eligible in 2007 were more likely to be poorer relative to control localities as measured by household per capita consumption on all items and all food expenditure items (meat/dairy, fruit/veg, cereals/grains/starches, and other items). Localities eligible in 2008 also had lower expenditure on these items, but I do not find statistically significant differences relative to the control localities, with the exception of other food expenditure on items like sweets, drinks, and food outside the home. Localities eligible in 2009 were comparable to those eligible in 2012 that serve as our control. All households spent about 18-20% of total expenditures on food, with no statistically significant differences between households eligible earlier or later in the roll out. Similarly there was no statistically significant difference in the fraction of food expenditure devoted to grains/cereals across the different locality types (16-22%), meat/dairy (33-35%), and fruits and vegetables. Households eligible in 2009 and the control localities tended to spend more on other food items 20% versus 1516% among localities eligible 2007-2008.

Figure 7.1 shows how consumption, income, living arrangements, and labor supply changes as individuals age in Mexico, graphing age specific means across ages 50 to 90. Food consumption and income decline across age, more so after age 70 than before. "HH Size" is a dummy variable for living alone as a single adult or with a spouse. Co-residency rates decrease with age as older household members become more isolated and labor supply declines by age but remains high overall, even in advanced ages (ages 80 and over). The "70 y Mas" pension payments targets individuals at the beginning of many these transitions into old age which often leave aging individuals in vulnerable position with regards to financial security, health, and wellbeing overall.

Estimation

For the ENIGH data, I adopt both a double difference and triple differences approach to parallel the work above with the vital statistics data. One advantage to the more explicit triple difference approach, comparing across age and locality size over time, is that it controls for changes in community level prices which may not otherwise be account for. This may be particularly relevant for measuring consumption of sugary foods and processed carbohydrates that we know have become significantly cheaper and more available in Mexico over the past decade. Research has shown that these prices may be responsible for some share of the rising burden of diabetes and other diseases in Mexico. [35] [16]

[16] A concern regarding the locality and locality-year fixed effect model over the double difference estimate with only year fixed effects is that the sample of localities included in the ENIGH survey is not balanced. Thus, the locality and locality-year fixed effect models that rely on differences over locality population and time rely on a smaller sample of localities interviewed in both pre and post treatment periods of the roll out. As I show in Table 7.9, these localities are different in several dimensions with regard to the full sample of localities included in the double difference models with just year fixed effects. Mainly, they tended to be richer with lower labor force participation, relative to the localities in the full sample, and thus may fail to meet the assumptions of the difference in difference model. The triple differences examines changes within this select group of localities controlling for all time invariant factors, which abates the selection issue to some extent. The locality-year fixed effect would also control for any state level policies that vary over time that may also affect consumption

The estimating equations for the triple difference models are:

$$\begin{aligned}Y_{ilt} &= \beta_0 + \beta_1 ELIGIBLE_i + \beta_2 COMMUNITY_l + \beta_3 ELIGIBLE \times POST_{it} + \dots \\ &+ \dots \beta_4 ELIGIBLE \times COMMUNITY_{il} + \beta_5 COMMUNITY \times POST_{lt} + \dots \\ &\dots + \beta_6 ELIGIBLE \times COMMUNITY \times POST_{ilt} + \tau_t + \varepsilon_{ilt}\end{aligned}$$

The estimating equations for the double difference are:

$$\begin{aligned}Y_{ilt} &= \beta_0 + \beta_1 COMMUNITY_t + \dots \\ &\dots + \beta_2 COMMUNITY \times POST_{ilt} + \tau_t + \varepsilon_{ilt}\end{aligned}$$

where $ELIGIBLE_i$ identifies individuals 70 years of age or older (or households with at least one member age 70 or older, relative to those households where the oldest individual is between the ages of 60 and 69), $POST_t$ identifiers the post period for a given locality (either eligible in 2007, 2008, or 2009), and $COMMUNITY_l$ is a dummy for being eligible for the pension program based off of population size. The coefficient of interest is β_6 in the triple differences in differences model and β_2 in the double difference model. I test the sensitivity to the inclusion of fixed effects for year γ_y, locality λ_l or locality-year $\tau_{l(t)}$. Y_{itl} is an outcome measure for consumption or labor supply for household or individual i. The specification of the dependent variable is described above.

Chapter 6

Results from Vital Statistics

6.1 Characteristics of the Eligible and Control Localities

There are important differences in demographic, health, and economic characteristics of eligible and control localities. These are shown in Table 6.1, summarized across the pre-treatment period.[1] Localities eligible earlier in the program roll out (those with populations of 2,500 persons or fewer) had higher mortality rates than control localities, but roughly the same proportion of circulatory (45% versus 48%) and non circulatory disease related deaths (55% versus 52 %). Household incomes (per capita, monthly) in the control localities were almost double those in pension eligible localities.[2] Across both treatment and control localities labor force participation (calculated among those 70 years of age and older) is high, between 30 and 40 %. [3]

Households eligible in 2007 were more likely to be indigenous, have lower literacy and IMSS/social security coverage, and more likely to be enrolled in the public insurance program *Seguro Popular* relative to households in control localities. These households were also more likely to lack access to water. Overall, localities eligible in 2007 and control localities tended to belong to municipalities and states with similar economic characteristics regarding public spending, drought exposure, medical staffing and state unemployment. Many of these characteristics also apply to localities eligible in subsequent years (2008 and 2009). These localities also had higher mortality rates than control localities, but roughly the same

[1]For localities eligible in 2007, the pre treatment period is 2002-2005. I omit 2006 since that year a similar pension program was introduced among the same set of localities initially eligible for "70 y Mas" under *Progresa/Oportunidades*. For localities eligible in 2008 and 2009, the pretreament period is 2002-2007 and 2002-2008 respectively.

[2]Per capita in this statistic gives each household member a weight of 1. These incomes were calculated among pension program eligible households only, e.g., households with at least one member 70 years of age or older.

[3]Labor supply is calculated from ENIGH survey, which asks about any work over the last *month*. This differs from other surveys in Mexico and other evaluations of this program where the convention is to ask about labor supply over the past *week*. This may explain why labor supply is higher in the sample I analyze.

proportion by cause of death. Incomes were lower for households eligible in 2008, who were also more likely to be indigenous, enrolled in *Seguro Popular*, illiterate, lack access to water, and lack IMSS coverage. An important difference between localities eligible in 2007 versus those eligible in later years (2008, 2009) is take up of the program: take up in localities eligible in 2009 was much lower (almost half) compared to localities that become eligible earlier by both official estimates and my own.

Table 6.3 presents mortality statistics disaggregated by year and eligibility across the entire ten year study period, 2002-2011. These descriptive patterns are also presented in the Fig 6.1, disaggregated by mortality cause (circulatory versus non circulatory). I observe increases in circulatory disease related mortality rate in the program roll out period, driven by smaller, more economically depressed localities eligible in 2007 and 2008. [4]

6.2 Increases in Circulatory and Non-circulatory Disease Mortality

To calculate the magnitude of the mortality increase more precisely, I estimate the differences-in-differences equation above and plot the coefficients of interest by eligibility year ($\{\gamma_t^{2007}\}$, $\{\gamma_t^{2010}\}$, $\{\gamma_t^{2009}\}$) in Figures 6.2 and 6.3. The descriptive trends in mortality rates are robust to the inclusion of locality fixed effects, which control for all time invariant locality characteristics (I switch to presenting changes in mortality rate estimated from models where log mortality rate is the dependent variable. This is less sensitive to outliers and allows for easier comparison across cause specific mortality and localities of different sizes). For all cause mortality shown in Fig. 6.2 I find statistically significant increases for localities eligible in 2007 (7.4%) and 2008 (5.6%), robust to the inclusion of time varying controls (6.3% and 4.6% respectively). For localities eligible in 2009, I find small and statistically insignificant increases in mortality between 0.9 and 1.20%. Taking an average across these estimates (2007, 2008, 2009 eligible localities) weighted by the share of the population 70

[4] One important observation is the mortality rate for 2007-eligible localities in the year 2006. In this year, the *Progresa/Oportunidades* program began rolling out a pension very similar to "70 y Mas" to households participating in the conditional cash transfer program. While I will continue to display mortality rates for all year across all eligible localities in future graphs, I exclude the year 2006 when calculate the average effect on mortality for localities eligible in 2007.

and over yields a 5.4% (or 4.6%, controls included) increase in all-cause mortality. [5] [6] [7]

To further inference about changes in mortality, I examine cause specific mortality in Figures 6.3, divided into causes that are "circulatory" (causes of death related to cardiovascular and cerebrovascular disease, such as heart disease and diabetes) and "non circulatory" (causes of death related to respiratory disease, cancer, infection, accidents, and several "other" or undefined/unknown causes of death). I plot coefficients from the main locality fixed effect estimating equation. The treatment effects for circulatory and non circulatory diseases are statistically different for localities eligible in 2007 and 2008: there are larger increases in circulatory diseases relative to non circulatory disease in the treatment period. For those eligible 2007, results shows a statistically significant 14.9 % average increase for circulatory cause of death and a statistically insignificant 3.2% increase non cardiovascular mortality rate. For localities eligible in 2008, we see a 9.1% increase in deaths attributable to circulatory causes of deaths and insignificant 2.1 % increase in noncirculatory disease mortality. Among localities eligible in 2009 I observe an insignificant 1.2% and 1.9% in-

[5] While the figure shows year specific estimates in the pre-program period are small and not statistically significant from zero, I formally test the parallel trends assumption for differences-in-differences models. For localities eligible in 2007, I test $\gamma_{2003} = \gamma_{2004} = \gamma_{2005}$ and report the p-value: 0.9152. For localities eligible in 2008, I test $\gamma_{2003} = \gamma_{2004} = \gamma_{2005} = \gamma_{2006} = \gamma_{2007}$ which yields a p-value of 0.8952. For localities eligible in 2008, I test $\gamma_{2003} = \gamma_{2004} = \gamma_{2005} = \gamma_{2006} = \gamma_{2007} = \gamma_{2008}$ and report the p-value: 0.8134

[6] The vector of controls includes most of the variables listed in Table 6.1 from INEGI (plus their interaction with eligibility dummies): fraction of the total population indigenous, fraction of the working age population (ages 15-65) with IMSS coverage, fraction of the population enrolled in *Seguro Popular* (which began in 2002), fraction of households without running water, fraction of households without electricity, fraction of adults illiterate, medical personnel per capita (municipality level), municipality per capita gross public expenditures, municipality exposure to drought (there were major draughts in Mexico in 2006, and in 2010 and 2011), and state level unemployment. These variables are meant to control for changes over time that might correlate with the roll out of the pension program and (determinants of) mortality. Many studies from economics and public health have shown the association between mortality and economic performance measured by public spending and unemployment, as well the importance of access to medical care. [23] [28] [9] I proxy broadly for locality level economic development with indicators like literacy and access to electricity and water. Indigenous populations in Mexico are socially and economically marginalized and experience higher mortality rates, particularly for some non circulatory causes of death like respiratory infections. By controlling for the proportion of the population covered by IMSS, I also hope to control for any mechanical increase in mortality that could be driven by changing patterns of insurance coverage. The same analysis can be run for deaths among insured populations only. These mortality rates do no decrease, suggesting that the increase I observe is not driven by sorting between insurance margins that might have been sensitive to the global recession which began around the same time as the pension program.

[7] The averaged post affect displayed in the graph notes is calculated by estimating β_3:

$$Y_{tl} = \lambda_l + \beta_1 + \beta_2 POST_{lt} + \beta_3 POST \times \text{ELIGIBLE}_{lt} + \varepsilon_{tl}$$

where $POST_{lt}$ is a dummy for the post period (either ≥ 2007, ≥ 2008, or ≥ 2009) and $ELIGIBLE_l$ is a dummy for localities eligible in 2007, 2008, or 2009. For 2007, I include the year 2007 even thought the program started late in that year. Additionally, I drop year 2006 from the calculations of the averaged effect although I leave the estimate pictured in the graph. This is because this is the year the *Progresa* program introduced its own pension program that was later retooled as "70 y Mas." The *Progresa* version paid about half of what "70 y Mas" paid and was more limited in scope, as only seniors living in *Progresa* eligible households were eligible.

crease in circulatory and non circulatory causes of death respectively. The results are also robust to the inclusion of time varying controls. These include year-specific controls at the locality, municipality, and state level, and even broader economic trends at the national level, such as healthcare spending growth and GDP growth. In Figures 6.4, 6.5, and 6.6 I disaggregate noncirculatory disease into the individual causes (cancer, infection/accident, respiratory disease, and other causes) by eligible localities. [8]

The large increases in cardiovascular disease mortality over non cardiovascular disease is consistent with studies of income and mortality that show effects - whether they are increases in mortality or decreases - concentrate among circulatory and cardiovascular causes of death related to diabetes and heart disease, rather than those related to infections, accidents, respiratory diseases, and cancers. Extant research also suggests changes in cardiovascular and circulatory disease mortality risk can manifest relatively quickly which is consistent with the contemporaneous effects we observe. Changes in risk factors of non circulatory diseases like cancers take longer to develop. Similarly, the risk factors for chronic disease or circulatory diseases may also exacerbate progression of cancer and other non circulatory diseases considered here, but there is little evidence to suggests that these manifest as clinically meaningful changes in mortality within the year. Rather, research has showed these factors to affect mortality outcomes over a longer time horizon of several years to decades.

The increases in all cause and cause specific mortality rate are robust to a number of alternate estimation strategies. In Table 6.4, I calculate the averaged yearly treatment effects by eligible locality for three variations on the main estimating equation: (1) no fixed effects, (2) locality fixed effects (same as main estimating equation, included for comparison), (3) state-year fixed effects, and (4) both locality and state-year fixed effects. The models control for all time invariant locality level characteristics (e.g., pre treatment levels in any demographic, economic, or mortality related covariate), any time varying state level characteristics (such as any regional economic or demographics shocks or state-specific policies that vary over time at the state level), and the combination of the two. In particular, the results in this table show that increases in mortality I observe are robust (or not attributable) to any state specific pension policy that may have been introduced during the ten year study period. (Alternatively we could remove these "contaminated" localities and results are the same).

6.3 Robustness Checks

I observe large increases in mortality rates related to both circulatory and non circulatory diseases. For all cause mortality, the results yield an elasticity between 0.12 and 0.16 for localities eligible in 2008 and 2007 respectively. Results for localities eligible in 2009 are

[8] As with all-cause mortality, I formally test for pre-trends in cause-specific mortality by eligibility year by testing the equivalence of year specific estimates from the pre program period for each group of eligible localities. For localities eligible in 2007, the p-value from a test for trend in mortality related to circulatory (non circulatory) diseases is 0.2116 (0.0732); for localities eligible in 2008, the p-value is 0.9787 (0.7950); for localities eligible in 2009, the p-values are 0.3684 (0.8104).

statistically insignificant, but yield an elasticity of 0.04. I consider three robustness checks below, testing for: (1) changes in the mortality rate for age-ineligible persons in eligible communities and across ages among eligible individuals, (2) heterogeneous effects by gender, and (3) heterogeneous effect across Mexican states with high (versus low) levels of chronic diseases risk factors (obesity, diabetes, and hypertension). These results are presented in Table 6.6 (while results are presented without adjusting for time varying controls, the point estimates are robust to their inclusion).

Age-Ineligible Mortality

Since only individuals ages 70 and above were eligible for the pension program, changes in mortality attributable to the program should not be present for younger individuals ineligible. To test this, I construct a mortality rate for younger adults at the locality level, ages 18 to 60. (Again, this age range was chosen given the data available). I estimate this placebo effect using the same differences-in-differences estimator outlined above. Graphs of the year specific ”treatment” effect are shown in Figures 6.7. I observe small and statistically insignificant changes in mortality for all groups of eligible localities. These results are important as they suggest the increases in 70+ mortality do not simply reflect differential effects of some other economic or population health shock. For example, the roll out of the program coincided with the global economic recession and prior work has established countercyclical associations between mortality and macro economic performances in Mexico specifically. [23] Thus the increase in mortality I observe could reflect more severe effects of the economic downturn among poorer localities eligible earlier on the in the pension program roll out, but the results of on the age-ineligible sample suggest this is not driving the effect I observe.

Table 6.5 tests for non monotonicity of the treatment affect across eligible ages. The results also show evidence of a lack of effect on age ineligibles among adults closer to the eligibility cut off of 70, pooling across localities eligible in 2007 and 2008. [9] The table also presents results by age group according to cause of death: either circulatory/cardiovascular or non circulatory/cardiovascular. Results are presented twice: one for the full sample of localities (columns 1, 3, and 5) and again with the limited sample of locality-year observations with good vital statistics reporting practices (columns 2, 4, and 6). Across both sets of models we see small and statistically insignificant increases in mortality for age ineligible populations of 60-69 year olds, relative to those 50 to 59. This small increase could reflect general trends in mortality or spillovers within or across households, but living arrangements are not identified on the death certificate. These insignificant increases could also be the results of contemporaneous economic shocks that vary within a locality-year across ages.

[9] Localities eligible in 2009 are excluded since we do not find significant effects in mortality in the difference in difference models. Localities with populations between 30001 and 100000 again serve as the control. However, because of the staggered roll out of the program it not possible to define a single ”post” period among the control localities for localities eligible in 2007 or 2008. To circumvent this issues, I drop years 2006 and 2007 from the sample and define the post period as year 2008 or later. Recall that in 2006, localities eligible later in 2007 were offered a pension program as an extension of *Progresa/Oportunidades*.

Consistent with the differences-in-differences results, we see changes in mortality starting among ages 70 to 75 around 4% and increasing to 7% for the oldest group of individuals included in the sample, ages 80 to 90. (Individuals older than 90 are excluded). The increases in mortality are driven by increases in circulatory/cardiovascular disease related deaths, which range from a 7% increase for those eligible under 75 to 10% for the oldest age group. While the estimates of the mortality increase for those in the oldest age group are not statistically different from the estimates in the younger eligible group, the larger increase in mortality could be consistent with two hypotheses. The first is that there is a dose response with income transfers: older individuals would have been receiving the pension for more years than those in their early 70s. The data in the post period here span years 2008 to 2011, meaning the maximum years of exposure would be six years for those eligible in 2007 (counting 2006 pilot pension program) or four years for those eligible in 2008. Thus those individuals 80-90 reflect in part an interaction between older ages as well as dose response. For younger individuals the combination of these effects is more difficult to assess.

I also compare the results by age group across the full sample of localities to the limited sample adjusted for changes in reporting standards in the vital statistics system. Columns (1) and (2) suggest reporting bias inflated mortality estimates for all ages, but particularly for older ages. This is consistent with the idea that very old individuals who are more socially isolated are more likely to have deaths go unreported. The estimate for the program effect on all-cause mortality for individuals aged 80 to 90 at the time of their death is more than double among the full sample relative to the reporting adjusted sample, while the differences between samples for ages 70-80 are non negligible but smaller. Importantly, limiting the sample to localities with good reporting standards does not change significantly the change in mortality among individuals ages 60 to 69, with the exception of non circulatory disease related causes of death. These individuals are less likely to be affected by the program's financial incentives to report deaths or benefit/be affected by the cash transfer itself.

Changes in Mortality by Gender

I analyze the results by gender in Table 6.6, columns (7)-(12). Differences exist in the distribution of disease type across gender. Men have higher mortality rates than women, but cardiovascular disease composes a larger proportion of cause of death for women than men: 49 % vs 42 % for women and men in localities eligible 2007, 51% versus 44 % for localities eligible 2008, and 51 % versus 46 % for localities eligible in 2009. (Among control localities, the difference is 51% versus 46%.) This is consistent with higher rates of chronic disease morbidity among women in Latin America. [67] Thus changes in the mortality rates in response to large cash transfers from the pension program may be different for men and women in the sample.

Men eligible in 2007 (2008/2009) experience an 3.5% (3.9%/3.0%) increase in all cause mortality, while women experience an 5.3% (3.9%/1.2%) increase for all cause mortality. Women's higher all cause mortality seems to be driven by statistically significant non circulatory disease, which is somewhat accounted for by the inclusion of controls. [10] For localities with populations under 2,500 persons eligible in 2007, there are comparable statistically significant increases in circulatory diseases for both men and women on average in the post treatment period. Models for men show a 17.4% increase in circulatory mortality and a statistically insignificant 1.2% increase in non circulatory diseases. Models for women shows a 14.3% increase in circulatory mortality. These results are qualitatively similar among localities eligible 2008: small statistically insignificant increases in non circulatory disease mortality, and similar, large, statistically significant increases for circulatory disease mortality (around 10%) for women and men. Estimates from 2009 show different patterns for men and women but due to large standard errors and small sample sizes, it is difficult to be more confident in these estimates.

Heterogeneity by Chronic Disease Risk Factors

We may expect populations with high chronic disease morbidity to be more susceptible to the income transfer's effect on cardiovascular mortality, so I analyze the change in mortality across observations with low and high levels of chronic diseases. [11] I divide the sample into localities from states with low and high prevalence of chronic disease risk factors, such as obesity, hypertension, and diabetes using the 2006 *Encuesta Nacional de Salud y Nutricion* (ENASNUT 2006; National Survey of Health and Nutrition). The ENSANUT survey is designed to be representative at the state level. I repeat the analysis above restricted to states with above/below median ranking of these indicators. [12] The results are shown in Table 6.6, columns (1)-(6).

Among localities eligible in 2007, high morbidity states experienced an all cause mortality increases of 9.1%, and a 23% increase in circulatory disease mortality, and an insignificant 5% increase in non circulatory disease mortality, relative to 2.3% all cause mortality, 10 % increases in circulatory mortality, and insignificant 2% increase in non circulatory disease mortality in observations from low morbidity states eligible in 2007. These conclusions are robust to the inclusion of controls, although we lose precision in our estimates. Effect sizes for non circulatory diseases are highly sensitive to the inclusion of controls, whereas circulatory

[10] The statistically significant increase for women's non circulatory disease related mortality in 2007 and men's noncirculatory related disease mortality in 2009 is puzzling, but has several different explanations. Given the large number of hypotheses being tested, we may expect some correlations to be significant based on chance alone rather than true underlying changes in population health. Second, these estimates could continue to be biased from changes in reporting patterns. Third, they could represent a small increase in non circulatory disease mortality which has been observed in some studies.

[11] While theoretical models are ambiguous about the effect of income on health, one conclusion from the Grossman model is that agents with low levels of health stock are more likely to die in response to health shocks, since smaller changes can more quickly reduce health stock to zero.

[12] These states are: Yucatan, Baja California Sur, Campeche, Tabasco, Baja California, Nuevo Leon, Oaxaca, Coahuila, Tamaulipas, Quintana Roo, Colima, Sonora, Durango, Sinaloa, Jalisco, and Chihuahua. I calculate state-level prevalence among the adult population (40 and over) of being either overweight, hypertensive, or diabetic. This is assessed using anthropometric measurements where available, as well as self reported data on diagnoses for these chronic conditions

disease estimates among high risk states are more stable. I observe similar patterns for localities eligible in 2008, although the results are not as strong. Among those localities in states with high levels of obesity, hypertension and diabetes eligible in 2008, there is a 7% increase in all cause mortality and 13 % increase in circulatory disease mortality, and a insignificant 4% increase in non circulatory disease related mortality. Among observations in states with low levels of morbidity, there is a 7% increase in circulatory mortality and a insignificant 1% increase in non cardiovascular disease related mortality. Inference for those localities eligible in 2009 is more limited: there are smaller statistically insignificant changes in mortality for both localities belonging to high and low morbidity states, with no statistically significant changes by cause specific mortality with or without controls.

Table 6.1: Eligible and Control Localities

	(1)	(2)	(3)	(4)
Total Pop. 2005	1946***	8079***	24304***	57453
	(286)	(4717)	(2914)	(20470)
Mortality Rate (MR)	17.4***	15.6***	14.4*	11.4
	(9.6)	(8.9)	(6.8)	(5.6)
MR Circulatory	7.8	7.2**	7.0*	5.5
	(6.8)	(5.0)	(3.6)	(2.8)
MR Non Circulatory	9.4***	8.3***	7.4	5.9
	(8.0)	(5.7)	(3.8)	(3.1)
Household Income (pc/mo)	1255**	1286**	2289*	2236
	(1694)	(1066)	(3317)	(2013)
Fraction Labor Force	0.37	0.36	0.26	0.31
	(0.48)	(0.48)	(0.44)	(0.46)
Fraction Indigenous	0.118***	0.080***	0.029	0.027
	(0.249)	(0.193)	(0.079)	(0.079)
Fraction IMSS	0.149***	0.201***	0.260***	0.331
	(0.324)	(0.185)	(0.154)	(0.147)
Fraction Seguro Pop.	0.133***	0.094***	0.065	0.049
	(0.194)	(0.137)	(0.083)	(0.057)
Fraction Illiterate	0.169***	0.126***	0.085***	0.069
	(0.111)	(0.087)	(0.042)	(0.035)
Fraction w/o Water	0.194***	0.120***	0.086	0.067
	(0.427)	(0.251)	(0.121)	(0.097)
Fraction w/o Electricity	0.107*	0.114	0.110	0.125
	(0.159)	(0.164)	(0.143)	(0.166)
Fraction Mun. Drought	0.034	0.033	0.035	0.041
	(0.106)	(0.108)	(0.107)	(0.119)
Mun. Spending PC (log)	7.1***	7.1*	7.0	7.0
	(0.4)	(0.4)	(0.3)	(0.4)
Medical staff PC	0.892***	0.808***	0.847	1.115
	(0.666)	(1.781)	(1.837)	(0.679)
State Unemployment	2.3***	2.4	2.4	2.5
	(1.1)	(1.1)	(1.1)	(1.1)
Fraction Take Up (Official)	1.000	0.919	0.479	0.000
	(–)	(–)	(–)	(–)
Fraction Take Up (Svy)	0.623	0.609	0.328	0.000
	(0.48)	(0.47)	(0.44)	(0.00)
Eligible	2007	2008	2009	CONTROL
N(70+ 2005, millions)	1.11	0.58	0.52	0.75
N(locality)	611	1010	72	144

Data: INEGI Vital Statistics (2002-2006); INEGI Census Records (2005, 2010)
Specification: Eligible refers to the year the localities became eligible. N(70+ 2005, million) refers to the number of individuals 70 and older in each group of eligible localities calculated from the 2005 census; N(locality) is the number of unique localities in each eligibility group . Mortality rates are from localities with good quality reporting statistics only. Data is averaged across 2002-2006. Data on household monthly income are from ENIGH 2006 and is presented in 2007 MX$, calculated among households with at least on member ages 70 or over. Fraction labor force refers to fraction of the population age 70 and older who report doing some work in the last month in the ENIGH 2004-06 survey. Take up(official) is the pension takeup rate published by SEDESOL. Take up (Svy) is the takeup rate calculated in ENSANUT. Data from ENIGH and ENSANUT are weighted using household or individual level survey weights.
Estimation: Estimates are weighted by the population Pop. Age $60+_{tl}$ I indicate statistically significant values (relative to control localities) with the following legend: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6.2: Differences in Death Certificate Reporting Quality by Eligible and Control Localities

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
High Reporting Quality	0.37	1.00	0.52	1.00	0.63	1.00	0.68	1.00
	(0.48)	(0.00)	(0.50)	(0.00)	(0.48)	(0.00)	(0.47)	(0.00)
Total Pop. 2005	1946	1966	8080	8655	24304	24185	57479	58329
	(286)	(289)	(4717)	(4766)	(2913)	(2803)	(20465)	(20390)
Mortality Rate (MR)	14.30	19.01	13.75	16.01	12.50	14.28	11.07	12.64
	(11.82)	(10.71)	(9.00)	(8.48)	(6.55)	(6.50)	(5.58)	(5.22)
MR Circulatory	6.53	8.81	6.47	7.59	6.11	7.03	5.39	6.13
	(7.05)	(7.12)	(5.08)	(4.95)	(3.56)	(3.57)	(2.85)	(2.69)
MR Non Circulatory	7.77	10.20	7.28	8.41	6.39	7.25	5.68	6.51
	(8.00)	(7.94)	(5.57)	(5.37)	(3.64)	(3.67)	(3.09)	(2.95)
Fraction Indigenous	0.12	0.08	0.08	0.06	0.03	0.02	0.03	0.02
	(0.25)	(0.20)	(0.19)	(0.15)	(0.08)	(0.04)	(0.08)	(0.07)
Fraction IMSS	0.15	0.13	0.20	0.19	0.26	0.25	0.33	0.29
	(0.25)	(0.13)	(0.17)	(0.14)	(0.15)	(0.14)	(0.14)	(0.13)
Fraction Seguro Pop.	0.20	0.20	0.16	0.15	0.13	0.12	0.10	0.09
	(0.23)	(0.22)	(0.18)	(0.17)	(0.13)	(0.12)	(0.10)	(0.10)
Fraciton Literate	0.15	0.14	0.11	0.10	0.08	0.08	0.06	0.07
	(0.10)	(0.08)	(0.08)	(0.07)	(0.04)	(0.04)	(0.03)	(0.03)
Fraction w/o Water	0.17	0.14	0.11	0.10	0.09	0.07	0.06	0.06
	(0.34)	(0.25)	(0.21)	(0.17)	(0.12)	(0.11)	(0.09)	(0.09)
Fraction w/o Electricity	0.07	0.06	0.07	0.07	0.06	0.07	0.07	0.08
	(0.12)	(0.11)	(0.13)	(0.14)	(0.11)	(0.12)	(0.13)	(0.15)
Fraction Mun. Drought	0.08	0.08	0.08	0.07	0.08	0.07	0.09	0.08
	(0.18)	(0.18)	(0.18)	(0.17)	(0.18)	(0.16)	(0.19)	(0.17)
Mun. Spending PC (log)	7.31	7.32	7.27	7.24	7.20	7.15	7.18	7.15
	(0.44)	(0.44)	(0.44)	(0.46)	(0.36)	(0.36)	(0.41)	(0.42)
Medical staff PC	1.04	0.99	1.01	0.96	1.06	0.97	1.28	1.23
	(0.75)	(0.69)	(1.49)	(1.67)	(1.43)	(1.25)	(0.78)	(0.72)
State Unemployment	3.16	3.22	3.22	3.21	3.20	3.09	3.33	3.07
	(1.60)	(1.56)	(1.61)	(1.59)	(1.60)	(1.57)	(1.62)	(1.51)
N(Loc)	2132	681	2534	1242	134	87	173	137
N(Loc-Yr)	21297	7260	25328	11725	1340	809	1725	1117
Eligible	2007	2007	2008	2008	2009	2009	CONTROL	CONTROL
Full Sample	X		X		X		X	
Good Reporting Quality		X		X		X		X

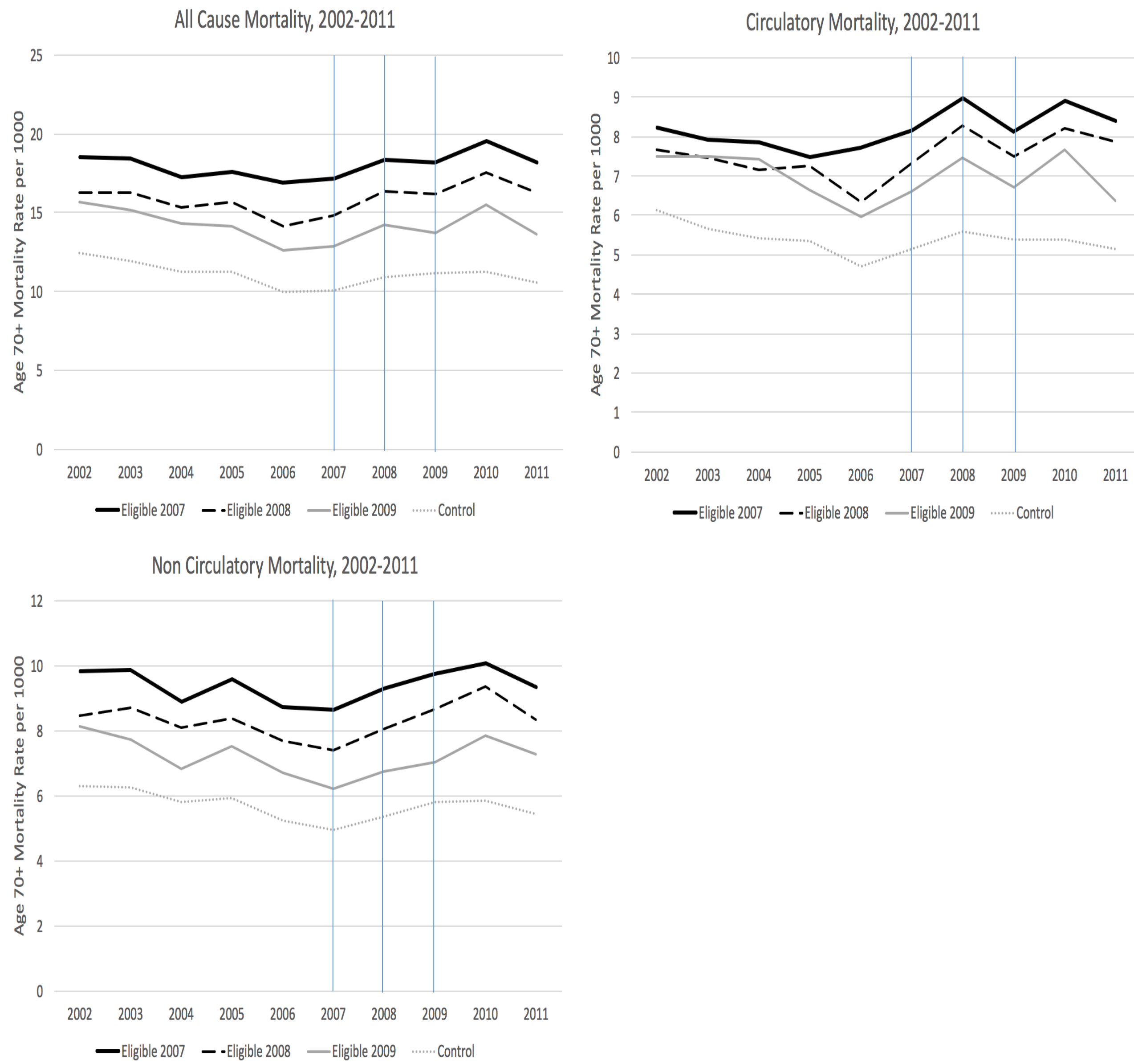
Data: INEGI Vital Statistics (2002-2006); INEGI Census Records (2005, 2010)
Specification: Good reporting quality is defined as observations above the median reporting score calculated across the sample of eligible localities 2007-2009. N(70+ 2005, million) refers to the number of individuals 70 and older in each group of eligible localities calculated from the 2005 census; N(locality) is the number of unique localities in each eligibility group. Data is averaged across 2002-2006. Data on household monthly income are from ENIGH 2006 and is presented in 2007 MX$, calculated among households with at least on member ages 70 or over. Fraction labor force refers to fraction of the population age 70 and older who report doing some work in the last month in the ENIGH 2004-06 survey. Data from ENIGH,and ENSANUT are weighted using household or individual level survey weights.
Estimation: Estimates are weighted by the population Pop. Age $60+_{tl}$

Table 6.3: All Cause Mortality Rate by Eligibility

	(1)	(2)	(3)	(4)
2002	18.498	16.312	15.651	12.442
	(9.254)	(8.695)	(6.882)	(6.204)
2003	18.400	16.260	15.199	11.898
	(9.343)	(8.220)	(6.526)	(5.751)
2004	17.249	15.322	14.280	11.225
	(8.639)	(7.828)	(6.914)	(5.231)
2005	17.615	15.691	14.173	11.258
	(9.073)	(7.938)	(5.617)	(5.536)
2006	16.940	14.113	12.645	9.949
	(8.789)	(7.802)	(6.901)	(5.094)
2007	17.177	14.813	12.838	10.063
	(8.977)	(8.433)	(6.657)	(5.814)
2008	18.378	16.355	14.224	10.914
	(8.856)	(8.204)	(5.502)	(5.188)
2009	18.197	16.184	13.729	11.170
	(9.221)	(8.109)	(6.102)	(5.581)
2010	19.570	17.580	15.527	11.218
	(9.719)	(8.612)	(6.710)	(5.712)
2011	18.221	16.235	13.656	10.602
	(9.214)	(8.323)	(5.953)	(5.298)
Eligible	2007	2008	2009	CONTROL
N(70+ 2005, millions)	1.11	0.58	0.52	0.75
N(locality)	611	1010	72	144

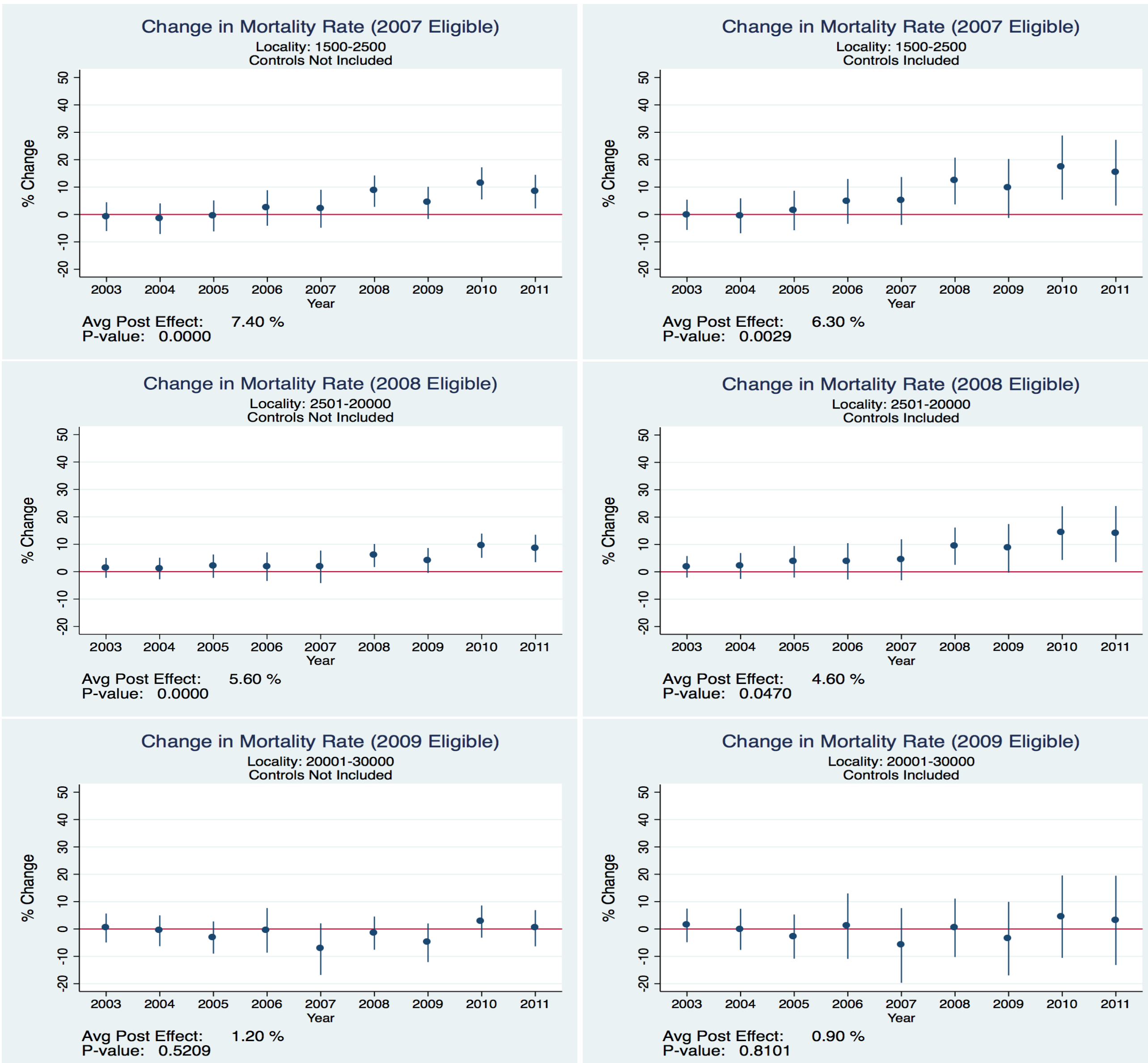
Data: INEGI Vital Statistics (2002-2011); INEGI Census Records (2005, 2010)
Specification: Sample limited to those localities with good vital statistics reporting. Column 1 is calculated among localities with 2005 census populations between 1,500 and 2,500 individuals eligible in 2007; Column 2 localities with 2005 census populations between 2,501 and 20,000 eligible in 2008; Column 3 localities with 2500 census populations between 20,001 and 30,000; and Column 4 presents characteristics of the localities between 30,001 and 100,000 that serve are our controls localities not eligible until after 2011. Mortality $\text{Rate}_{tl} = 1000 \times \frac{\text{Uninsured Deaths (Age 70+)}_{tl}}{\text{Pop. Age 60+}_{tl}}$ for locality l and year t. Uninsured defined as deceased with no insurance/social security or only *Seguro Popular*. Pop. Age $60+_{tl}$ interpolated between census round years using locality specific linear growth rate. N(70+ 2005, million) refers to the number of individuals 70 and older in each group of eligible localities calculated from the 2005 census; N(locality) is the number of unique localities in each eligibility group.
Estimation: Estimates are weighted by the population Pop. Age $60+_{tl}$.

Figure 6.1: Descriptive Trends in Mortality by Eligible Localities



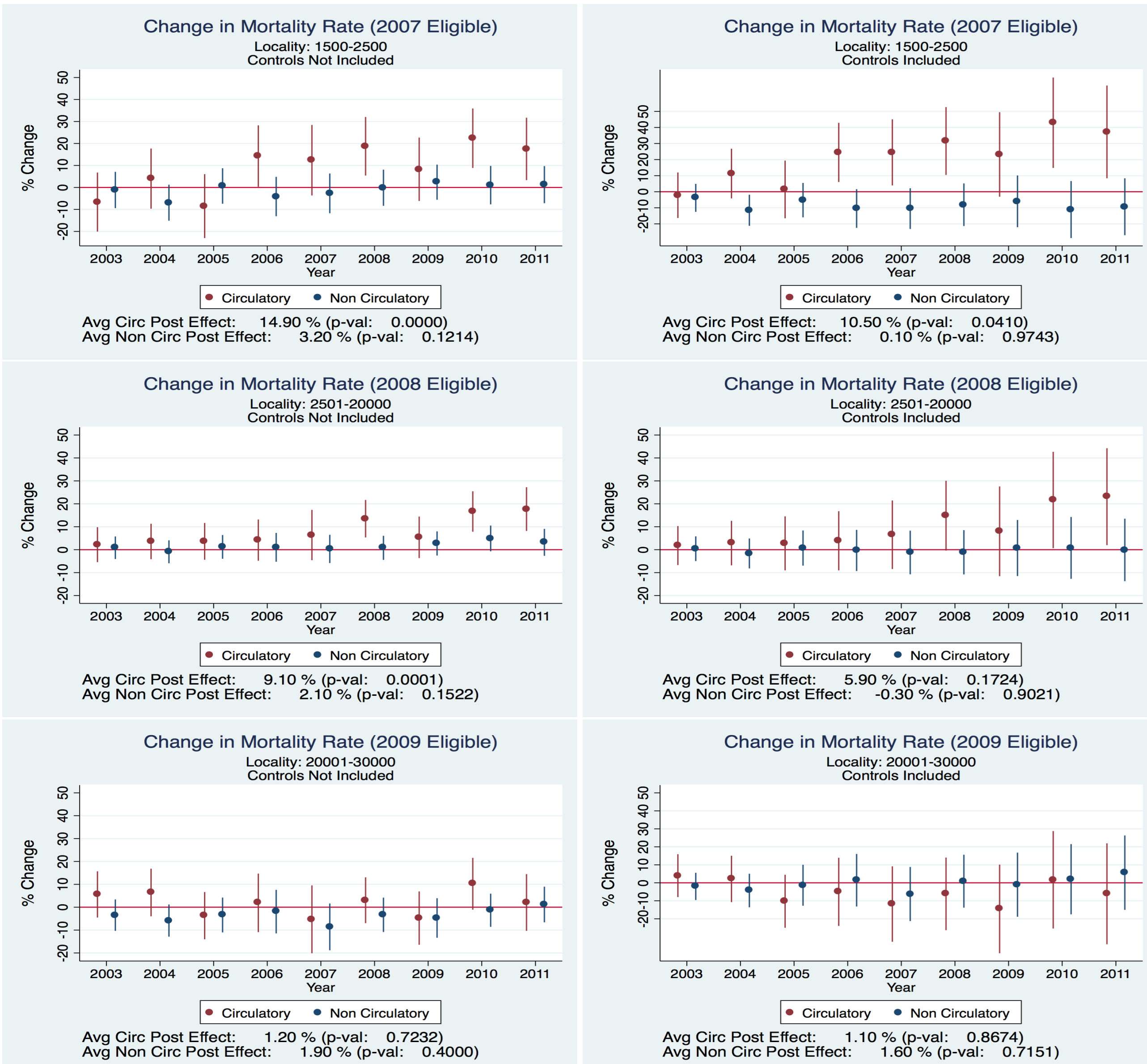
Data: INEGI Vital Statistics (2002-2011); INEGI Census Records (2005, 2010)
Specification: Mortality Rate$_{tl}$ $=1000 \times \frac{\text{Uninsured Deaths (Age 70+)}_{tl}}{\text{Pop. Age 60+}_{tl}}$ for locality l and year t. Uninsured defined as deceased with no insurance/social security or only *Seguro Popular*. Pop. Age 60+$_{tl}$ interpolated between census round years using locality specific linear growth rate. Eligible 2007 refers to localities with populations in the 2005 census between 1,500 and 2,500. Eligible 2008 refers to localities with populations in the 2005 census between 2,501 and 20,000. Eligible 2009 refers to localities with populations in the 2005 census between 20,001 and 30,000. Sample limited to localities with good quality reporting practices only.
Estimation: Estimates are weighted by the population Pop. Age 60+$_{tl}$

Figure 6.2: Estimated Trends in Mortality



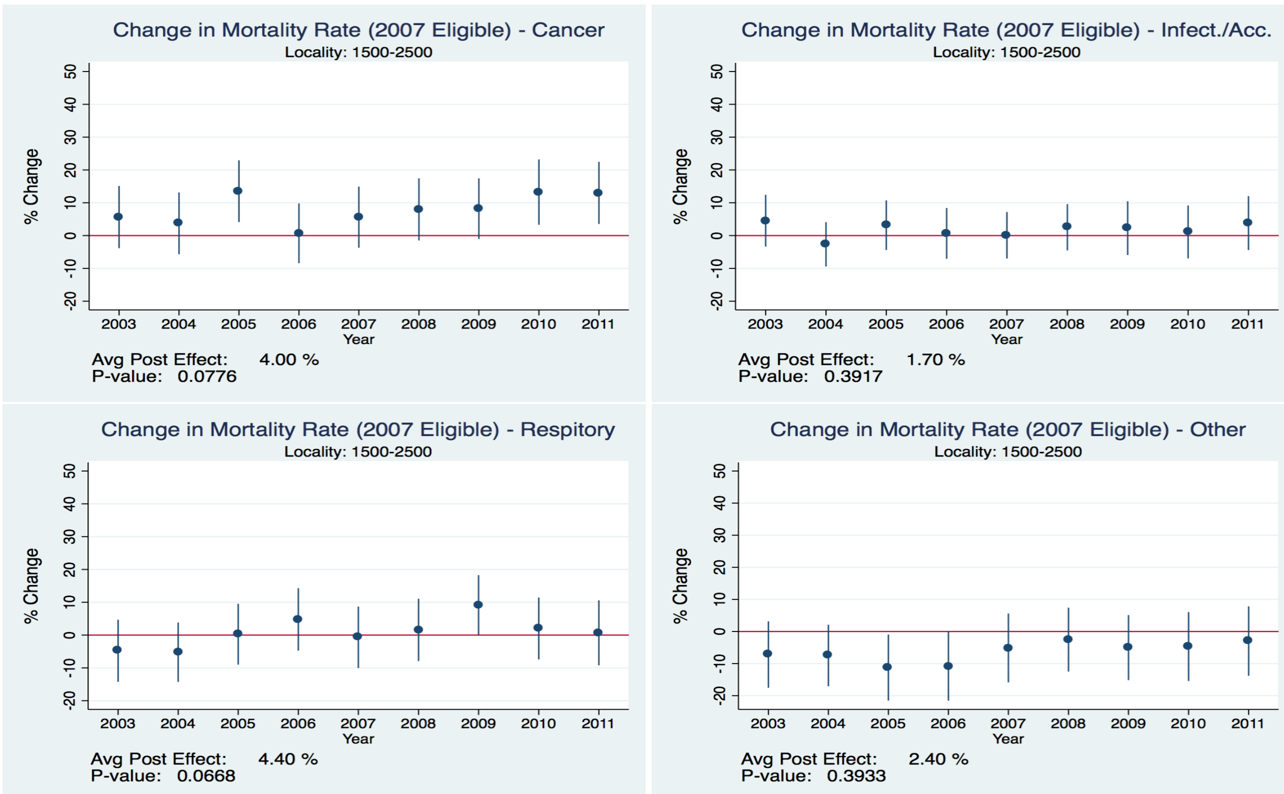
Data: INEGI Vital Statistics (2002-2011); INEGI Census Records (2005, 2010)
Specification: Sample limited to localities with good reporting scores. Dependent variable is $log(MR_{tl})$.
Estimation: Estimates are from the locality fixed effects equation specification with or without a vector X_{tl} of time varying locality, municipality, and state controls and interactions (with dummies for eligibility in 2007/8/9) included. Point estimates and 95% confidence intervals are shown in the graph. Averaged effect (β_3) is estimated from $Y_{tl} = \lambda_l + \beta_1 + \beta_2 POST_{tl} + \beta_3 POST_{tl} \times ELIGIBLE_l + X_{tl}\delta + \varepsilon_{tl}$. Standard errors clustered at the locality level and heteroskedactic robust. $POST_{tl}$ is a dummy variable for the post period. $ELIGIBLE_{tl}$ is a dummy for being eligible for the pension program. For localities eligible in 2007, year 2006 omitted from estimation of averaged effect because of the introduction of the *Progresa/Oportunidades* pension in this year.

Figure 6.3: Estimated Trends in Cause Specific Mortality



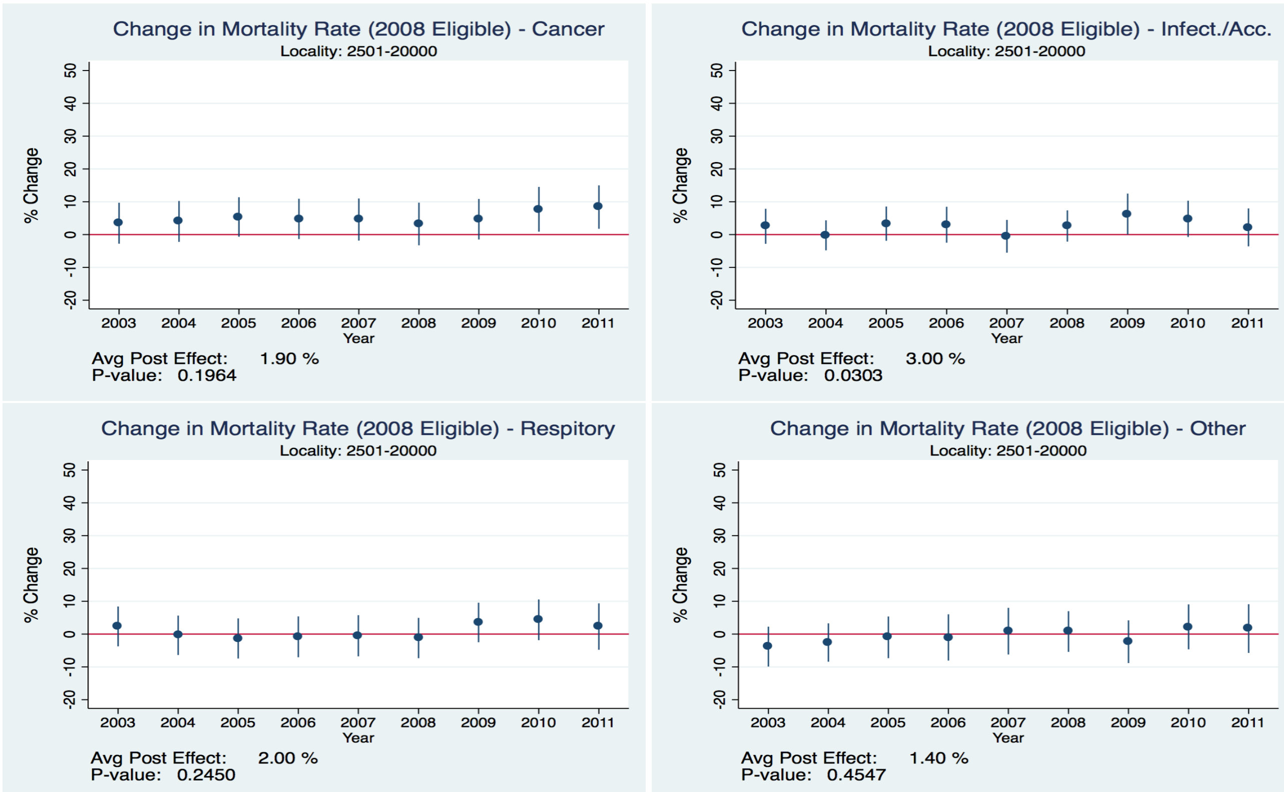
Data: INEGI Vital Statistics (2002-2011); INEGI Census Records (2005, 2010)
Specification: Sample limited to localities with good reporting scores. Dependent variable is $log(MR_{tl})$.
Estimation: Estimates are from the locality fixed effects equation specification with or without a vector X_{tl} of time varying locality, municipality, and state controls and interactions (with dummies for eligibility in 2007/8/9) included. Point estimates and 95% confidence intervals are shown in the graph. Averaged effect (β_3) is estimated from $Y_{tl} = \lambda_l + \beta_1 + \beta_2 POST_{tl} + \beta_3 POST_{tl} \times ELIGIBLE_l + X_{tl}\delta + \varepsilon_{tl}$. Standard errors clustered at the locality level and heteroskedactic robust. $POST_{tl}$ is a dummy variable for post period. $ELIGIBLE_{tl}$ is a dummy for being eligible for the pension program, determined by 2005 census locality population. For localities eligible in 2007, year 2006 omitted from estimation because of the introduction of the *Progresa/Oportunidades* pension in this year.

Figure 6.4: Estimated Trends in Non Circulatory Mortality (Eligible 2007)



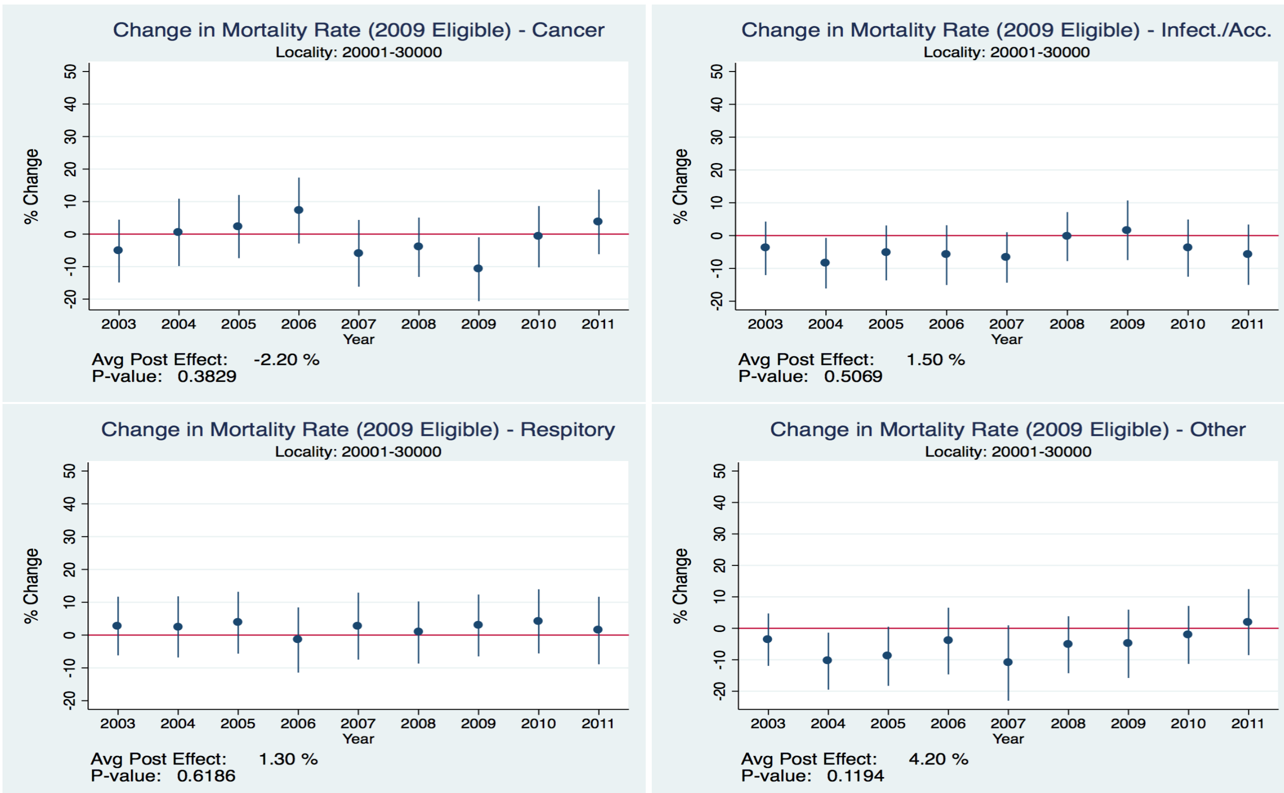
Data: INEGI Vital Statistics (2002-2011); INEGI Census Records (2005, 2010)
Specification: Sample limited to localities with good reporting scores. Dependent variable is $log(MR_{tlc})$. Cause-Specific Mortality Rate$_{ctl}$ $=1000 \times \frac{\text{Uninsured Deaths (Age 70+) for Cause } C_{tl}}{\text{Pop. Age } 60+_{tl}}$ for locality l and year t and c cause (cancer, infections/accidents, respiratory disease, or other). Uninsured defined as deceased with no insurance/social security or only *Seguro Popular*. Pop. Age $60+_{tl}$ interpolated between census round years using locality specific linear growth rate.
Estimation: Estimates are from the locality fixed effects equation specification without a vector X_{tl} of time varying controls. Point estimates and 95% confidence intervals are shown in the graph. Averaged effect (β_3) is estimated from $Y_{tl} = \lambda_l + \beta_1 + \beta_2 POST_{tl} + \beta_3 POST_{tl} \times ELIGIBLE_l + \varepsilon_{tl}$. Standard errors are clustered at the locality level and heteroskedactic robust. $POST_{tl}$ is a dummy variable for ≥ 2007. $ELIGIBLE_{tl}$ is a dummy for being eligible for the pension program in 2007, determined by 2005 census locality population. For localities eligible in 2007, year 2006 omitted from estimation because of the introduction of the *Progresa/Oportunidades* pension in this year.

Figure 6.5: Estimated Trends in Non Circulatory Mortality (Eligible 2008)



Data: INEGI Vital Statistics (2002-2011); INEGI Census Records (2005, 2010)
Specification: Sample limited to localities with good reporting scores. Dependent variable is $log(MR_{tlc})$. Cause-Specific Mortality Rate$_{ctl}$ $=1000 \times \frac{\text{Uninsured Deaths (Age 70+) for Cause } C_{tl}}{\text{Pop. Age } 60+_{tl}}$ for locality l and year t and c cause (cancer, infections/accidents, respiratory disease, or other). Uninsured defined as deceased with no insurance/social security or only *Seguro Popular*. Pop. Age $60+_{tl}$ interpolated between census round years using locality specific linear growth rate.
Estimation: Estimates are from the locality fixed effects equation specification without a vector X_{tl} of time varying controls. Point estimates and 95% confidence intervals are shown in the graph. Averaged effect (β_3) is estimated from $Y_{tl} = \lambda_l + \beta_1 + \beta_2 POST_{tl} + \beta_3 POST_{tl} \times ELIGIBLE_l + \varepsilon_{tl}$. Standard errors are clustered at the locality level and heteroskedactic robust. $POST_{tl}$ is a dummy variable ≥ 2008. $ELIGIBLE_{tl}$ is a dummy for being eligible for the pension program in 2008, determined by 2005 census locality population.

Figure 6.6: Estimated Trends in Non Circulatory Mortality (Eligible 2009)



Data: INEGI Vital Statistics (2002-2011); INEGI Census Records (2005, 2010)
Specification: Sample limited to localities with good reporting scores. Dependent variable is $log(MR_{tlc})$.
Cause-Specific Mortality Rate$_{ctl}$ $=1000 \times \frac{\text{Uninsured Deaths (Age 70+) for Cause } C_{tl}}{\text{Pop. Age } 60+_{tl}}$ for locality l and year t and c cause (cancer, infections/accidents, respiratory disease, or other). Uninsured defined as deceased with no insurance/social security or only *Seguro Popular*. Pop. Age $60+_{tl}$ interpolated between census round years using locality specific linear growth rate.
Estimation: Estimates are from the locality fixed effects equation specification without a vector X_{tl} of time varying controls. Point estimates and 95% confidence intervals are shown in the graph. Averaged effect (β_3) is estimated from $Y_{tl} = \lambda_l + \beta_1 + \beta_2 POST_{tl} + \beta_3 POST_{tl} \times ELIGIBLE_l + \varepsilon_{tl}$. Standard errors are clustered at the locality level and heteroskedactic robust. $POST_{tl}$ is a dummy variable for ≥ 2009. $ELIGIBLE_{tl}$ is a dummy for being eligible for the pension program in or 2009, determined by 2005 census locality population.

Table 6.4: Estimates from FE Specifications

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
All												
Post X Elig	-0.00907	0.000649	-0.0428	0.074***	0.0562**	0.0175	0.0168	0.0416*	-0.00403	0.0380**	0.0418***	0.0193
	(0.0187)	(0.0191)	(0.0321)	(0.0146)	(0.0128)	(0.0190)	(0.0170)	(0.0164)	(0.0317)	(0.0133)	(0.0115)	(0.0184)
Circ.												
Post X Elig	0.0717*	0.0385	-0.0605	0.149***	0.0912***	0.0121	0.108***	0.0860***	-0.0124	0.131***	0.0932***	0.0174
	(0.0325)	(0.0276)	(0.0459)	(0.0300)	(0.0212)	(0.0314)	(0.0300)	(0.0241)	(0.0453)	(0.0278)	(0.0193)	(0.0313)
Non Circ.												
Post X Elig	-0.0207	-0.0142	-0.0355	0.0317	0.0212	0.0193	-0.00122	0.0228	-0.00293	0.0189	0.0228	0.0192
	(0.0200)	(0.0180)	(0.0295)	(0.0179)	(0.0134)	(0.0207)	(0.0201)	(0.0163)	(0.0304)	(0.0182)	(0.0131)	(0.0219)
Eligible	2007	2008	2009	2007	2008	2009	2007	2008	2009	2007	2008	2009
Locality FE	No	No	No	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
State-Year FE	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes

Data: INEGI Vital Statistics (2002-2011); INEGI Census Records (2005, 2010)

Specification: Sample limited to localities with good vital statistics reporting practices. Dependent variable is $log(MR_{tl})$. Mortality $\text{Rate}_{tl} = 1000 \times \frac{\text{Uninsured Deaths (Age 70+)}_{tl}}{\text{Pop. Age 60+}_{tl}}$ for locality l and year t. Uninsured defined as deceased with no insurance/social security or only *Seguro Popular*. Pop. Age $60+_{tl}$ interpolated between census round years using locality specific linear growth rate. $POST_{tl}$ is a dummy variable for either ≥ 2007, ≥ 2008, or ≥ 2009. $ELIGIBLE_{tl}$ is a dummy for being eligible for the pension program in 2007, 2008, or 2009, determined by 2005 Census locality population. For localities eligible in 2007, year 2006 omitted from estimation because of the introduction of the *Progresa/Oportunidades* pension.

Estimation: Averaged effect is estimated from the following equations. Models are weighted by the population 60 and over and standard errors are clustered at the locality level and heteroskedaktic robust. Controls not included in estimates.

Columns (1) , (2), & (3) estimate β_4 from: $Y_{tl} = \beta_1 + \beta_2 ELIGIBLE_l + \beta_3 POST_{tl} + \beta_4 POST_{tl} \times ELIGIBLE_l + \varepsilon_{tl}$

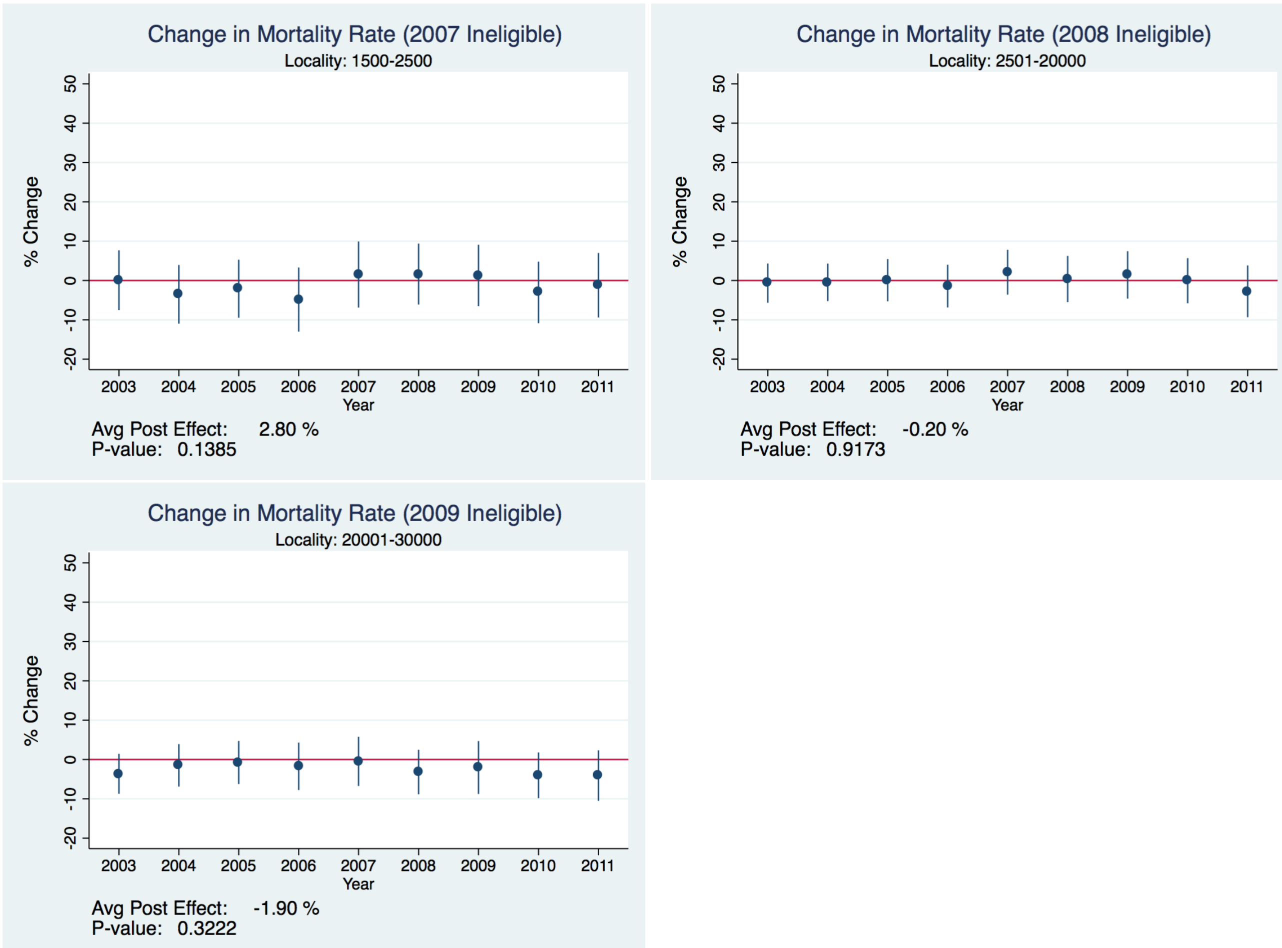
Columns (4), (5), & (6) estimate β_3 from: $Y_{tl} = \lambda_l + \beta_1 + \beta_2 POST_{tl} + \beta_3 POST_{tl} \times ELIGIBLE_l + \varepsilon_{tl}$ for locality fixed effect l

Columns (7), (8), & (9) estimate β_3 from: $Y_{tl} = \mu_{e(t)} + \beta_1 + \beta_2 ELIGIBLE_{tl} + \beta_3 POST_{tl} \times ELIGIBLE_l + \varepsilon_{e(t)l}$ for state-year fixed effect $e(t)$

Columns (10), (11), & (12) estimate β_2 from: $Y_{tl} = \mu_{e(t)} + \lambda_l + \beta_1 + \beta_2 POST_{tl} \times ELIGIBLE_l + \varepsilon_{e(t)l}$

* p < 0.05, ** p < 0.01, *** p <0.001

Figure 6.7: Estimated Trends in Cause Specific Mortality for Age-Ineligibles (18-60 y.o.)



Data: INEGI Vital Statistics (2002-2011); INEGI Census Records (2005, 2010)
Specification: Sample limited to localities with good reporting scores. Dependent variable is $log(MR_{tl})$. Mortality $\text{Rate}_{tl} = 1000 \times \frac{\text{Uninsured Deaths (Age 18-60)}_{tl}}{\text{Pop. Age 18-60}_{tl}}$ for locality l and year t. Uninsured defined as deceased with no insurance/social security or only *Seguro Popular*. Pop. Age $18\text{-}60_{tl}$ interpolated between census round years using locality specific linear growth rate.
Estimation: Estimates are from the locality fixed effects equation specification. Point estimates and 95% confidence intervals are shown in the graph. Averaged effect (β_3) is estimated from $Y_{tl} = \lambda_l + \beta_1 + \beta_2 POST_{tl} + \beta_3 POST_{tl} \times ELIGIBLE_l + \varepsilon_{tl}$. Standard errors are clustered at the locality level and heteroskedactic robust. $POST_{tl}$ is a dummy variable for either ≥ 2007, ≥ 2008, or ≥ 2009. $ELIGIBLE_{tl}$ is a dummy for being eligible for the pension program in 2007, 2008, or 2009, determined by 2005 census locality population. For localities eligible in 2007, year 2006 omitted from estimation because of the introduction of the *Progresa/Oportunidades* pension in this year.

Table 6.5: Changes in Mortality by Age

	(1)	(2)	(3)	(4)	(5)	(6)
Age 60-69	0.0381	0.0210	0.0140	-0.00270	0.0612*	0.0336
	(0.0321)	(0.0394)	(0.0398)	(0.0480)	(0.0358)	(0.0463)
Age 70-74	0.0724**	0.0428	0.0855**	0.0718	0.0754*	0.0391
	(0.0326)	(0.0391)	(0.0429)	(0.0505)	(0.0403)	(0.0519)
Age 75-79	0.107***	0.0614	0.113**	0.0916	0.0641	0.00655
	(0.0334)	(0.0448)	(0.0460)	(0.0620)	(0.0426)	(0.0539)
Age 80-90	0.172***	0.0729*	0.178***	0.100**	0.154***	0.0508
	(0.0317)	(0.0375)	(0.0378)	(0.0438)	(0.0387)	(0.0467)
N	108790	49680	108790	49680	108790	49680
Eligible	Pooled	Pooled	Pooled	Pooled	Pooled	Pooled
Cause	All	All	Circ	Circ	Non Circ	Non Circ
FE	Loc-Yr	Loc-Yr	Loc-Yr	Loc-Yr	Loc-Yr	Loc-Yr
Reporting Quality		X		X		X

Data: INEGI Vital Statistics (2002-2005, 2008-2011); INEGI Census Records (2005, 2010)
Specification: Sample limited to localities with good vital statistics reporting practices and eligible in 2007 or 2008. Pooled refers to localities eligible in either year. Localities eligible in 2009 excluded, but localities with populations 30001-100000 are included to explore variation across locality size in addition to time and age eligibility. Dependent variable is $D_{gcl(t)}$, the log number of uninsured deaths in a given locality-year $l(t)$, age group g for cause c (all cause, circulatory/cardiovascular, or non-circulatory/non-cardiovascular disease). Uninsured defined as deceased with no insurance/social security or only *Seguro Popular*.
Estimation: Table displays triple difference estimates from the following model, $\{\beta^3_g\}$ for each group g (ages 60-69, 70-74, 75-79, 80-90, and ages 50-59 omitted as the reference population): $D_{gl(t)} = \tau_{l(t)} + \gamma_g + \sum_g \beta^1_g ELIGIBLE \times \mathbb{1}(Age = g)_{gl(t)} + \sum_g \beta^2_g POST \times \mathbb{1}(Age = g)_{egl(t)} + \sum_g \beta^3_g ELIGIBLE \times POST \times \mathbb{1}(Age = g)_{gl(t)} + \varepsilon_{gt(l)}$
for $POST_{tl}$ is a dummy variable for $\geq$ 2008 (I drop years 2006, 2007), $ELIGIBLE_{tl}$ is a dummy for being eligible for the pension program in 2007 or 2008, determined by 2005 Census locality population. Fixed effects included are a locality-year fixed effects $\tau_{l(t)}$ and age group fixed effects γ_g. Models are weighted by the population 60 and over and standard errors are clustered at the locality level and heteroskedaktic robust. Controls not included in estimates. Columns (1), (3), and (5) are the full sample of eligible localities. Columns (2), (4), and (6) are limited to locality-year observations with good reporting standards.
* p < 0.10, ** p < 0.05, *** p <0.01

Table 6.6: Combined Estimates from Robustness Specifications

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
All												
Post X Elig	0.0911**	0.0239	0.0663**	0.0243	0.00117	0.0296	0.0361*	0.0528**	0.0392*	0.0373*	0.0303	0.0124
	(0.0284)	(0.0193)	(0.0244)	(0.0172)	(0.0347)	(0.0243)	(0.0184)	(0.0167)	(0.0161)	(0.0153)	(0.0230)	(0.0236)
Circ.												
Post X Elig	0.229***	0.0989*	0.127**	0.0700*	0.00304	0.0250	0.174***	0.143***	0.106***	0.0958***	-0.0134	0.0520
	(0.0584)	(0.0406)	(0.0394)	(0.0291)	(0.0543)	(0.0423)	(0.0418)	(0.0365)	(0.0287)	(0.0274)	(0.0443)	(0.0401)
Non Circ.												
Post X Elig	0.0561	0.0148	0.0410	0.00909	0.00142	0.0297	0.0124	0.0491*	0.0274	0.0220	0.0610*	-0.0114
	(0.0335)	(0.0254)	(0.0247)	(0.0187)	(0.0410)	(0.0258)	(0.0233)	(0.0221)	(0.0181)	(0.0164)	(0.0260)	(0.0278)
Eligible	2007	2007	2008	2008	2009	2009	2007	2007	2008	2008	2009	2009
Sample	High	Low	High	Low	High	Low	Men	Women	Men	Women	Men	Women

Data: INEGI Vital Statistics (2002-2011); INEGI Census Records (2005, 2010)
Specification: Sample is limited to those localities with good quality reporting scores. "High" refers to observations from states with high level of chronic diseases morbidity (hypertension, diabetes, or obesity) and "Low" refers to observations from from states with low levels of chronic disease morbidity, as assessed in the ENSANUT 2006 survey. Dependent variable is $log(MR_{tl})$. Mortality Rate$_{tl}$ =1000 $\times \frac{\text{Uninsured Deaths (Age 70+)}_{tl}}{\text{Pop. Age 60+}_{tl}}$ for locality l and year t. Uninsured defined as deceased with no insurance/social security or only *Seguro Popular*. Pop. Age 60+$_{tl}$ interpolated between census round years using locality specific linear growth rate. $POST_{tl}$ is a dummy variable for either ≥ 2007, ≥ 2008, or ≥ 2009. $ELIGIBLE_{tl}$ is a dummy for being eligible for the pension program in 2007, 2008, or 2009, determined by 2005 Census locality population. For localities eligible in 2007, year 2006 omitted from estimation because of the introduction of the *Progresa/Oportunidades* pension.
Estimation: Averaged effect is estimated from the following equation. Models are weighted by the population 60 and over and standard errors are clustered at the locality level and heteroskedaktic robust. β_3 from: $Y_{tl} = \lambda_l + \beta_1 + \beta_2 POST_{tl} + \beta_3 POST_{tl} \times ELIGIBLE_l + \varepsilon_{tl}$
* p < 0.05, ** p < 0.01, *** p <0.001

Chapter 7

Consumption & Retirement Transitions

What explains the increase in mortality I observe? Literature highlights two pathways between income receipt and mortality that may be especially relevant for the population eligible for "70 y Más": changes in diet and food consumption and the retirement transition. Cash transfers can have significant effects on risk factors for circulatory diseases and associated mortality, as shown in Table 4 previously. Households dramatically increase food consumption that affects an individual's anthropometric measures like body mass index and blood pressure. Changes in diet can also impact mortality risk for cardiovascular causes over relatively short-run horizons as well as long term horizons. Additionally, several studies have tackled the question about whether transitions out of the labor force at old ages (retirement) are harmful to health or protective (Table 3 above). Studies have found a large increases in chronic diseases morbidity following retirement as well. [47] Unfortunately, data on the retirement transitions of older adults in low and middle income countries is lacking, but this remains a particularly compelling hypothesis because of the large magnitudes observed relatively quickly, often within a year of retirement.

To explore how applicable these hypothesis are to the "70 y Mas" population, I examine household consumption data and labor market activity using the *Encuesta Nacional de Ingresos y Gastos de los Hogares* (ENIGH) from 2004, 2005, 2006, 2008, and 2010. Among a sample with households members (for consumption) or individuals (for labor supply) between 60 and 80 years of age, I estimate the impact of the program using a triple differences model to parallel the analysis of vital statistics above and present results on changes in diet by food group and labor supply (any work in the last month) in Tables 7.2, 7.3, and 7.4. In these (differences in) differences-in-differences models, I include a variety of fixed effects (year, locality and year, and locality-year) to control for differences in prices/labor markets specific to a given community in a given year. [1] The sample is restricted to households

[1]The estimating equation for the triple difference is $Y_{il(t)} = \beta_0 + \beta_1 ELIGIBLE \times POST_{il(t)} + \beta_2 ELIGIBLE \times COMMUNITY_{il(t)} + \beta_3 ELIGIBLECOMMUNITY \times POST_{il(t)} + \tau_{l(t)} + \varepsilon_{il(t)}$ and for the double difference $Y_{ily} = \beta_0 + \beta_1 POST \times COMMUNITY_{il(t)} + \beta_2 COMMUNITY \times POST_{il(t)} + \lambda_l + \gamma_y + \varepsilon_{ils}$

that have at least one age qualifying member (a household resident at 70 or older) among households where the head is not eligible for formal social security like IMSS or ISSSTE.

Increases in Food Consumption

In Table 7.2, I observe dramatic changes in household food consumption for localities eligible in 2007 and 2008 that correlate with changes in mortality, but not observe increases in consumption for those localities eligible in 2009 where I observe small, statistically insignificant changes in mortality. For 2007-eligible households in localities with populations 2,500 or fewer, I observe large but imprecise changes in consumption across the double difference and triple difference model. Some of this variation across models can be attributable to the unbalanced panel of localities across years in the ENIGH survey, which I comment on in Chapter 5. The large reduction in the double difference point estimate could reflect the fact that wealthier localities were more likely to be included in both the pre and post periods, so selection could drive this estimate downwards if there is some interaction between baseline levels or time invariant characteristics and eligibility for the program. Despite the lack of statistical significance, the estimates all suggest large changes in food consumption. Looking within localities at double difference estimates across age or triple difference estimates with locality year fixed effects, the point estimate is larger if not statistically significant, suggesting an increase in food per capita monthly food consumption between 12% and 22%.

For localities eligible in 2008, results are larger in magnitude and more precise than results for localities eligible in 2007. Again due to changes in the sample of localities interviewed across the ENIGH survey, the fixed effects results yield comparably smaller changes in consumption as these localities were more likely to have higher consumption per capita than the full set of eligible localities. The results from the locality-specific year fixed effects models suggest an increase in food consumption of 30-40%, while estimates from the year fixed effects models suggest smaller changes from 20 to 33%. To improve precision, I pool households in localities eligible in either 2007 or 2008. These models suggest an average increase in food consumption of 20-30%.[2] For households in localities eligible in 2009, I observe insignificant changes in food consumption, small in magnitude relative to what is observed in localities eligible in 2007 and 2008. These estimates range from insignificant 10% decrease

where $ELIGIBLE_i$ identifies individuals 70 years of age or older (or households with at least one member age 70 or older, relative to those households where the oldest individual is between the ages of 60 and 69), $POST_t$ identifiers the post period for a given locality (either eligible in 2007, 2008, or 2009), and $COMMUNITY_l$ is a dummy for being eligible for the pension program based off of locality population size. The coefficient of interest is β_3 in the triple difference model and β_2 in the double difference model. I include fixed effects for year γ_y, locality λ_l or locality-year $\tau_{l(t)}$. Y_{itl} is an outcome measure for consumption or labor supply for household or individual.

[2] These changes in consumption are inline with the Galiani (2016) evaluation of the program in 2007-2008, which was only able to measure short run changes among households eligible in 2007 immediately following the roll out of the program. The authors find a 23% increase in consumption. [33]

to small 2% increase in food consumption in the models estimated with a locality-year fixed effect.

In Table 7.3, I pool households eligible in 2007 and 2008 to examine changes in consumption by food group given the small sample sizes. I estimate the same series of double difference and triple difference models with year, locality, and locality-specific year fixed effects. The locality fixed effect models continue to present a selection issue, driving down changes in estimated increases in consumption. While it is difficult to be be precise, the double difference estimates suggest increases in all food groups: a 16% increase in grains/cereals, a 24% increase in protein and dairy, a 20% increase in fruits and vegetable consumption, and a 30% increase in sweets, sodas, alcohol, tobacco, and food outside the household. The triple difference estimates also reveal large changes across food groups, but the results contrast slightly to the simple differences in difference estimates and are less precise. The results suggest a 25 % increase in cereal consumption, a statistically significant 42% increase in meat and dairy, and a 47 % increase in sweets and other goods. The increase in fruit and vegetable consumption is consistent with the double difference estimate of 20%, but smaller relative to the increase in consumption of other food groups.

Since food consumption is measured at the household level and not the individual level, these models may not accurately estimate changes in consumption for age qualifying individuals if food is not shared evenly in the household. To assuage concerns, I re estimated the models on a limited sample to households including only 2 individuals (one "70 y Mas" qualifying individual and one other adult). This household formation makes up approximately 47% of the ENIGH sample. Among these households, I find no statistically significant difference in the consumption changes by food group, and in some cases find estimates substantially larger. This does not rule out changes in consumption for other household members not directly qualifying for the pension, but it does suggest that the changes in consumption we observe are not driven solely by increases among pension-ineligible members.

Reductions in Labor Supply

I also observe meaningful changes in labor supply (defined as doing *any* work in the last month) in Table 7.4, which I argue reflect increased rates of retirement among the eligible population. I adopt the same strategy as my analysis of consumption above, presenting results from both triple difference and double difference models. Again, the locality fixed effects models introduce important selection effects in the double difference models, and these estimates can be considerably larger than the triple difference estimates or doubled difference estimates exploiting variation within eligible localities across time and age.

Among individuals living localities eligible in 2007, locality-year fixed effect models yield a reduction on the extensive margin of 10-14 percentage points, equivalent to a 24% to 29% reduction in labor supply over the prior month. Estimates from the other triple difference models and the year fixed effect double difference model are comparable. Consistent with localities with lower old age labor force being selected into the sample across pre and post treatment periods, the locality fixed effect model suggests a dramatic change in labor supply of 21 percentage points. Estimates of reductions in labor supply are comparable among localities eligible in 2008. The locality fixed effect models suggest a decrease in labor supply of 12 to 18 percentage points, or about a 30-47% reduction in labor supply. Estimates from the other model specification do not fall far outside of this range, with the exception of the double difference model including the locality fixed effect.

To gauge the magnitude on mortality of the potential effect of retirement observed in the ENIGH survey, I use the 15% mortality increase among individuals ages 71-78 from Hernaes (2013) in Table 3 and multiply by the weighted average of the retirement I observe in Table 7.4, which yields an estimate of 5.7% increase in (all cause) mortality, close to the average we observe across localities eligible in 2007, 2008, 2009 (a 4.6% increase in mortality with adjustment for time varying controls). Importantly, the changes in labor supply are not statistically different across men and women in the sample - both report high labor force participation at older ages and both groups seem to retire with the onset of the pension eligibility. Thus, retirement transitions and their effect on health could explain the increase in mortality we observe for both genders. [3]

Other Spending

Another consumption type of interest may by spending on healthcare, such as primary care visits, hospitalizations, and prescription drugs. I table these estimates in Table 7.7, pooling across localities eligible in 2007 and 2008 and analyzing separately those localities eligible in 2009. Although individuals in the sample would be eligible for healthcare at little or no cost through *Seguro Popular*, recall then when potential recipients of the pension program were asked ex ante how they would spend the income transfer, 30% reported they would use it to buy prescription drugs. This finding is largely inline with literature that suggests implementation of the insurance program has relied on unreliable funding across Mexican municipalities and inadequate levels of service provision. Individuals may still rely on private providers for access to things like prescription drugs and cash welfare programs may be important ways of financing treatment for chronic diseases.

Due to the low prevalence of any healthcare spending, I dichotomize continuous measures of healthcare expenditure into dummy variables for any health spending (on hospitalization, prescription drugs, and primary care/outpatient visits) and any prescription drug spending.

[3]The increases in consumption and decrease in labor supply I observe are robust to the inclusion of household and individual level controls that might confound the estimate or violate assumptions for the causal impact of a differences-in-differences estimator. Of particular concern is that the pension program could have induced significant changes in household composition and intergenerational co-residency arrangements. For example, households with age qualifying individuals may take in young relatives/children, such that the increase in consumption reflects changing tastes among household members rather than changes in individual diets for men and women ages 70 and over. Similarly, working age adults may move into (or out of) the household as well, which may also effect age eligible household members' labor supply. In both models I control for household composition and results are robust to these controls. Further, I analyze household size and generation structure as dependent variables and find no changes across these measures in later models in this chapter explicitly.

I use the same specification for double difference and triple difference estimates with combinations of locality and year fixed affects as before. [4] Pooling across localities eligible for the pension program in 2007-2008, I find small and statistically insignificant increases in any health care spending. Among localities eligible in 2009, I also find small and statistically insignificant changes in healthcare spending that vary in direction across model specification. These results are very similar when analyzing any prescription drug spending as a separate category.

These findings are consistent with what observed in the pilot evaluation of "70 y Mas", which found no statistically significant increases in healthcare utilization despite pre treatment period interviews which suggested respondents might spend otherwise. Although my theoretical model in Chapter 3 does not explicitly entertain comparative statistics about health investment via health service utilization, more traditional extensions of the Grossman model suggest health spending at older ages should increase with income. These effects could be more ambiguous if, for example, individual utility functions don't include a "consumption" component to health, such that when individuals retire the returns to health investment are weaker, as I have suggested. Another explanation departing from the framework of my model is that individuals could exhibit present bias such that large increases in other consumption types in the short run crowd out other expenses with long term benefits.

Individuals may also increase non food (and non health expenditure as well). This may be important in understanding differences in the effect of income on adult mortality across localities and across countries with similar programs. For example, individuals who are more likely to save may better smooth consumption, such that large income windfalls have limited affects on health. Similarly, individuals who use the additional income for more durable consumption may also be less susceptible to consumptions shocks on health. In table 7.8 I analyze changes in such nonfood and non health expenditure (log per capita monthly non food and non health expenditure) and whether the respondent has any savings in any formal or informal savings account, association (tanda) etc. [5]

Pooling across localities eligible in 2007 and 2008, I find limited evidence or increases in nonfood/nonhealth expenditure. Simple double difference estimates suggest negligible and statistically insignificant increases in this expenditure category, however other specifications of fixed effects models suggest large increases in non food expenditure. Households in localities eligible in 2009 have more consistent estimates of increases in non food consumption. Additionally, I argue there are no statistically significant changes on savings across localities eligible in 2007-2009. The one statistically significant positive estimates is likely driven by sample selection towards wealthier localities with higher formal savings rate among the "70 y Mas" eligible population.

[4] One additional benefit of the locality-year fixed effect is that I am able to control implicitly for the roll out of *Seguro Popular* across the study period.

[5] Information about savings in ENIGH is limited. I opt to use the binary measure of savings rather than the residual of expenditures from income.

Household Composition

Table 7.5 analyzes household size (number of family members living in a household). Results are not consistent across model specifications or localities eligible in 2007 and 2008 (where we see large changes in consumption, labor supply, and mortality) suggesting that while there may have been some change in living conditions (age eligible pensioners more likely to be living in smaller households), these would unlikely explain the large changes in mortality, consumption, or labor supply I observe.

In table 7.6, I analyze martial status, another way to understand how participation in the income transfer program might have affected household composition and social support/isolation, consumption, and labor supply. For localities eligible in 2007, estimated changes in being married are small and insignificant. For localities eligible in 2008, changes in marital status suggest individuals in localities participating in the pension program are more likely to be married, but these estimates are not statistically significant and small. Finally, localities eligible in 2009 showed small and statistically insignificant decreases in being married in the year fixed effects models, but large and imprecise increases in individuals who stay married in the locality specific year models. The large standard errors may reflect small sample sizes and selection: localities samples in both pre and post waves may e different from those sampled in just one period or the other in that they tended to have a higher prevalence of age eligible individuals who are married.

Discussion

Literature on income transfers and adult mortality highlight two pathways linking cash receipt and mortality: change in food consumption and labor supply. The changes in food consumption I observe in the ENIGH survey are largely inline with prior evaluations of the "70 y Mas" program and what has been seen elsewhere among other cash transfer programs in Latin America. Not only does the increase in total food consumption mirror short run results reported in Galiani et al (2016), but they also are consistent with evidence that poor rural households are likely to consume almost all of the cash transfer (although some of this evidence comes from *conditional* cash transfers). Kabeer and coauthor (2015) report in a meta evaluation of cash transfer programs from Mexico, Brazil, and Colombia, that 80-90% of a cash transfer is consumed via food consumption. Kabeer reports that in Mexico the residual was spent on productive activities and assets with high returns, while this was not the case in other countries in the region. Evidence from the ENIGH surveys suggests that the population targeted by the pension in Mexico was less similar to those households eligible for *Progresa/Oportunidades* given the increases in consumption we observe. The distribution of consumption across food groups is not peerless in the literature either. Angelucci reports that among households eligible for *Progresa/Oportunidades*, household food consumption primarily increased among proteins (meat and dairy), similar to what we observe for localities eligible in 2007 and 2008. However, other income support programs in Mexico find somewhat conflicting results.

How do the changes in retirement and labor supply compare to other non contributory pension programs? First, they contrast noticeably with what is observed by Gerlter et al (2016) and Juarez and Pfutze (2016), who find minor reductions in labor supply that are heterogenous across household composition. It should be noted that both of these studies uses a data set different from the ENIGH data. Gertler et al uses an evaluation data set that examines only changes within the first year of the program for localities eligible in 2007 or 2008, while Juarez and Pfutze uses Mexico's quarterly employment surveys to examine changes in labor supply among localities eligible in 2009 only. However, there is supportive evidence from other countries' experience with non contributory pensions (or similar such programs) for large decreases in labor supply. For example,Filho (2008) studies the roll out of a noncontributory pension program in Brazil and finds a 38% reduction in labor supply on the extensive margin. Ranchod (2006) finds a comparable estimate in South Africa among age eligible pensioners. There is conflicting evidence from China about whether the New Rural Pension Scheme reduced labor supply (Ning et al 2015, Shiu 2015) and in India, Kaushal (2014) finds no significant effect on old age labor supply in response to a pension program. Evidence from other (conditional) cash transfer programs in Latin America suggests little change in labor force participation of eligible members (Kabeer 2015; Alzua 2013). Whether or not the results would remain the same if the study sample were limited to old age members similar in profile to those eligible of "70 y Mas" is unclear.

Comparisons of labor supply and consumption responses across countries and localities is a useful exercise to help understand they role each might play in explaining the increase in mortality in Mexico and hint at whether or not we might expect similar results in other settings. The large changes in diet composition and food consumption among localities eligible in 2007 and 2008 that are mirrored elsewhere as part of other cash transfer programs and evaluations would support the hypothesis that dramatic changes in consumption from large cash transfers among low income population increase mortality risk. On one hand, large meals and consumption "shocks" correlate positively with health shocks like heart attacks, but increase in meat and diary can also increase protein intake, which is an important source of nutrition for older populations. (Recall Jensen and Richter attributed changes in mortality among a cohort of Russian pensioners to decreases in consumption, caloric intake, and protein intake.) Large changes in food outside the home and increases in alcohol, tobacco, sodas, and other sugars may be particularly harmful to health in the medium or long run, as they increase risk or exacerbate obesity, diabetes, and other cardiovascular/circulatory diseases. The physiological effect of these goods may manifest over a longer period relative to the more immediate association between consumption shocks and cardiovascular disease related mortality.

Within the ENIGH survey, retirement patterns across localities eligible between 2007 and 2009 suggest withdraw from the labor force could also explain the results we observe. Further support for this comes from analysis of the change in mortality across age groups in Chapter 6. Increases in mortality were not driven by deaths among very old adults far from the retirement margin (ages where labor force participation is low). Estimates of mortality among adults between 70 and 75 were comparable to those at older ages. This suggests retirement transitions could play some role in explaining the mortality patterns we observe but given the differential propensity to work across ages, it may not be the only pathway.

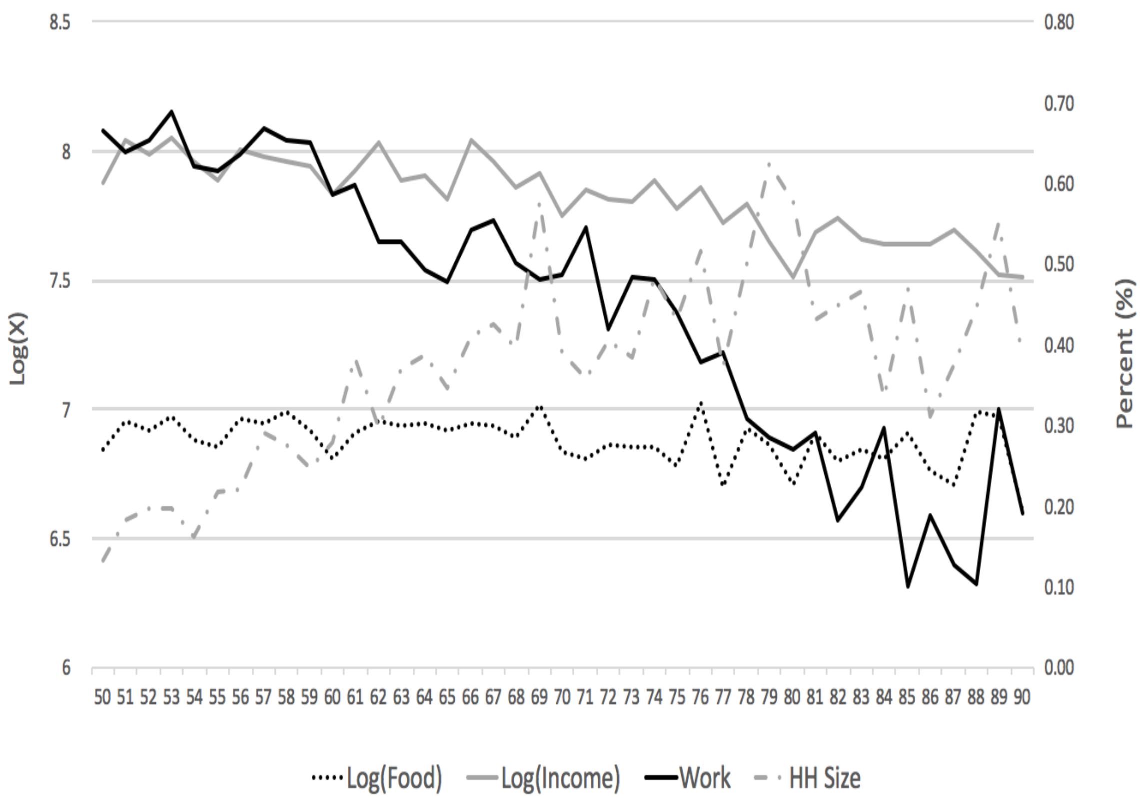
Further, this extrapolates from limited evidence about the affect of retirement from high income countries, where the direction and magnitude of the effects of is still disputed. As discussed in earlier chapters, literature studying the effect of retirement on mortality yields large positive and large negative estimates. Evidence about the effect of retirement in low income settings or among low income populations is lacking. It could be that retirement induces more sedentary behavior and social isolation, which could increase risk for mortality particularly in combination with increases in unhealthy changes in diet. On the other hand, retirement could relieve stress associated with working, particularly if the work is physically demanding. Future work could examine mortality patterns by occupational class, which is recorded on the death certificate. An additional point to consider is that the patterns of retirement I observe seem to be inconsistent with what is observed in other surveys among the same population in Mexico and among populations from other countries experimenting with non contributory pensions or similar programs. Evidence from China (which showed improvements in old age mortality) also demonstrated a range of estimates on labor supply from small reductions to large reductions. These studies suggest that retirement alone may not be sufficient to explain the increase in mortality I observe among the "70 y Mas" population.

Table 7.1: ENIGH: Household Consumption

	(1)	(2)	(3)	(4)
HH Size	3.37	3.47	3.25	3.27
	2.14	2.30	2.16	2.06
HH Size ≤ 2	0.28	0.30	0.25	0.27
	0.45	0.46	0.44	0.45
Any Children/Teen	0.22	0.17	0.19	0.19
	0.41	0.38	0.39	0.39
# 70+	1.24*	1.19	1.17	1.17
	0.44	0.40	0.39	0.38
# Working Age	1.31	1.44	1.38	1.39
	1.29	1.43	1.39	1.35
HH Head Ed. (yrs)	1.81^{+}	2.05*	2.16	2.44
	1.25	1.50	1.46	1.67
All Expenditure p.c.	1334.17^{+}	1583.75	2106.60	2016.51
	1969.58	3031.86	3041.11	2579.04
Food Expenditure p.c.	288.32^{+}	335.84	399.50	399.30
	278.31	301.74	311.56	310.70
Cereals Expenditure p.c.	59.46**	67.31	66.93	72.28
	63.68	63.13	51.03	51.51
Meat Expenditure p.c.	93.51***	113.27	138.85	141.88
	105.56	120.90	113.97	137.14
Fruit/Veg Expenditure p.c.	50.76*	63.62	63.68	64.59
	58.65	78.33	74.25	74.90
Other Food Expenditure p.c.	45.92^{+}	55.10*	83.45	79.18
	117.79	141.62	212.93	169.68
Health Expenditure p.c.	68.85	86.72	302.37	86.09
	646.39	602.92	1737.56	416.12
N_{HH}	4170	1611	446	1265
Eligible	2007	2008	2009	Control

Data: ENIGH Survey (2004-2008)
Specification: Sample limited to eligible households (households including at least one member age 70 and older) where head of household does not have access to formal social security and household roster contains at least one individual between ages 60 and 80. Sample weighted with survey weights. Food consumption is the sum total of carbohydrates/cereals, meat/dairy, fruits and vegetables, and others (sodas, alcohol, tobacco, food outside the home, sweets). Statistics calculated in the locality specific pre treatment period only. Control households, we calculate the statistics for survey years prior to 2007.
Estimation:Heteroskedactic robust standard errors in parenthesis clustered at the locality type level.
* $p < 0.10$ ** $p < 0.05$, *** $p < 0.01$, + $p < 0.001$

Figure 7.1: Household Economic Activity by Age



Data: ENIGH Survey (2004-2006)
Specification: Sample limited to eligible households (households including at least one member age 70 and older) where head of household does not have access to formal social security among localities with populations between 1 and 30001 eligible for the pension program between 2007 and 2009. Sample weighted with survey expansion weights. "Log(food)" is log of monthly per capita food expenditure, the sum total of carbohydrates/cereals, meat/dairy, fruits and vegetables, and others (sodas, alcohol, tobacco, food outside the home, sweets) food groups. "Log(Income)" is monthly per capita income, from labor market earnings and non-earned income sources as well (transfers, etc). Per capita estimates give each household member a unitary weight regardless of age. Work is a dummy variable for having worked for at least one hours at all (in any sector, at home or outside the home, for pay or not for pay) in the past month. "HH Size" is the percent of individuals living by themselves or with a spouse only. Statistics calculated in the pre treatment period only (< 2008).

Table 7.2: ENIGH - Food Consumption: Estimates from FE Specifications

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
DD	0.169	0.0770	0.121*	0.188	0.0574	0.308**	0.117	0.0623	0.186**	-0.0748	0.0113	-0.0999
	(0.119)	(0.137)	(0.0675)	(0.130)	(0.133)	(0.122)	(0.107)	(0.123)	(0.0641)	(0.214)	(0.273)	(0.291)
Observations	3611	3611	6203	2029	2029	2671	4670	4670	8623	1175	1175	734
DDD	0.208	0.109	0.218	0.327**	0.265	0.405**	0.181	0.158	0.283*	-0.00619	-0.0176	0.0252
	(0.128)	(0.145)	(0.164)	(0.152)	(0.163)	(0.188)	(0.118)	(0.144)	(0.163)	(0.233)	(0.240)	(0.307)
Observations	8251	8251	8251	4711	4711	4711	10663	10663	10663	2783	2783	2783
Eligible	2007	2007	2007	2008	2008	2008	Pooled	Pooled	Pooled	2009	2009	2009
FE	Yr	Loc, Yr	Loc-Yr	Yr	Loc, Yr	Loc-Yr	Yr	Loc, Yr	Loc-Yr	Yr	Loc, Yr	Loc-Yr

Data: ENIGH Survey (2004-2010)
Specification: Sample limited to households where head of household does not have access to formal social security and/or household roster contains at least one individual between ages 60 and 80 (triple differences in differences in differences, "DDD") or one individual 70 years of age and older (double differences in differences, "DD"). Sample weighted with survey expansion weights weights. Dependent variable is the monthly per capita food consumption, the sum total of carbohydrates/cereals, meat/dairy, fruits and vegetables, and others (sodas, alcohol, tobacco, food outside the home, sweets).
Estimation: "Yr" refers to year FE; "Loc, Yr" refers year FE plus locality fixed effects, and "Loc-Yr" refers to locality-specific year fixed. The triple difference ("DDD") displays coefficient β_6 from estimating equation:
$Y_{islt} = \beta_0 + \beta_1 ELIGIBLE_i + \beta_2 COMMUNITY_l + \beta_3 ELIGIBLE \times POST_{it} + \beta_4 COMMUNITY \times POST_{lt} + \beta_5 ELIGIBLE \times COMMUNITY_{il} + \beta_6 ELIGIBLE \times COMMUNITY \times POST_{ilt} + \tau_t + \varepsilon_{ilt}$.
The double difference ("DD") displays coefficient β_2 from estimating equation: $Y_{ilt} = \beta_0 + \beta_1 COMMUNITY_l + \ldots$
$\ldots + \beta_2 COMMUNITY \times POST_{lt} + \tau_t + \varepsilon_{ilt}$. $ELIGIBLE$ is a dummy for a household that has at least one individual 70 years of age or older. $COMMUNITY$ is a dummy for being eligible in either 2007, 2008, or 2009 and $POST$ is a dummy for the post period (either post 2007, 2008, or 2009 depending on the locality). Columns (7), (8), and (9) pool estimates from localities eligible in 2007 and 2008. The double difference estimates with the locality-specific year fixed effect in columns (3), (6), (9), and (12) use variation across age for identification. The sample is limited to only eligible localities and the table displays coefficient β_2 from the following model:
$Y_{ilt} = \beta_0 + \beta_1 ELIGIBLE_i + \beta_2 ELIGIBLE \times POST_{it} + \tau_t + \varepsilon_{ilt}$. Heteroskedactic robust standard errors in parenthesis clustered at the locality type level. p < 0.10 *, p < 0.05 **, p < 0.01 ***

Table 7.3: ENIGH - Food Consumption by Item: Estimates from FE Specifications

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
DD	0.0300	-0.0169	0.156**	0.136	0.0697	0.236**	0.0379	0.0553	0.211**	0.195	0.240	0.319*
	(0.0857)	(0.132)	(0.0769)	(0.130)	(0.164)	(0.106)	(0.107)	(0.189)	(0.0946)	(0.207)	(0.326)	(0.182)
Observations	4423	4310	8150	4250	4138	7814	4128	4023	7728	3247	3172	6215
DDD	0.109	0.133	0.246	0.277*	0.271	0.422*	0.0330	0.0991	0.183	0.293	0.304	0.471
	(0.109)	(0.127)	(0.150)	(0.147)	(0.187)	(0.232)	(0.130)	(0.150)	(0.190)	(0.221)	(0.259)	(0.324)
Observations	10132	10132	10132	9761	9761	9761	9555	9555	9555	7714	7714	7714
Eligible	Pooled	Pooled	Pooled	Pooled	Pooled	Pooled	Pooled	Pooled	Pooled	Pooled	Pooled	Pooled
FE	Yr	Loc, Yr	Loc-Yr	Yr	Loc, Yr	Loc-Yr	Yr	Loc, Yr	Loc-Yr	Yr	Loc, Yr	Loc-Yr
Group	Cereals	Cereals	Cereals	Meat	Meat	Meat	Veg	Veg	Veg	Other	Other	Other

Data: ENIGH Survey (2004-2010)
Specification: Sample limited to households where head of household does not have access to formal social security and/or household roster contains at least one individual between ages 60 and 80 (triple differences in differences in differences, "DDD") or one individual 70 years of age and older (double differences in differences, "DD"). Sample weighted with survey expansion weights weights. Dependent variable is the monthly per capita food consumption for the following food groups: carbohydrates/cereals, meat/dairy ("meat"), fruits and vegetables ("veg", and others (sodas, alcohol, tobacco, food outside the home, sweets).
Estimation: "Yr" refers to year FE; "Loc, Yr" refers year FE plus locality fixed effects, and "Loc-Yr" refers to locality-specific year fixed. The triple difference ("DDD") displays coefficient β_6 from estimating equation:
$Y_{islt} = \beta_0 + \beta_1 ELIGIBLE_i + \beta_2 COMMUNITY_l + \beta_3 ELIGIBLE \times POST_{it} + \beta_4 COMMUNITY \times POST_{lt} + \beta_5 ELIGIBLE \times COMMUNITY_{il} + \beta_6 ELIGIBLE \times COMMUNITY \times POST_{ilt} + \tau_t + \varepsilon_{ilt}$.
The double difference ("DD") displays coefficient β_s from estimating equation: $Y_{ilt} = \beta_0 + \beta_1 COMMUNITY_l + \ldots$
$\ldots + \beta_2 COMMUNITY \times POST_{lt} + \tau_t + \varepsilon_{ilt}$. $ELIGIBLE$ is a dummy for a household that has at least one individual 70 years of age or older. $COMMUNITY$ is a dummy for being eligible in either 2007, 2008, or 2009 and $POST$ is a dummy for the post period (either post 2007, 2008, or 2009 depending on the locality). Columns (7), (8), and (9) pool estimates from localities eligible in 2007 and 2008. The double difference estimates with the locality-specific year fixed effect in columns (3), (6), (9), and (12) use variation across age for identification. The sample is limited to only eligible localities and the table displays coefficient β_2 from the following model:
$Y_{ilt} = \beta_0 + \beta_1 ELIGIBLE_i + \beta_2 ELIGIBLE \times POST_{it} + \tau_t + \varepsilon_{ilt}$. Heteroskedactic robust standard errors in parenthesis clustered at the locality type level.
$p < 0.10$ *, $p < 0.05$ **, $p < 0.01$ ***

Table 7.4: ENIGH - Labor Supply: Estimates from FE Specifications

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
DD	-0.103*	-0.214**	-0.0901*	-0.166**	-0.241**	-0.121	-0.0684	0.0144	0.323
	(0.0579)	(0.0769)	(0.0491)	(0.0636)	(0.0922)	(0.0816)	(0.147)	(0.157)	(0.222)
Observations	4646	4646	8008	2545	2545	3377	1448	1448	904
DDD	-0.0748	-0.109	-0.144*	-0.0598	-0.0878	-0.175*	-0.0163	0.164	0.130
	(0.0700)	(0.0707)	(0.0812)	(0.0853)	(0.0895)	(0.102)	(0.190)	(0.187)	(0.231)
Observations	10534	10534	10534	5892	5892	5892	3429	3429	3429
Eligible	2007	2007	2007	2008	2008	2008	2009	2009	2009
FE	Yr	Loc, Yr	Loc-Yr	Yr	Loc, yr	Loc-yr	Yr	Loc, Yr	Loc-Yr

Data: ENIGH Survey (2004-2010)
Specification: Sample limited to households where head of household does not have access to formal social security and/or the oldest member of the household is between ages 60 and 69 and individual are also between ages 60 and 69, or between ages 70 and 80 (triple differences in differences in differences, "DDD") or one individual 70 years of age and older (double differences in differences, "DD"). Sample weighted with survey expansion weights weights. Dependent variable is any work in the past month for at least on hour.
Estimation: "Yr" refers to year FE; "Loc, Yr" refers year FE plus locality fixed effects, and "Loc-Yr" refers to locality-specific year fixed. The triple difference ("DDD") displays coefficient β_6 from estimating equation:
$Y_{islt} = \beta_0 + \beta_1 ELIGIBLE_i + \beta_2 COMMUNITY_l + \beta_3 ELIGIBLE \times POST_{it} + \beta_4 COMMUNITY \times POST_{lt} + \beta_5 ELIGIBLE \times COMMUNITY_{il} + \beta_6 ELIGIBLE \times COMMUNITY \times POST_{ilt} + \tau_t + \varepsilon_{ilt}$.
The double difference ("DD") displays coefficient β_2 from estimating equation: $Y_{ilt} = \beta_0 + \beta_1 COMMUNITY_l + \ldots$
$\ldots + \beta_2 COMMUNITY \times POST_{lt} + \tau_t + \varepsilon_{ilt}$. $ELIGIBLE$ is a dummy for a individuals ages 70 or older. $COMMUNITY$ is a dummy for being eligible in either 2007, 2008, or 2009 and $POST$ is a dummy for the post period (either post 2007, 2008, or 2009 depending on the locality). Columns (7), (8), and (9) pool estimates from localities eligible in 2007 and 2008. The double difference estimates with the locality-specific year fixed effect in columns (3), (6), (9), and (12) use variation across age for identification. The sample is limited to only eligible localities and the table displays coefficient β_2 from the following model:
$Y_{ilt} = \beta_0 + \beta_1 ELIGIBLE_i + \beta_2 ELIGIBLE \times POST_{it} + \tau_t + \varepsilon_{ilt}$. Heteroskedactic robust standard errors in parenthesis clustered at the locality type level.
$p < 0.10$ *, $p < 0.05$ **, $p < 0.01$ ***

Table 7.5: ENIGH - Household Size: Estimates from FE Specifications

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
DD	-0.578*	0.0164	-0.306	-0.251	0.831	-0.395	-1.013*	0.193	-0.247
	(0.302)	(0.485)	(0.204)	(0.350)	(0.557)	(0.387)	(0.536)	(0.505)	(0.539)
Observations	3611	3611	6203	2029	2029	2671	1175	1175	734
DDD	0.625**	0.650**	0.699**	-0.251	0.0636	-0.272	-0.483	0.152	-0.0154
	(0.258)	(0.283)	(0.316)	(0.391)	(0.416)	(0.488)	(0.596)	(0.544)	(0.630)
Observations	8251	8251	8251	4711	4711	4711	2783	2783	2783
Eligible	2007	2007	2007	2008	2008	2008	2009	2009	2009
FE	Yr	Loc, Yr	Loc-Yr	Yr	Loc, yr	Loc-yr	Yr	Loc, Yr	Loc-Yr

Data: ENIGH Survey (2004-2010)
Specification: Sample limited to households where head of household does not have access to formal social security and/or the oldest member of the household is ages 60 and 80 (triple differences in differences in differences, "DDD") or 70 years of age and older (double differences in differences, "DD"). Sample weighted with survey expansion weights weights. Dependent variable is household size (number of individuals of any age in the household).
Estimation: "Yr" refers to year FE; "Loc, Yr" refers year FE plus locality fixed effects, and "Loc-Yr" refers to locality-specific year fixed. The triple difference ("DDD") displays coefficient β_6 from estimating equation:
$Y_{islt} = \beta_0 + \beta_1 ELIGIBLE_i + \beta_2 COMMUNITY_l + \beta_3 ELIGIBLE \times POST_{it} + \beta_4 COMMUNITY \times POST_{lt} + \beta_5 ELIGIBLE \times COMMUNITY_{il} + \beta_6 ELIGIBLE \times COMMUNITY \times POST_{ilt} + \tau_t + \varepsilon_{ilt}$.
The double difference ("DD") displays coefficient β_2 from estimating equation: $Y_{ilt} = \beta_0 + \beta_1 COMMUNITY_l + \ldots$
$\ldots + \beta_2 COMMUNITY \times POST_{lt} + \tau_t + \varepsilon_{ilt}$. $ELIGIBLE$ is a dummy for a household that has at least one individual 70 years of age or older. $COMMUNITY$ is a dummy for being eligible in either 2007, 2008, or 2009 and $POST$ is a dummy for the post period (either post 2007, 2008, or 2009 depending on the locality). Columns (7), (8), and (9) pool estimates from localities eligible in 2007 and 2008. The double difference estimates with the locality-specific year fixed effect in columns (3), (6), (9), and (12) use variation across age for identification. The sample is limited to only eligible localities and the table displays coefficient β_2 from the following model:
$Y_{ilt} = \beta_0 + \beta_1 ELIGIBLE_i + \beta_2 ELIGIBLE \times POST_{it} + \tau_t + \varepsilon_{ilt}$. Heteroskedactic robust standard errors in parenthesis clustered at the locality type level.
$p < 0.10$ *, $p < 0.05$ **, $p < 0.01$ ***

Table 7.6: ENIGH - Marital Status: Estimates from FE Specifications

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
DD	0.00844	-0.0610	-0.0307	0.0513	-0.00802	0.0456	-0.0283	0.106	0.288
	(0.0680)	(0.110)	(0.0568)	(0.0756)	(0.0975)	(0.0906)	(0.159)	(0.246)	(0.180)
Observations	4646	4646	8008	2547	2547	3379	1448	1448	904
DDD	-0.0188	0.00808	0.00451	0.127	0.0962	0.0807	-0.0493	-0.00163	0.213
	(0.0767)	(0.0852)	(0.0934)	(0.0933)	(0.0998)	(0.115)	(0.192)	(0.242)	(0.199)
Observations	10535	10535	10535	5895	5895	5895	3430	3430	3430
Eligible	2007	2007	2007	2008	2008	2008	2009	2009	2009
FE	Yr	Loc, Yr	Loc-Yr	Yr	Loc-yr	Loc-yr	Yr	Loc, Yr	Loc-Yr

Data: ENIGH Survey (2004-2010)
Specification: Sample limited to households where head of household does not have access to formal social security and/or the oldest member of the household is between ages 60 and 69 and individual are also between ages 60 and 69, or between ages 70 and 80 (triple differences in differences in differences, "DDD") or one individual 70 years of age and older (double differences in differences, "DD"). Sample weighted with survey expansion weights weights. Dependent variable is whether individual is married or not.
Estimation: "Yr" refers to year FE; "Loc, Yr" refers year FE plus locality fixed effects, and "Loc-Yr" refers to locality-specific year fixed. The triple difference ("DDD") displays coefficient β_6 from estimating equation:
$Y_{islt} = \beta_0 + \beta_1 ELIGIBLE_i + \beta_2 COMMUNITY_l + \beta_3 ELIGIBLE \times POST_{it} + \beta_4 COMMUNITY \times POST_{lt} + \beta_5 ELIGIBLE \times COMMUNITY_{il} + \beta_6 ELIGIBLE \times COMMUNITY \times POST_{ilt} + \tau_t + \varepsilon_{ilt}$.
The double difference ("DD") displays coefficient β_2 from estimating equation: $Y_{ilt} = \beta_0 + \beta_1 COMMUNITY_l + \ldots$
$\ldots + \beta_2 COMMUNITY \times POST_{lt} + \tau_t + \varepsilon_{ilt}$. $ELIGIBLE$ is a dummy for a individuals 70 years of age or older. $COMMUNITY$ is a dummy for being eligible in either 2007, 2008, or 2009 and $POST$ is a dummy for the post period (either post 2007, 2008, or 2009 depending on the locality). Columns (7), (8), and (9) pool estimates from localities eligible in 2007 and 2008. The double difference estimates with the locality-specific year fixed effect in columns (3), (6), (9), and (12) use variation across age for identification. The sample is limited to only eligible localities and the table displays coefficient β_2 from the following model:
$Y_{ilt} = \beta_0 + \beta_1 ELIGIBLE_i + \beta_2 ELIGIBLE \times POST_{it} + \tau_t + \varepsilon_{ilt}$. Heteroskedactic robust standard errors in parenthesis clustered at the locality type level.
$p < 0.10$ *, $p < 0.05$ **, $p < 0.01$ ***

Table 7.7: ENIGH - Health Expenditure: Estimates from FE Specifications

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
DD	-0.0124	0.0186	0.0449	-0.0603	0.0190	0.00455	0.0440	-0.0246	0.0345	0.161	0.133	-0.0860
	(0.0494)	(0.0762)	(0.0508)	(0.140)	(0.144)	(0.0787)	(0.0532)	(0.0912)	(0.0461)	(0.153)	(0.162)	(0.0864)
Observations	4670	4555	8623	1177	1177	2783	4670	4555	8623	1177	1177	2783
DDD	0.0926	0.0778	0.108	0.0465	0.0948	-0.0871	0.0840	0.0894	0.117	0.246	0.221	0.0512
	(0.0665)	(0.0726)	(0.0884)	(0.171)	(0.219)	(0.225)	(0.0642)	(0.0713)	(0.0853)	(0.177)	(0.221)	(0.267)
Observations	10663	10663	10663	2783	2783	2783	10663	10663	10663	2783	2783	2783
Eligible	Pooled	Pooled	Pooled	2009	2009	2009	Pooled	Pooled	Pooled	2009	2009	2009
FE	Yr	Loc, Yr	Loc-Yr	Yr	Loc, Yr	Loc-Yr	Yr	Loc, Yr	Loc-Yr	Yr	Loc, Yr	Loc-Yr
Group	Health	Health	Health	Health	Health	Health	Rx	Rx	Rx	Rx	Rx	Rx

Data: ENIGH Survey (2004-2010)
Specification: Sample limited to households where head of household does not have access to formal social security and/or the oldest member of the household is ages 60 and 80 (triple differences in differences in differences, "DDD") or 70 years of age and older (double differences in differences, "DD"). Sample weighted with survey expansion weights weights. Dependent variable is any positive health spending across prescription drugs, hospitalizations, and primary care visits in columns (1)-(6) and any spending on prescription drugs in columns (7)-(12). Estimation: "Yr" refers to year FE; "Loc, Yr" refers year FE plus locality fixed effects, and "Loc-Yr" refers to locality-specific year fixed. The triple difference ("DDD") displays coefficient β_6 from estimating equation:
$Y_{islt} = \beta_0 + \beta_1 ELIGIBLE_i + \beta_2 COMMUNITY_l + \beta_3 ELIGIBLE \times POST_{it} + \beta_4 COMMUNITY \times POST_{lt} + \beta_5 ELIGIBLE \times COMMUNITY_{il} + \beta_6 ELIGIBLE \times COMMUNITY \times POST_{ilt} + \tau_t + \varepsilon_{ilt}$.
The double difference ("DD") displays coefficient β_2 from estimating equation: $Y_{ilt} = \beta_0 + \beta_1 COMMUNITY_l + \ldots$
$\ldots + \beta_2 COMMUNITY \times POST_{lt} + \tau_t + \varepsilon_{ilt}$. $ELIGIBLE$ is a dummy for a household that has at least one individual 70 years of age or older. $COMMUNITY$ is a dummy for being eligible in either 2007, 2008, or 2009 and $POST$ is a dummy for the post period (either post 2007, 2008, or 2009 depending on the locality). Columns (7), (8), and (9) pool estimates from localities eligible in 2007 and 2008. The double difference estimates with the locality-specific year fixed effect in columns (3), (6), (9), and (12) use variation across age for identification. The sample is limited to only eligible localities and the table displays coefficient β_2 from the following model:
$Y_{ilt} = \beta_0 + \beta_1 ELIGIBLE_i + \beta_2 ELIGIBLE \times POST_{it} + \tau_t + \varepsilon_{ilt}$. Heteroskedactic robust standard errors in parenthesis clustered at the locality type level.
$p < 0.10$ *, $p < 0.05$ **, $p < 0.01$ ***

Table 7.8: ENIGH - Savings and Other Expenditures: Estimates from FE Specifications

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
DD	0.0584	0.336	0.237**	0.218	0.179	0.0576	-0.0031	0.129*	0.0158	0.0097	0.0055	0.0004
	(0.166)	(0.266)	(0.0972)	(0.246)	(0.251)	(0.175)	(0.0520)	(0.0767)	(0.0360)	(0.126)	(0.136)	(0.0866)
Obs.	4659	4544	8610	1175	1175	2781	4670	4555	8623	1177	1177	2783
DDD	0.325	0.237	0.258	0.380	0.325	0.337	-0.0025	0.0295	-0.0106	-0.0079	0.105	0.0131
	(0.213)	(0.262)	(0.277)	(0.293)	(0.302)	(0.329)	(0.0779)	(0.0917)	(0.104)	(0.132)	(0.123)	(0.137)
Obs.	10649	10649	10649	2781	2781	2781	10663	10663	10663	2783	2783	2783
Eligible	Pooled	Pooled	Pooled	2009	2009	2009	Pooled	Pooled	Pooled	2009	2009	2009
FE	Yr	Loc, Yr	Loc-Yr	Yr	Loc, Yr	Loc-Yr	Yr	Loc, Yr	Loc-Yr	Yr	Loc, Yr	Loc-Yr
Group	Non-Food	Non-Food	Non-Food	Non-Food	Non-Food	Non-Food	Savings	Savings	Savings	Savings	Savings	Savings

Data: ENIGH Survey (2004-2010)
Specification: Sample limited to households where head of household does not have access to formal social security and/or the oldest member of the household is ages 60 and 80 (triple differences in differences in differences, "DDD") or 70 years of age and older (double differences in differences, "DD"). Sample weighted with survey expansion weights weights. Dependent variable is log of monthly per capita non food and non health expenditure in columns (1)-(6) and any savings in a formal or informal savings account in columns (7)-(12).
Estimation: "Yr" refers to year FE; "Loc, Yr" refers year FE plus locality fixed effects, and "Loc-Yr" refers to locality-specific year fixed.
The triple difference ("DDD") displays coefficient β_6 from estimating equation:
$Y_{islt} = \beta_0 + \beta_1 ELIGIBLE_i + \beta_2 COMMUNITY_l + \beta_3 ELIGIBLE \times POST_{it} + \beta_4 COMMUNITY \times POST_{lt} + \beta_5 ELIGIBLE \times COMMUNITY_{il} + \beta_6 ELIGIBLE \times COMMUNITY \times POST_{ilt} + \tau_t + \varepsilon_{ilt}$.
The double difference ("DD") displays coefficient β_2 from estimating equation: $Y_{ilt} = \beta_0 + \beta_1 COMMUNITY_l + \ldots$
$\ldots + \beta_2 COMMUNITY \times POST_{lt} + \tau_t + \varepsilon_{ilt}$. $ELIGIBLE$ is a dummy for a household that has at least one individual 70 years of age or older. $COMMUNITY$ is a dummy for being eligible in either 2007, 2008, or 2009 and $POST$ is a dummy for the post period (either post 2007, 2008, or 2009 depending on the locality). Columns (7), (8), and (9) pool estimates from localities eligible in 2007 and 2008. The double difference estimates with the locality-specific year fixed effect in columns (3), (6), (9), and (12) use variation across age for identification. The sample is limited to only eligible localities and the table displays coefficient β_2 from the following model:
$Y_{ilt} = \beta_0 + \beta_1 ELIGIBLE_i + \beta_2 ELIGIBLE \times POST_{it} + \tau_t + \varepsilon_{ilt}$. Heteroskedactic robust standard errors in parenthesis clustered at the locality type level.
$p < 0.10$ *, $p < 0.05$ **, $p < 0.01$ ***

Table 7.9: ENIGH - Sampled Locality Characteristics

	(1)	(2)	(3)	(4)	(5)
Age Eligible Sample					
Both Pre/Post Periods	6209.4**	-0.105***	0.114*	0.148*	0.337*
	(2770.4)	(0.0284)	(0.0634)	(0.0879)	(0.183)
Observations	209	4160	3106	11244	3891
Full Sample					
Both Pre/Post Periods	11757.1***	-0.000272	0.180***	0.236***	
	(1743.7)	(0.00860)	(0.0403)	(0.0489)	
Observations	2141	83952	26560	115134	
Variable	Pop	Work	Food Exp	Income	Age

Data: ENIGH Survey (2004-2006)
Specification: Age-eligible sample limited to households where head of household does not have access to formal social security and household roster contains at least one individual over age 70. Sample weighted with survey expansion weights in columns (2)-(5). Full sample includes all households in ENIGH surveys. Column (1) estimated at the locality level, columns (2)-(5) estimated at the household or individual level. Dependent variable for column (1) ("Pop") is locality population in 2005 census, used to determine eligibility for the pension program. Column (2) ("Work") includes whether the respondent was working and is estimated at the individual level. Column (3) is log per capita food consumption at the household level and column (4) is log per capita income (earned and unearned income) also at the household level. Column (5) is age and measured at the individual level.
Estimation: Table estimates come from the following equation for outcome Y:
$Y_{tl} = \delta_0 + \delta_1 BOTHPERIODS_l + \varepsilon_{tl}$ where $BOTHPERIODS_l$ is a dummy variable for localities included in both pre and post periods (localities with more than one observation in the 2004, 2005, or 2006 survey waves and more than one observation in the 2008 or 2010 survey waves as well). Heteroskedactic robust standard errors in parenthesis clustered at the locality level. + p < 0.10 * p < 0.05, ** p < 0.01, *** p <0.001

Chapter 8

Discussion

What are the effects of universal pension policies and can their impact be improved with more careful design? I tackle the first part of this question above and discuss the implication for design of non contributory pension policies and other government sponsored cash transfer programs in this chapter, drawing on evidence from programs around Latin America to fill in what I cannot evaluate experimentally with the data for "70 y Mas". The difference-in-difference analysis of vital statistics shows large increases in mortality consistent with income transfers from the "70 y Más" pension program leading to increased risk for circulatory disease-related deaths. The results are strongest among localities eligible earlier on in the program roll out that were more socioeconomically disadvantaged and had high rates of take up of the pension program. Inference is limited about the effect of the program in larger localities eligible in 2009: I estimate small changes in mortality, but lack precision due to small sample sizes. These localities are more economically developed and less marginalized. The income transfers from the program represented a smaller percentage of household income and formal pension take up (pensions provided by IMSS) may be higher and crowd out participation in the program (although up until 2012 even individuals in IMSS were eligible).

To compare the findings here to those available in similar studies, I convert the estimates into income-mortality elasticities. For localities eligible in 2007, we observe a 6.3 % increase in all cause mortality (estimate is from locality fixed effect model adjusted for controls) among localities where the transfer represented about 39% of household monthly per person income. This yields an elasticity of 0.16. For localities eligible in 2008, I observe a 4.6% increase in all cause mortality among households where the average cash transfer represents 38 % of monthly household income. This yields an elasticity of 0.12. The income-mortality elasticity among localities eligible in 2009 is 0.04 but statistically insignificant from zero.[1] The average across localities eligible for the program (weighted by share of population 70 and over from the 2005 Census) is 0.13 using the ITT estimates and 0.14 adjusting for incomplete take up in localities eligible in 2008 and 2009 reported by SEDESOL.

[1] I use the ITT estimate among 2009-eligible localities to calculate this elasticity, but this may be under-estimates if take up is low. Using the 47% take up rate to inflate our ITT estimate, we yield an elasticity of 0.08.

These positive income-mortality elasticities contrast with the limited extant research about (cash transfer) income and adult mortality from other countries like Russia, China, and Mexico's *Progresa/Oportunidades* program. These studies (Table 2.1) find cash transfers improve mortality outcomes and yield large, negative income-mortality elasticities. The authors cite changes in disability and chronic disease morbidity, healthcare utilization, and other health production inputs (e.g., diet/nutrition) for the decreases in mortality rates. These changes in mortality were driven mainly by circulatory and cardiovascular disease-related deaths. The differences in direction of effect between results presented here from the pension program and those in Table 2.1 may reflect underlying differences in population health as well as program design. For example, the conditionality of the transfers on various health investments may explain differences between results presented here and those in Barham and Rowberry (2013). [2] However, the increase in mortality in response to income is not peerless in the literature. My results echo findings from Snyder and Evans (2002) and Evans and Moore (2011, 2012): all three studies find large, positive income-mortality increases. [60] [27] [26]. Table 2 shows these estimates range from 0.20 to 0.60. My estimates of 0.13 (averaged over localities eligible in 2007-2009) falls below this range. [3]

To explain my results I focus on two explanatory pathways: changes in diet and food

[2]There are some key differences between *Progresa/Oportunidades* and "70 y Más" that may offer some explanation for the difference in effect size and direction. The pension program analyzed here included a larger, unconditional cash transfer: unlike *Progresa/Oportunidades* , the grant was not conditional on provider (primary care) visits or attendance at community level nutrition and health classes. Conditioning health seeking behavior and providing nutritional supplements to the household in conjunction with the cash transfer may have had a different effect than an unconditional, larger payment. A second difference between the programs is the benefits delivery schedule. Payments under *Progresa/Oportunidades* were paid monthly, while under "70 y Mas" the payments were made bimonthly, eg 1,000 MX$ every two months. Larger cash transfers paid less frequently may lead to particular changes in consumption and health behaviors relative to smaller payments paid more frequently. [63] [?]

[3]I make a fine but perhaps important distinction between Snyder and Evans (2002) and Evans and Moore (2011, 2012). Snyder and Evans's study is more in line with the one here, while the latter two test specifically for income effects on mortality in the immediate short run, looking at contemporaneous income "shocks" and spikes in mortality. This work is echoed in Sweden, where Andersson and co authors attribute a 20% increase in mortality risk upon income (pay check) receipt, largely driven by increased in cardiovascular/circulatory disease mortality among low income individuals. [8] These studies suggest a very short run mechanism that does not rely on long term physiological changes (for example: the consumption of heavy meals and subsequent, immediate risk of heart attack). Another short run risk factor or trigger commonly cited in the literature is alcohol consumption. Large cash payments especially may increase the consumption of "vice" goods like tobacco and alcohol. However, I observe very low consumption of both alcohol and tobacco among the age qualifying recipients in the ENIGH data, although this type of consumption may be underreported. Nonetheless, physiological changes in response to income do not need years to realize: evidence suggest that adverse changes to physical health can occur in a matter of weeks. Rekhopf et al (2014) show how biomarkers for chronic disease vary in the medium-short run with EITC receipt among a low income population in the United States. [50] Although not possible to test whether the changes I observe occur in the immediate short run of receiving the pension stipend or develop over weeks or months with the ENIGH data, it is certainly possible that the increase in consumption could correlate with *both* increases in immediate and acute "triggers" and long term exposures induced in part by changes in diet and retirement.

consumption and retirement transitions. Studies of cash transfers in Latin American provide considerable evidence that this additional income increases consumption, particularly of foods with poor nutritional content and high fat and sugar content, that associate with higher risk of chronic disease morbidity from factors like obesity, hypertension, and diabetes. The initial evaluation of the "70 y Más" program indeed showed increases in the prevalence of hypertension among participants eligible in 2007 coinciding with substantial changes in household consumption. I document similar trends using household expenditure data from Mexico for localities eligible in 2007 and 2008 and find large increases in the consumption food, particularly meat and dairy which can contain high fat and cholesterol. Literature from medical fields and public health suggests changes in health behaviors, particularly those around diet and consumption, affect risk for mortality not only in the long run, but in the very short run as well. While changes in body mass index and weight gain (both important risk factors for obesity, diabetes, high blood pressure, and cardiovascular disease mortality) in response to changes in diet may take months or years to manifest, there are also "acute" risk factors which trigger mortality over the span of weeks, days, or hours. Studies have noticed that heavy meals can significantly increase the risk of first time myocardial infarction and ischemic stroke within the a 24 hour time span. [44] [48] [37] Sugar in particular has received considerable attention for its role linking diet and chronic disease morbidity and mortality, increasing risk of obesity, diabetes, high blood pressure, and coronary heart disease. [31] [45] [21]

Some of the increases in consumption observed in the ENIGH survey lack definitive evidence regarding the magnitude or potential for adverse affects. The increase in calories, particular those from proteins, among food insecure populations or undernourished populations may improve health stock. Jensen and Richter (2004) hint at a such a pathway in their study of mortality among Russian pensioners, citing a decline in caloric intake and protein consumption following cuts in pension income that lead to a large increase in mortality. However, there's little evidence to suggest the "70 y Mas" eligible population is undernourished. The 70 and over population has high rates of overweight and obesity and a negligible underweight population. Further research making use of biomarkers and anthropometric measurements in surveys could be used to better understand how changes in consumption and diet might manifest themselves physiologically. For example, if such changes in consumption reflect an adverse health input, we may expect to see increases in blood pressure (as observed in the experimental data set) and body mass index.

There may be health consequences to retiring early, a hypothesis which has been increasingly explored since Snyder and Evans Social Security "notch" paper in 2004 suggested higher benefits lead to earlier retirement and increases in mortality in the United States. The estimates from research on retirement and health and retirement's effect on mortality more specifically (reviewed in Table 2.2 above) are certainly relevant for a pension program aiming to assist individuals in their transition out of the labor force at older ages, but also because the estimates from retirement literature yield changes of relatively large magnitude that in combination with the changes in consumption could help explain the estimates I observe. Despite the recent academic interest in retirement and health, the exact mechanisms linking old age labor marker transitions to mortality and morbidity are not well understood. Sociological perspectives suggest the break with routine and work relationships may have consequences for mental and physical health, but there are also physiological processes at work as well. For example, with the retirement transition can come more sedentary behavior, an important risk to metabolic processes protective against cardiovascular disease like hypertension and diabetes. [39] [25] On the other hand, retirement from physically strenuous and stressful jobs may be a positive shock to health production. While there is inconsistent evidence about the effect of retirement among high income countries, even less is known about the career trajectories of impoverished, old age populations in low and middle income countries. To the best of my knowledge, no study has tackles whether retirement in these settings may have an adverse or protective effect on health.

The results regarding consumption and labor supply suggest the increase in mortality could be related to household's inability to smooth consumption. The design of such programs, such as whether these benefits should be made conditional or distributed at a higher frequency in smaller amounts, is important to address in future research in that it may assist household smooth consumption and avoid adverse effects. Although I do not observe the exact timing of the transfer, it is possible that the increase in mortality is an immediate consequence of increases in consumption following large cash benefit payments as documented by Evans and Moore (2011, 2012) and Andersson et al (2015). [27] [26] [8] Andersson's study notes these mortality shocks around pay days were particularly acute for low income populations in blue collar occupations or with low educational attainment. These authors argue that instruments to smooth consumption for economically disadvantaged populations may help mitigate these patterns.

There is some evidence to suggests that changes to the program administration could improve health outcomes. Aguila, Arce, and Kapteyn (2016) examine the expansion of a similar pension program in one city in the Yucutan state in Mexico, where the distributed cash benefits at monthly intervals (rather than bimonthly as done with "70 y Mas"). They observe that households participating in the monthly program were more likely to have purchased healthcare and food when surveyed, relative to households that received the benefits every two months. [4] This finding echoes suggestions from studies mentioned in the previous paragraph regarding potential adverse consequences to inability to smooth consumption that could explain the contemporaneous correlation between income and mortality shocks surrounding "pay day".

The ability of eligible households to smooth consumption under "70 y Mas" may also provide some explanation for the cross country differences in the direction of the income-mortality "elasticity" we observe. In China for example, pension income appears to improve old age mortality outcomes in spite of a rising chronic disease burden among aging populations. However, old age populations in this context may have a higher marginal propensity to save the pension program income than in a setting like Mexico, so that they are better able to smooth consumption and avoid the consumption-mortality shocks that have been noted elsewhere in the literature. Dullemen (2015) reports the average household savings in China are around 30%, among the highest in OECD countries, and as such are much more able to smooth consumption. [46] This is accompanied by low household consumption, which reflects precautionary attitudes towards risk. [12] For households with older members, precautionary savings may be quite high in anticipation of costly health shocks. Baldacci cites that households with older individuals with chronic diseases are more likely to save (up to 20% higher savings) than those without. Moreover, evidence from health insurance expansion in Taiwan correlated with a decrease in savings for older individuals. Chinese households eligible for the New Rural Pension Scheme however were not reported to decrease their savings behavior in response to the pension program. [24] In contrast, I find the savings are quite low in ENIGH survey among "70 y Mas" eligible households and that this does not increase with the cash transfers.

There are additional factors that may explain differences across countries regarding income-mortality "elasticities." I discuss two here: changes in living arrangements and retirement behaviors. The evidence for change in retirement behaviors under the New Rural Pension Scheme in China is mixed. If individuals are less likely to retire in China (which may be true since the income transfer represented a smaller proportion of income) and if working at older ages is protective of health in this context (but not in others), this may help explain some of the cross country differences we observe. Ning et al (2016) find no change in the labor supply of pension eligible individuals, except a small and statistically insignificant change for individuals with chronic diseases. On the other hand, Shu (2015) finds quite large increases in retirement transitions and reduction in labor supply, either concentrated among women (increased retirement by 28 percentage points), or agricultural labor (both men and women report large reductions in hours of about 17 and 23 hours per week, respectively). If living arrangements arrangements are protective, differences in the income effect on living arrangements could also explain cross country differences and add to our understanding of the external validity of the program. China's rural pension program participants were more likely to live independently (about half of the sample in Cheng et al (2015) reported to live independently, versus 44 % in ENIGH survey) and this fraction increased following the rollout of the program, but was concentrated mainly among individuals who were wealthier, healthier, and better educated.

Changes in labor supply, savings, and consumption could explain differences between the results of "70 y Mas" and other programs - outside of China's New Rural Pension Scheme - as well. For example, these factors could help reconcile the findings with those from Barham and Rowberry's study of income and mortality under *Progresa/Oportunidades* program (2013) in addition to the differences in program administration I cite above (conditionality, schedule of payments, and benefit amount). With regard to living arrangements, the old age adults in their study by necessity had to be coresiding with children, if not also the children's parents. These extended family structures may have mitigated any adverse effects of the cash and older individuals would be less incentivized to move out of the household lest they lose the direct benefits of the program. Second, Angelucci et al report that rural households in *Progresa/Oportunidades* were more likely to save and less likely to consume the benefit, opting instead to reinvest the cash transfers into business endeavors and household micro enterprises.

Among the "70 y Mas" eligible households in ENIGH survey, most of the benefit was consumed and little was reinvested into household production, consistent with self reports of declining labor supply.In Chapter 7 I report that almost all of the cash transfer from "70 y Mas" seemed to go towards food consumption. Not only was the average payment a much higher percentage of income, but but this manifested with a major increase in caloric intake. Studies of labor supply distortion among *Progresa/Oportunidades* households often find little evidence of an effect, although mostly concentrated on working age eligible member of the household rather than those in old ages eligible for "70 y Mas." On one hand, the these older household member may retire via an income effect, but on the other they may continue to contribute towards household production, particularly if any childcare responsibilities are lessened due the schooling requirements.

The conditionality of transfers like those in *Progresa/Oportunidades* may also be important for explaining differences across studies within Mexico, but there is not strong evidence in the literature about the effect of conditionality for health behaviors related to adults. While some work has been devoted to understanding the effect of conditionality among adolescent population in Sub Saharan Africa and sexual/reproductive health, it is difficult to find research testing this program feature for an adult population similar to "70 y Mas". One study from Mexico examines conditionality of an in-kind transfer program targeted towards poor households. [10].[4] The author tests whether the condition to participate in community health groups had any positive effects on health. He finds that the conditionality mainly affected women in the household, reducing obesity and excess caloric intake. The program also had insignificant reductions in smoking behaviors. Aside from conditionality, might in kind transfers be better for adult health and minimize adverse affects? Leroy, studying the in kind component of the same program, finds the transfer helped increase caloric intake for individuals who are energy deprived, but also increased excess energy consumption among more food secure individuals. In contrast to the income effects on patterns of consumption I observe for "70 y Mas," the in kind transfers seemed to increase fruit and vegetable consumption just as much as animal product (meat/dairy) consumption. Thus in kind transfers, while carrying a heavy administrative burden (for example as part of the program studied by Leroy, the in kind transfer had to be trucked in to localities) may be more successful at encouraging health consumption than a simple unconditional cash transfer.

This study contributes broadly to work detailing a negative correlation between health (mortality) and economic wellbeing. Here I refer to work from Evans and Snyder (2004), Fernald, Hou, Gertler (2008), Rehkopf et al (2014), but also literature from Ruhm and coauthors (Ruhm 2000, Gerdtham & Ruhm 2006, Ruhm 2016) exploring the pro-cyclical relationship between mortality (particularly mortality related to cardiovascular and circulatory disease/-causes of death). Linking these studies to my own is the underlying hypothesis that when individuals have more income they are more likely to engage in some behavior associated with increased mortality. [52] [34] [53] Evidence from a low or middle income country like

[4] As part of the *Programa de Apoyo Alimentario* in 2003, households were given in kind transfers of rice, beans, fortified powdered milk, and other goods. For those households assigned to a conditional transfer (in kind or cash), members were required to attend nutrition classes.

Mexico is sparse about the relationship between macro level economic performance and mortality. Additionally, these studies of macro-level antecedents of mortality shocks have not focused on aging populations to my knowledge. [5]

More pragmatically, the results here provide concrete evidence about the effects of cash transfer programs in low income settings for a population of interest, and about noncontributory pension programs specifically, which are an increasingly common policy response to changing demographic patterns that have only recently received traction in academic literature. Universal income programs may also benefit from this line of research. Recent programs across the world have began experimenting with unconditional guaranteed income programs, from United States and Finland to Kenya. Recent evidence from Kenya examined the impact of the cash on health outcomes, but only among children, a population that has already received substantial attention in the literature. Further research on the effect of the program on *adult* outcomes would be helpful to understand the external validity of the results I depict here, particularly given the transfer is on average 100% of household income, around 3 times the amount under "70 y Mas."

Given the increase in mortality I observe attributable to the cash transfer program, should governments cease expansion of social welfare programs like noncontributory pensions, or ensure cash transfers programs are conditional? These conclusions carry some suggestions in this paper to extremes, and are not supported by evidence or theory. However, the results of this study do shed new light on economic and social determinants of health and the ways in which policies (like cash transfers) may potentially lead to adverse consequences. In the same study setting, observational evidence has shown that high incomes associate with increased morbidity (weight gain, obesity, hypertension), and more recent work has shown that there is evidence to interpret this as causal. Current research however has not determined how this affects mortality, particularly for old age populations, thus the evidence I present here forms the basis for relatively novel conclusions.

[5] I reiterate here that the results I attribute to participating in the "70 y Mas" program are robust to the potential confounding effect of the global recession which began in 2008-2009. Not only would these contradict what we often observe about the relationship between macro economic conditions and health albeit high income settings, but I take to care to establish that the increases in mortality we observe are unique to the age eligible population only.

Chapter 9

Conclusion

Using a differences-in-differences approach, I analyze the effects of a large cash transfer program on adult mortality outcomes by way of a universal pension targeting the poor. Contrary to the scant evidence from similar pension programs in low/middle income settings published recently, I find a moderate 5% average increase in mortality, driven by increases in circulatory and cardiovascular diseases, robust to several econometric specifications and time varying controls. These estimates yield positive income-mortality ”elasticities” around 0.12, which are not peerless in the literature. Studies from the United States have found income transfers associate positively with mortality and the elasticity I calculate falls at the lower range of those estimates. However, these results are the first from a low/middle income country to find such positive associations. Earlier work from another welfare program in Mexico found government income transfers improved mortality, and evidence from a similar pension program in China finds a large decrease in mortality.

I conjure the large increase in mortality observed within the sample population may be explained by changes in consumption and diet, a pattern well documented elsewhere in Mexico and Latin America, that could affect both short term, acute mortality risk as well as long term health behaviors, morbidity, and mortality. Ample evidence suggest cash transfers can lead to excessive caloric intake, as well as increases in hypertension and obesity. Additionally, retirement transitions may also explain the large change in mortality we observe immediately following the implementation of the program, although there is conflicting support in the literature for both the direction and magnitude of these effects. Further, we know little about retirement transitions in low middle income settings where large portions of the labor force work informally. Whether they are beneficial or harmful to health has not been well-studied.

The changes in consumption and diet, labor supply, and underlying patterns of diseases my help explain why the results of ”70 y Mas” differ from other countries. Individuals receiving the pension may spend money on high calorie, nutrient-poor food, retire into sedentary and isolate lifestyles, and already have high burden of chronic, cardiovascular diseases. Indeed, I note above the magnitude of the mortality increase was largest in states with high prevalence of hypertension, diabetes, and obesity. In other countries, individuals may continue to work, change living arrangements, or shift diet and calorie composition in other ways that are beneficial to health. Further, the high chronic disease burden in Mexico is not closely matched elsewhere. Other hypothesis not explored in depth there that could contribute to differences across countries or across welfare programs (eg, explaining the differences between my results and those from Barham and Rowberry's study of *Progresa/Oportunidades* (2013)) could be differences in propensity to save and smooth consumption. If the increases in mortality I observe represents a shock correlated with large and immediate changes in consumption, patterns of consumption smoothing could address concerns about external validity. Further, differences in benefit schedule, amount, and conditionality could also explain differences in the effect of income transfers on adult, old age mortality. These will be important directions for future research.

Future policy and impact evaluation should consider how the design of these programs can be improved to better address poverty, health, and wellbeing or low income populations. The noncontributory pension policy I evaluate here is increasingly popular in many low and middle income countries, particularly in Latin American, but elsewhere as well. Further, the conclusions of this research will be of interest to other cash welfare programs, such as universal income programs, which are gaining increasing traction among policy makers. Whether the results I find in Mexico apply outside of this setting is uncertain, and may depend on interactions between many of the factors mentioned above. This study also makes contributions to our understanding about health production: specifically, the relationship between income and health. Results presented here continue in line with other studies to suggest potentially adverse effects of income on health and mortality but are particularly remarkable because of the low-middle income settings. Despite the positive correlation seen observationally between income and health, whether policies aimed at increasing income map directly onto health improvements will be universally successful is unclear.

Chapter 10

Appendix: Tables and Figures

Table A1: Robustness to Dependent Variable Specification

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
All Cause Mortality									
Eligible X Post	0.0651**	0.0590	0.627	0.0472*	0.0586	0.504	0.0182	0.0432	0.360
	(0.0225)	(0.0491)	(0.356)	(0.0198)	(0.0345)	(0.271)	(0.0294)	(0.0559)	(0.358)
Circulatory Mortality									
Eligible X Post	0.145***	0.0669	0.633**	0.0896***	0.0600	0.450**	0.0146	0.0401	0.154
	(0.0339)	(0.0500)	(0.232)	(0.0238)	(0.0340)	(0.166)	(0.0339)	(0.0580)	(0.240)
Non Circulatory Mortality									
Eligible X Post	0.0312	0.0315	-0.00597	0.0209	0.0116	0.0539	0.0211	0.0385	0.206
	(0.0202)	(0.0503)	(0.263)	(0.0149)	(0.0371)	(0.178)	(0.0226)	(0.0573)	(0.242)
Eligible	2007	2007	2007	2008	2008	2008	2009	2009	2009
Specification	Log(MR)	Log(Deaths)	MR	Log(MR)	Log(Deaths)	MR	Log(MR)	Log(Deaths)	MR
Mean MR			21.24			15.73			14.63
Mean MR(Circ)			9.62			7.32			7.12
Mean MR(N.Circ)			11.62			8.41			7.51
ln(POP60) - All		0.75			0.80			0.97	
ln(POP60) - Circ		0.73			0.78			0.96	
ln(POP60) - N.Circ		0.71			0.74			0.94	

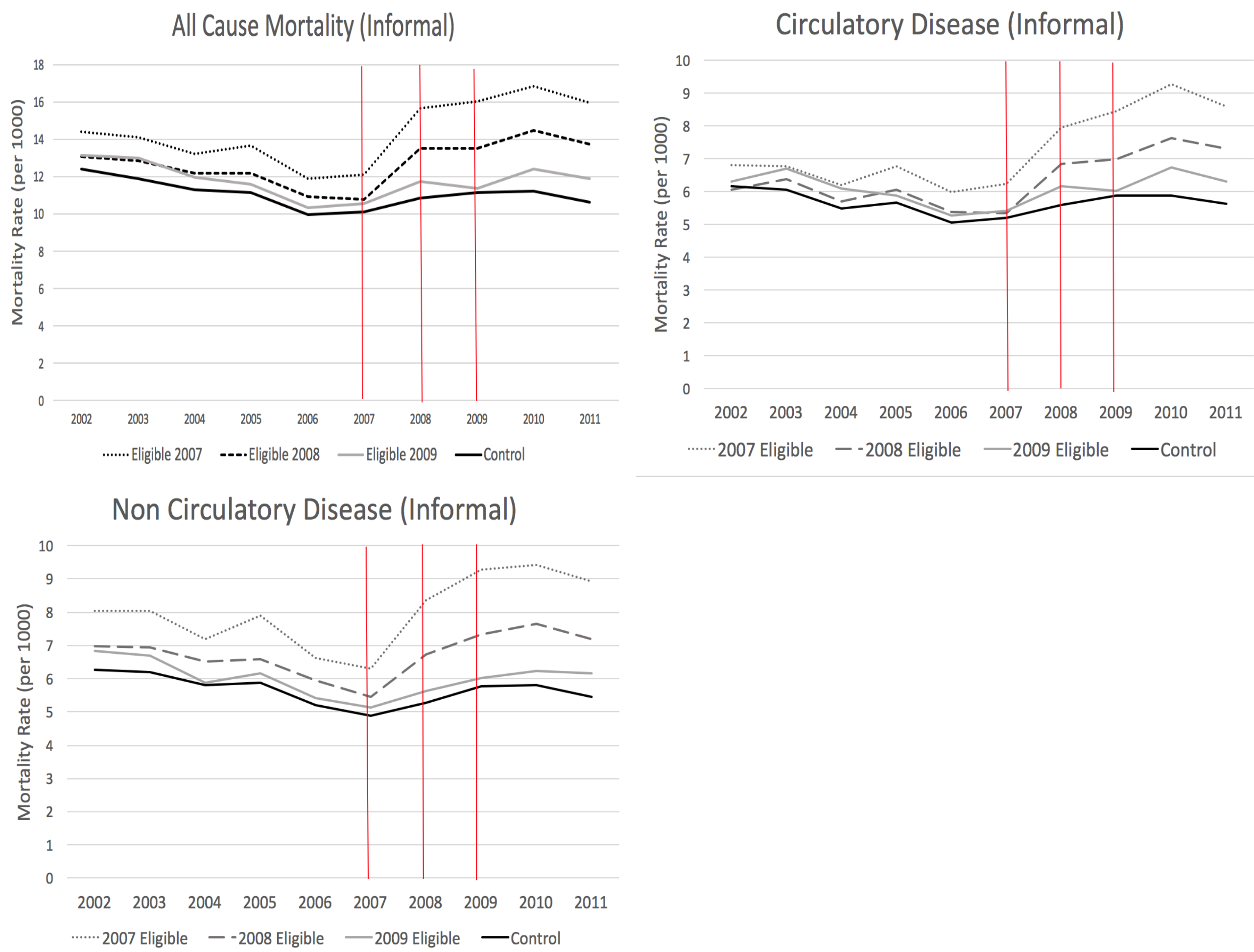
Data: INEGI Vital Statistics (2002-2011); INEGI Census Records (2005, 2010)

Specification: Sample is limited to those localities with good quality reporting scores. Mortality $\text{Rate}_{tl} = 1000 \times \frac{\text{Uninsured Deaths (Age 70+)}_{tl}}{\text{Pop. Age 60+}_{tl}}$ for locality l and year t. Uninsured defined as deceased with no insurance/social security or only *Seguro Popular*. Pop. Age $60+_{tl}$ interpolated between census round years using locality specific linear growth rate. $POST_{tl}$ is a dummy variable for either ≥ 2007, ≥ 2008, or ≥ 2009. $ELIGIBLE_{tl}$ is a dummy for being eligible for the pension program in 2007, 2008, or 2009, determined by 2005 Census locality population. For localities eligible in 2007, year 2006 omitted from estimation because of the introduction of the *Progresa/Oportunidades* pension.

Estimation: Averaged effect is estimated from the following equation. Models are weighted by the population 60 and over and standard errors are clustered at the locality level and heteroskedaktic robust. β_3 from: $Y_{tl} = \lambda_l + \beta_1 + \beta_2 POST_{tl} + \beta_3 POST_{tl} \times ELIGIBLE_l + \varepsilon_{tl}$

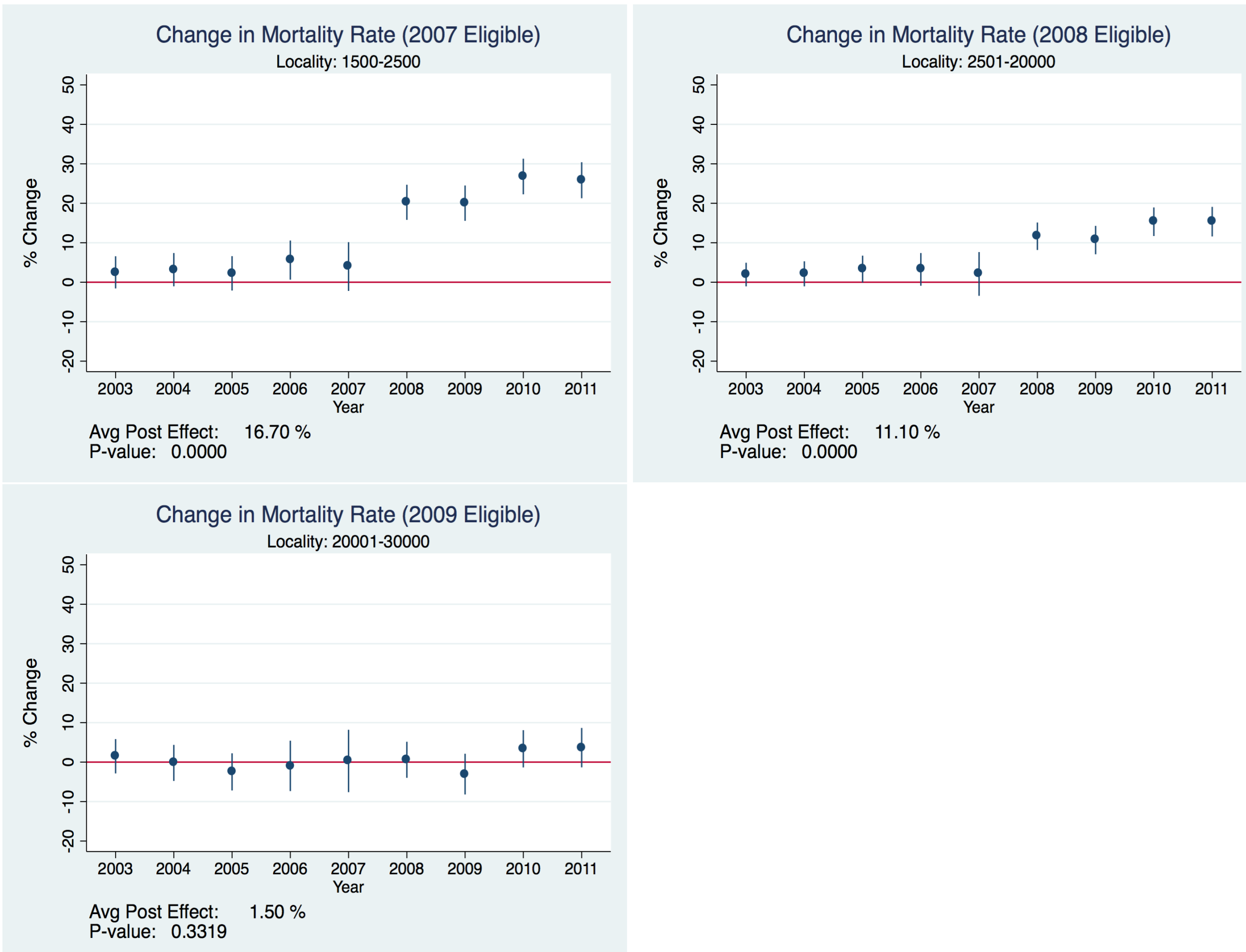
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Figure A1: Estimated Change in All Cause Mortality (Unadjusted for Reporting Incentives)



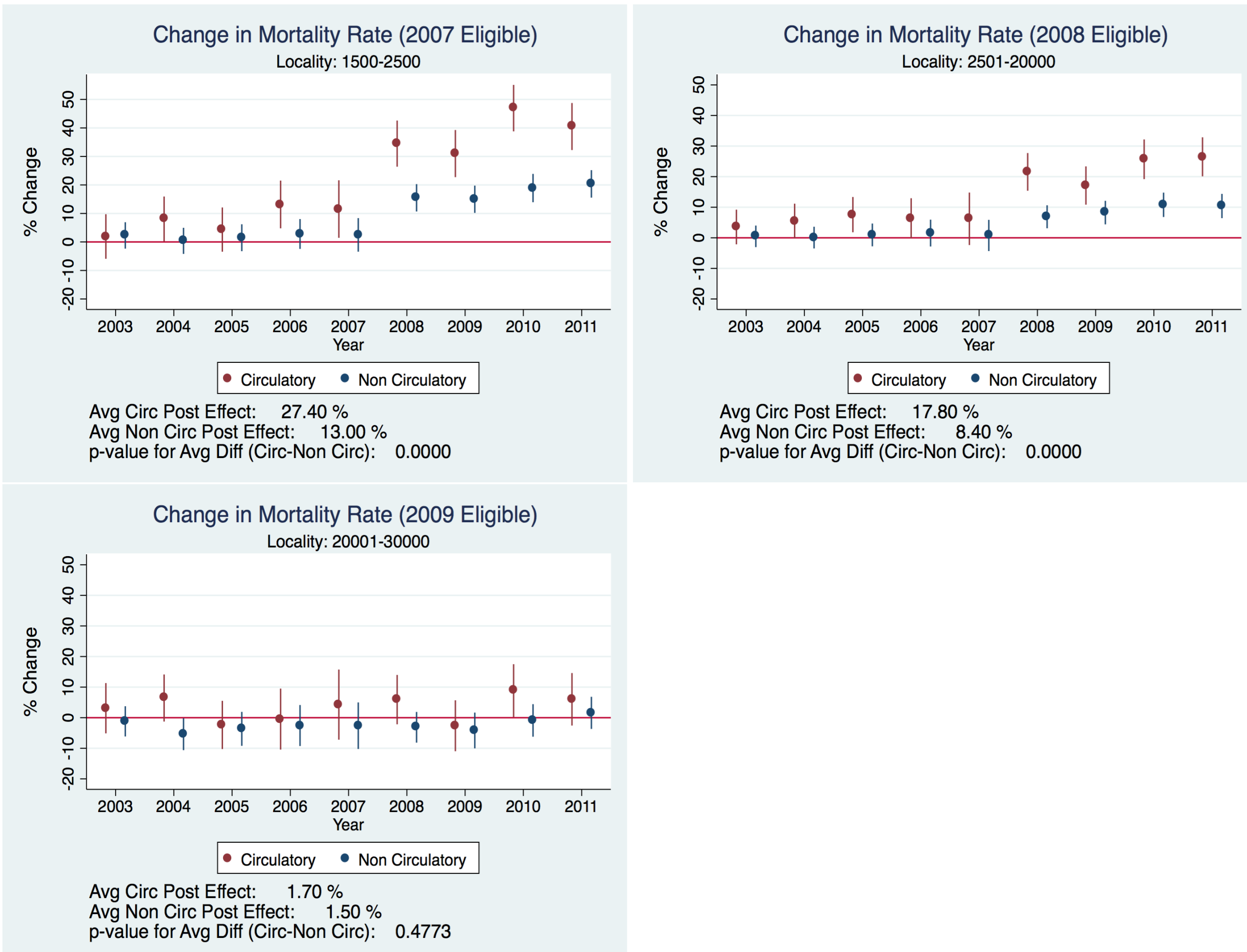
Data: INEGI Vital Statistics (2002-2011); INEGI Census Records (2005, 2010)
Specification: $MortalityRate_{tl} = 1000 \times \frac{\text{Uninsured Deaths (Age 70+)}_{tl}}{\text{Pop. Age 60+}_{tl}}$ for locality l and year t. Uninsured defined as deceased with no insurance/social security or only *Seguro Popular*. Pop. Age $60+_{tl}$ interpolated between census round years using locality specific linear growth rate. Eligible 2007 refers to localities with populations in the 2005 census between 1,500 and 2,500. Eligible 2008 refers to localities with populations in the 2005 census between 2,501 and 20,000. Eligible 2009 refers to localities with populations in the 2005 census between 20,001 and 30,000.

Figure A2: Estimated Change in All Cause Mortality (Unadjusted for Reporting Incentives)



Data: INEGI Vital Statistics (2002-2011); INEGI Census Records (2005, 2010)
Specification: Dependent variable is $log(MR_{tl})$. Mortality Rate$_{tl}$ =1000 $\times \frac{\text{Uninsured Deaths (Age 70+)}_{tl}}{\text{Pop. Age 60+}_{tl}}$ for locality l and year t. Uninsured defined as deceased with no insurance/social security or only *Seguro Popular*. Pop. Age 60+$_{tl}$ interpolated between census round years using locality specific linear growth rate. Estimation: Estimates are from the locality fixed effects equation specification. Point estimates and 95% confidence intervals are shown in the graph. Averaged effect (β_3) is estimated from $Y_{tl} = \lambda_l + \beta_1 + \beta_2 POST_{tl} + \beta_3 POST_{tl} \times ELIGIBLE_l + \varepsilon_{tl}$. Standard errors are clustered at the locality level and heteroskedactic robust. $POST_{tl}$ is a dummy variable for either $\geq$ 2007, $\geq$ 2008, or $\geq$ 2009. $ELIGIBLE_{tl}$ is a dummy for being eligible for the pension program in 2007, 2008, or 2009, determined by 2005 census locality population. For localities eligible in 2007, year 2006 omitted from estimation of averaged effect because of the introduction of the *Progresa/Oportunidades* pension in this year.

Figure A3: Estimated Change in All Cause Mortality (Unadjusted for Reporting Incentives)



Data: INEGI Vital Statistics (2002-2011); INEGI Census Records (2005, 2010)
Specification: Dependent variable is $log(MR_{tl})$. Mortality Rate$_{tl}$ =1000 $\times \frac{\text{Uninsured Deaths (Age 70+)}_{tl}}{\text{Pop. Age 60+}_{tl}}$ for locality l and year t. Uninsured defined as deceased with no insurance/social security or only *Seguro Popular*. Pop. Age 60+$_{tl}$ interpolated between census round years using locality specific linear growth rate.
Estimation: Estimates are from the locality fixed effects equation specification. Point estimates and 95% confidence intervals are shown in the graph. Averaged effect (β_3) is estimated from $Y_{tl} = \lambda_l + \beta_1 + \beta_2 POST_{tl} + \beta_3 POST_{tl} \times ELIGIBLE_l + X_{tl}\delta + \varepsilon_{tl}$. Standard errors are clustered at the locality level and heteroskedactic robust. $POST_{tl}$ is a dummy variable for either $\geq$ 2007, $\geq$ 2008, or $\geq$ 2009. $ELIGIBLE_{tl}$ is a dummy for being eligible for the pension program in 2007, 2008, or 2009, determined by 2005 census locality population. For localities eligible in 2007, year 2006 omitted from estimation of averaged effect because of the introduction of the *Progresa/Oportunidades* pension in this year.

Figure A4: Estimated Change in Non Circulatory Mortality (Eligible 2007 - Unadjusted for Reporting Incentives)

Data: INEGI Vital Statistics (2002-2011); INEGI Census Records (2005, 2010)
Specification: Dependent variable is $log(MR_{tl})$. Mortality Rate$_{tl}$ =1000 $\times \frac{\text{Uninsured Deaths (Age 70+)}_{tl}}{\text{Pop. Age 60+}_{tl}}$ for locality l and year t. Uninsured defined as deceased with no insurance/social security or only *Seguro Popular*. Pop. Age 60+$_{tl}$ interpolated between census round years using locality specific linear growth rate. Estimation: Estimates are from the locality fixed effects equation specification. Point estimates and 95% confidence intervals are shown in the graph. Averaged effect (β_3) is estimated from $Y_{tl} = \lambda_l + \beta_1 + \beta_2 POST_{tl} + \beta_3 POST_{tl} \times ELIGIBLE_l + X_{tl}\delta + \varepsilon_{tl}$. Standard errors are clustered at the locality level and heteroskedactic robust. $POST_{tl}$ is a dummy variable for either $\geq$ 2007, $\geq$ 2008, or $\geq$ 2009. $ELIGIBLE_{tl}$ is a dummy for being eligible for the pension program in 2007, 2008, or 2009, determined by 2005 census locality population. For localities eligible in 2007, year 2006 omitted from estimation of averaged effect because of the introduction of the *Progresa/Oportunidades* pension in this year.

Figure A5: Estimated Change in Non Circulatory Mortality (Eligible 2008 - Unadjusted for Reporting Incentives)

Data: INEGI Vital Statistics (2002-2011); INEGI Census Records (2005, 2010)
Specification: Dependent variable is $log(MR_{tl})$. Mortality Rate$_{tl}$ =1000 $\times \frac{\text{Uninsured Deaths (Age 70+)}_{tl}}{\text{Pop. Age 60+}_{tl}}$ for locality l and year t. Uninsured defined as deceased with no insurance/social security or only *Seguro Popular*. Pop. Age 60+$_{tl}$ interpolated between census round years using locality specific linear growth rate. Estimation: Estimates are from the locality fixed effects equation specification. Point estimates and 95% confidence intervals are shown in the graph. Averaged effect (β_3) is estimated from $Y_{tl} = \lambda_l + \beta_1 + \beta_2 POST_{tl} + \beta_3 POST_{tl} \times ELIGIBLE_l + X_{tl}\delta + \varepsilon_{tl}$. Standard errors are clustered at the locality level and heteroskedactic robust. $POST_{tl}$ is a dummy variable for either $\geq$ 2007, $\geq$ 2008, or $\geq$ 2009. $ELIGIBLE_{tl}$ is a dummy for being eligible for the pension program in 2007, 2008, or 2009, determined by 2005 census locality population. For localities eligible in 2007, year 2006 omitted from estimation of averaged effect because of the introduction of the *Progresa/Oportunidades* pension in this year.

Figure A6: Estimated Change in Non Circulatory Mortality (Eligible 2009 - Unadjusted for Reporting Incentives)

Data: INEGI Vital Statistics (2002-2011); INEGI Census Records (2005, 2010)
Specification: Dependent variable is $log(MR_{tl})$. Mortality Rate$_{tl}$ =1000 $\times \frac{\text{Uninsured Deaths (Age 70+)}_{tl}}{\text{Pop. Age 60+}_{tl}}$ for locality l and year t. Uninsured defined as deceased with no insurance/social security or only *Seguro Popular*. Pop. Age 60+$_{tl}$ interpolated between census round years using locality specific linear growth rate. Estimation: Estimates are from the locality fixed effects equation specification. Point estimates and 95% confidence intervals are shown in the graph. Averaged effect (β_3) is estimated from $Y_{tl} = \lambda_l + \beta_1 + \beta_2 POST_{tl} + \beta_3 POST_{tl} \times ELIGIBLE_l + X_{tl}\delta + \varepsilon_{tl}$. Standard errors are clustered at the locality level and heteroskedactic robust. $POST_{tl}$ is a dummy variable for either $\geq$ 2007, $\geq$ 2008, or $\geq$ 2009. $ELIGIBLE_{tl}$ is a dummy for being eligible for the pension program in 2007, 2008, or 2009, determined by 2005 census locality population. For localities eligible in 2007, year 2006 omitted from estimation of averaged effect because of the introduction of the *Progresa/Oportunidades* pension in this year.

Table A2: Estimates by Year: Eligible 2007 (No Covariate Adjustment)

	(1)	(2)	(3)	(4)	(5)	(6)
x2003	0.0397	0.00384	0.0116	-0.0551	0.0370	0.0164
	(0.0256)	(0.0345)	(0.0449)	(0.0691)	(0.0266)	(0.0453)
x2004	0.0466	0.00154	0.0748	0.0516	0.0169	-0.0507
	(0.0265)	(0.0356)	(0.0451)	(0.0712)	(0.0273)	(0.0455)
x2005	0.0385	0.00970	0.0401	-0.0637	0.0289	0.0299
	(0.0273)	(0.0355)	(0.0445)	(0.0739)	(0.0284)	(0.0447)
x2006	0.0732*	0.0426	0.131**	0.165*	0.0419	-0.0122
	(0.0297)	(0.0397)	(0.0483)	(0.0713)	(0.0294)	(0.0489)
x2007	0.0546	0.0409	0.109*	0.132	0.0389	0.00403
	(0.0357)	(0.0426)	(0.0556)	(0.0824)	(0.0336)	(0.0495)
x2008	0.215***	0.0598	0.338***	0.187**	0.166***	0.0169
	(0.0279)	(0.0363)	(0.0465)	(0.0687)	(0.0282)	(0.0462)
x2009	0.213***	0.0554	0.302***	0.101	0.163***	0.0510
	(0.0282)	(0.0362)	(0.0476)	(0.0734)	(0.0282)	(0.0442)
x2010	0.282***	0.0871*	0.462***	0.223**	0.203***	0.0396
	(0.0283)	(0.0370)	(0.0464)	(0.0693)	(0.0291)	(0.0487)
x2011	0.271***	0.0795	0.393***	0.194**	0.218***	0.0393
	(0.0289)	(0.0410)	(0.0479)	(0.0738)	(0.0283)	(0.0482)
Cause	All	All	Circ	Circ	Non Circ	Non Circ
Reporting Quality		X		X		X
FE	Loc	Loc	Loc	Loc	Loc	Loc

Data: INEGI Vital Statistics (2002-2011); INEGI Census Records (2005, 2010)
Specification: Estimating Equation listed on page 20. Dependent variable is $log(MR_{tl})$. Mortality $\text{Rate}_{tl} = 1000 \times \frac{\text{Uninsured Deaths (Age 70+)}_{tl}}{\text{Pop. Age 60+}_{tl}}$ for locality l and year t. Uninsured defined as deceased with no insurance/social security or only *Seguro Popular*. Pop. Age $60+_{tl}$ interpolated between census round years using locality specific linear growth rate. RQ refers to sample limited to localities with good reporting quality. Models are weighted by the population 60 and over and standard errors are clustered at the locality level and heteroskedaktic robust.
* p < 0.05, ** p < 0.01, *** p <0.001

Table A3: Estimates by Year: Eligible 2007 (No Covariate Adjustment)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
x2003	0.0155	0.0422	0.00833	-0.0611	0.0371	0.0688	0.00430	-0.0569
	(0.0369)	(0.0671)	(0.0414)	(0.0764)	(0.0421)	(0.0769)	(0.0460)	(0.0856)
x2004	0.0370	-0.0543	-0.00200	-0.0921	0.0301	0.0500	-0.00896	-0.0657
	(0.0333)	(0.0588)	(0.0410)	(0.0735)	(0.0410)	(0.0764)	(0.0451)	(0.0802)
x2005	0.0335	0.0163	0.0302	-0.00725	0.0802	0.202**	-0.0353	-0.111
	(0.0358)	(0.0644)	(0.0434)	(0.0765)	(0.0426)	(0.0767)	(0.0474)	(0.0854)
x2006	0.0180	-0.0141	0.0664	0.0651	0.0858*	0.0336	-0.0113	-0.0801
	(0.0362)	(0.0668)	(0.0410)	(0.0770)	(0.0420)	(0.0747)	(0.0474)	(0.0897)
x2007	0.0485	0.0152	0.0957*	0.0122	0.112*	0.0892	0.00821	-0.0250
	(0.0342)	(0.0624)	(0.0437)	(0.0761)	(0.0438)	(0.0769)	(0.0530)	(0.0893)
x2008	0.0740*	0.0347	0.117**	0.00332	0.151***	0.106	0.198***	0.00632
	(0.0331)	(0.0613)	(0.0416)	(0.0775)	(0.0433)	(0.0770)	(0.0472)	(0.0823)
x2009	0.0430	0.0195	0.156***	0.130	0.171***	0.125	0.143**	-0.0235
	(0.0391)	(0.0696)	(0.0427)	(0.0735)	(0.0418)	(0.0747)	(0.0462)	(0.0836)
x2010	0.0819*	0.00330	0.171***	0.0227	0.194***	0.185*	0.185***	-0.00964
	(0.0378)	(0.0681)	(0.0418)	(0.0757)	(0.0426)	(0.0803)	(0.0472)	(0.0904)
x2011	0.120**	0.0369	0.184***	0.0259	0.213***	0.189*	0.210***	-0.00169
	(0.0378)	(0.0703)	(0.0420)	(0.0786)	(0.0419)	(0.0768)	(0.0474)	(0.0913)
Cause	Inf/Acc	Inf/Acc	Resp	Resp	Cancer	Cancer	Other	Other
Reporting Quality		X		X		X		X
FE	Loc	Loc	Loc	Loc	Loc	Loc	Loc	Loc

Data: INEGI Vital Statistics (2002-2011); INEGI Census Records (2005, 2010)

Specification: Estimating Equation listed on page 20. Dependent variable is $log(MR_{tl})$. Mortality Rate$_{tl}$ =1000 $\times \frac{\text{Uninsured Deaths (Age 70+)}_{tl}}{\text{Pop. Age 60+}_{tl}}$ for locality l and year t. Uninsured defined as deceased with no insurance/social security or only *Seguro Popular*. Pop. Age 60+$_{tl}$ interpolated between census round years using locality specific linear growth rate. RQ refers to sample limited to localities with good reporting quality. Models are weighted by the population 60 and over and standard errors are clustered at the locality level and heteroskedaktic robust.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A4: Estimates by Year: Eligible 2007 (Covariates Adjusted)

	(1)	(2)	(3)	(4)	(5)	(6)
x2003	0.0227	-0.0181	0.0164	-0.0148	0.0115	-0.0324
	(0.0401)	(0.0404)	(0.0454)	(0.0716)	(0.0260)	(0.0438)
x2004	0.0396	-0.00375	0.0876	0.123	-0.0109	-0.106*
	(0.0465)	(0.0465)	(0.0499)	(0.0776)	(0.0282)	(0.0465)
x2005	0.0167	0.0108	0.0573	0.0254	0.000655	-0.0381
	(0.0526)	(0.0535)	(0.0547)	(0.0877)	(0.0324)	(0.0511)
x2006	0.0734	0.0723	0.144*	0.264**	0.00933	-0.0840
	(0.0576)	(0.0620)	(0.0592)	(0.0893)	(0.0360)	(0.0568)
x2007	0.0553	0.0885	0.147*	0.267**	0.00958	-0.0780
	(0.0688)	(0.0707)	(0.0677)	(0.0996)	(0.0404)	(0.0585)
x2008	0.339***	0.108	0.382***	0.338***	0.143***	-0.0508
	(0.0610)	(0.0636)	(0.0654)	(0.0986)	(0.0386)	(0.0607)
x2009	0.351***	0.108	0.354***	0.261*	0.144**	-0.0273
	(0.0747)	(0.0805)	(0.0803)	(0.124)	(0.0470)	(0.0737)
x2010	0.500***	0.153	0.567***	0.459***	0.195***	-0.0744
	(0.0860)	(0.0890)	(0.0901)	(0.134)	(0.0527)	(0.0838)
x2011	0.477***	0.155	0.483***	0.394**	0.209***	-0.0608
	(0.0848)	(0.0917)	(0.0905)	(0.137)	(0.0517)	(0.0830)
Cause	All	All	Circ	Circ	Non Circ	Non Circ
Reporting Quality		X		X		X
FE	Loc	Loc	Loc	Loc	Loc	Loc

Data: INEGI Vital Statistics (2002-2011); INEGI Census Records (2005, 2010)
Specification: Estimating Equation listed on page 20. Dependent variable is $log(MR_{tl})$. Mortality Rate$_{tl}$ =1000 $\times \frac{\text{Uninsured Deaths (Age 70+)}_{tl}}{\text{Pop. Age 60+}_{tl}}$ for locality l and year t. Uninsured defined as deceased with no insurance/social security or only *Seguro Popular*. Pop. Age 60+$_{tl}$ interpolated between census round years using locality specific linear growth rate. RQ refers to sample limited to localities with good reporting quality. Models are weighted by the population 60 and over and standard errors are clustered at the locality level and heteroskedaktic robust.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A5: Estimates by Year: Eligible 2007 (Covariates Adjusted)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
x2003	0.0325	0.0632	-0.00442	-0.116	0.0529	0.106	-0.0380	-0.141
	(0.0397)	(0.0705)	(0.0432)	(0.0786)	(0.0453)	(0.0806)	(0.0455)	(0.0824)
x2004	0.0693	-0.0141	-0.0313	-0.154	0.0527	0.0830	-0.0550	-0.177*
	(0.0399)	(0.0671)	(0.0452)	(0.0803)	(0.0469)	(0.0850)	(0.0465)	(0.0807)
x2005	0.0773	0.0650	-0.0135	-0.104	0.115*	0.244**	-0.0936	-0.254**
	(0.0463)	(0.0816)	(0.0512)	(0.0891)	(0.0521)	(0.0934)	(0.0552)	(0.0940)
x2006	0.0592	0.0290	0.0241	-0.0110	0.130*	0.0680	-0.0777	-0.235*
	(0.0470)	(0.0845)	(0.0524)	(0.0959)	(0.0546)	(0.0946)	(0.0598)	(0.102)
x2007	0.0944*	0.0356	0.0526	-0.106	0.163**	0.150	-0.0545	-0.182
	(0.0474)	(0.0836)	(0.0568)	(0.0973)	(0.0563)	(0.0971)	(0.0660)	(0.102)
x2008	0.131*	0.0726	0.0771	-0.0672	0.219***	0.183	0.132*	-0.163
	(0.0513)	(0.0900)	(0.0570)	(0.103)	(0.0589)	(0.104)	(0.0655)	(0.109)
x2009	0.105	0.0415	0.0964	0.0258	0.270***	0.208	0.0726	-0.225
	(0.0672)	(0.121)	(0.0744)	(0.126)	(0.0687)	(0.121)	(0.0769)	(0.132)
x2010	0.147*	-0.0128	0.114	-0.138	0.314***	0.276*	0.120	-0.256
	(0.0729)	(0.129)	(0.0809)	(0.140)	(0.0778)	(0.140)	(0.0871)	(0.152)
x2011	0.190*	0.0274	0.127	-0.104	0.349***	0.281*	0.138	-0.205
	(0.0744)	(0.134)	(0.0811)	(0.142)	(0.0778)	(0.139)	(0.0864)	(0.150)
Cause	Inf/Acc	Inf/Acc	Resp	Resp	Cancer	Cancer	Other	Other
Repoting Quality		X		X		X		X
FE	Loc	Loc	Loc	Loc	Loc	Loc	Loc	Loc

Data: INEGI Vital Statistics (2002-2011); INEGI Census Records (2005, 2010)
Specification: Estimating Equation listed on page 20. Dependent variable is $log(MR_{tl})$. Mortality $\text{Rate}_{tl} = 1000 \times \frac{\text{Uninsured Deaths (Age 70+)}_{tl}}{\text{Pop. Age 60+}_{tl}}$ for locality l and year t. Uninsured defined as deceased with no insurance/social security or only *Seguro Popular*. Pop. Age $60+_{tl}$ interpolated between census round years using locality specific linear growth rate. RQ refers to sample limited to localities with good reporting quality. Models are weighted by the population 60 and over and standard errors are clustered at the locality level and heteroskedaktic robust.
* p < 0.05, ** p < 0.01, *** p <0.001

Table A6: Estimates by Year: Eligible 2008 (No Covariate Adjustment)

	(1)	(2)	(3)	(4)	(5)	(6)
x2003	0.0844**	0.0559	0.0672	0.0693	0.0681*	0.0361
	(0.0317)	(0.0301)	(0.0457)	(0.0480)	(0.0304)	(0.0298)
x2004	0.0841**	0.0484	0.0869*	0.0805	0.0610	0.0198
	(0.0311)	(0.0313)	(0.0407)	(0.0466)	(0.0314)	(0.0306)
x2005	0.0971**	0.0599	0.107*	0.0809	0.0715*	0.0439
	(0.0317)	(0.0319)	(0.0433)	(0.0483)	(0.0323)	(0.0309)
x2006	0.0990**	0.0641	0.0993*	0.0842	0.0796*	0.0472
	(0.0322)	(0.0351)	(0.0421)	(0.0505)	(0.0323)	(0.0348)
x2007	0.0848*	0.0589	0.0932	0.105	0.0702*	0.0366
	(0.0358)	(0.0378)	(0.0494)	(0.0582)	(0.0347)	(0.0342)
x2008	0.179***	0.0838**	0.245***	0.182***	0.131***	0.0323
	(0.0316)	(0.0311)	(0.0439)	(0.0454)	(0.0317)	(0.0320)
x2009	0.170***	0.0700*	0.202***	0.106*	0.144***	0.0536
	(0.0332)	(0.0347)	(0.0459)	(0.0532)	(0.0331)	(0.0330)
x2010	0.218***	0.122***	0.288***	0.210***	0.172***	0.0787*
	(0.0338)	(0.0329)	(0.0461)	(0.0501)	(0.0342)	(0.0333)
x2011	0.216***	0.126***	0.293***	0.227***	0.167***	0.0679
	(0.0334)	(0.0380)	(0.0452)	(0.0557)	(0.0333)	(0.0362)
Cause	All	All	Circ	Circ	Non Circ	Non Circ
Reporting Quality		X		X		X
FE	Loc	Loc	Loc	Loc	Loc	Loc

Data: INEGI Vital Statistics (2002-2011); INEGI Census Records (2005, 2010)
Specification: Estimating Equation listed on page 20. Dependent variable is $log(MR_{tl})$. Mortality Rate$_{tl}$ $=1000 \times \frac{\text{Uninsured Deaths (Age 70+)}_{tl}}{\text{Pop. Age 60+}_{tl}}$ for locality l and year t. Uninsured defined as deceased with no insurance/social security or only *Seguro Popular*. Pop. Age 60+$_{tl}$ interpolated between census round years using locality specific linear growth rate. RQ refers to sample limited to localities with good reporting quality. Models are weighted by the population 60 and over and standard errors are clustered at the locality level and heteroskedaktic robust.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A7: Estimates by Year: Eligible 2008 (No Covariate Adjustment)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
x2003	0.0561	0.0264	0.0210	0.0507	0.0611	0.0529	0.0116	-0.0337
	(0.0329)	(0.0466)	(0.0376)	(0.0493)	(0.0424)	(0.0539)	(0.0404)	(0.0459)
x2004	0.0541	-0.00216	0.0186	-0.000559	0.0630	0.0668	0.0300	-0.00374
	(0.0306)	(0.0407)	(0.0411)	(0.0507)	(0.0406)	(0.0516)	(0.0400)	(0.0444)
x2005	0.0671*	0.0405	-0.0222	-0.00469	0.114**	0.0891	0.0466	0.0250
	(0.0312)	(0.0446)	(0.0426)	(0.0524)	(0.0431)	(0.0504)	(0.0437)	(0.0494)
x2006	0.0577	0.0414	0.0125	0.0179	0.102*	0.0759	0.0629	0.0339
	(0.0316)	(0.0465)	(0.0390)	(0.0523)	(0.0398)	(0.0504)	(0.0435)	(0.0533)
x2007	0.0406	-0.00223	0.0335	0.0159	0.105*	0.0753	0.0728	0.0610
	(0.0294)	(0.0430)	(0.0392)	(0.0524)	(0.0430)	(0.0550)	(0.0473)	(0.0516)
x2008	0.0928**	0.0513	0.0531	-0.0108	0.129**	0.0518	0.145***	0.0336
	(0.0321)	(0.0432)	(0.0373)	(0.0503)	(0.0420)	(0.0543)	(0.0421)	(0.0486)
x2009	0.121***	0.0921	0.0895*	0.0600	0.142***	0.0842	0.127**	-0.00707
	(0.0363)	(0.0519)	(0.0374)	(0.0477)	(0.0410)	(0.0527)	(0.0436)	(0.0511)
x2010	0.130***	0.0673	0.0941*	0.0676	0.178***	0.121*	0.172***	0.0627
	(0.0348)	(0.0468)	(0.0402)	(0.0497)	(0.0423)	(0.0553)	(0.0440)	(0.0511)
x2011	0.110**	0.0314	0.102**	0.0614	0.192***	0.134*	0.166***	0.0650
	(0.0340)	(0.0491)	(0.0393)	(0.0562)	(0.0421)	(0.0563)	(0.0435)	(0.0566)
Cause	Inf/Acc	Inf/Acc	Resp	Resp	Cancer	Cancer	Other	Other
Reporting Quality		X		X		X		X
FE	Loc	Loc	Loc	Loc	Loc	Loc	Loc	Loc

Data: INEGI Vital Statistics (2002-2011); INEGI Census Records (2005, 2010)
Specification: Estimating Equation listed on page 20. Dependent variable is $log(MR_{tl})$. Mortality Rate$_{tl}$ $=1000 \times \frac{\text{Uninsured Deaths (Age 70+)}_{tl}}{\text{Pop. Age 60+}_{tl}}$ for locality l and year t. Uninsured defined as deceased with no insurance/social security or only *Seguro Popular*. Pop. Age 60+$_{tl}$ interpolated between census round years using locality specific linear growth rate. RQ refers to sample limited to localities with good reporting quality. Models are weighted by the population 60 and over and standard errors are clustered at the locality level and heteroskedaktic robust.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A8: Estimates by Year: Eligible 2008 (Covariates Adjusted)

	(1)	(2)	(3)	(4)	(5)	(6)
x2003	0.0162	0.0251	0.0236	0.0234	0.00765	0.0129
	(0.0292)	(0.0311)	(0.0347)	(0.0428)	(0.0200)	(0.0270)
x2004	0.0165	0.0155	0.0384	0.0378	0.00631	-0.00212
	(0.0366)	(0.0376)	(0.0393)	(0.0479)	(0.0229)	(0.0302)
x2005	0.0323	0.0368	0.0496	0.0384	0.0181	0.0286
	(0.0418)	(0.0453)	(0.0444)	(0.0563)	(0.0268)	(0.0355)
x2006	0.0344	0.0506	0.0462	0.0562	0.0200	0.0254
	(0.0476)	(0.0535)	(0.0491)	(0.0606)	(0.0309)	(0.0413)
x2007	0.0251	0.0591	0.0517	0.0863	0.0190	0.0232
	(0.0600)	(0.0638)	(0.0588)	(0.0713)	(0.0354)	(0.0425)
x2008	0.186***	0.0932	0.214***	0.169*	0.0836**	0.0271
	(0.0499)	(0.0536)	(0.0548)	(0.0676)	(0.0323)	(0.0427)
x2009	0.167**	0.0825	0.164*	0.106	0.0992*	0.0500
	(0.0622)	(0.0698)	(0.0679)	(0.0880)	(0.0405)	(0.0545)
x2010	0.252***	0.155*	0.262***	0.245*	0.127**	0.0577
	(0.0746)	(0.0780)	(0.0788)	(0.0971)	(0.0460)	(0.0622)
x2011	0.255***	0.156	0.278***	0.256**	0.121**	0.0436
	(0.0739)	(0.0813)	(0.0789)	(0.0971)	(0.0457)	(0.0625)
Cause	All	All	Circ	Circ	Non Circ	Non Circ
Reporting Quality		X		X		X
FE	Loc	Loc	Loc	Loc	Loc	Loc

Data: INEGI Vital Statistics (2002-2011); INEGI Census Records (2005, 2010)
Specification: Estimating Equation listed on page 20. Dependent variable is $log(MR_{tl})$. Mortality Rate$_{tl}$ =1000 $\times \frac{\text{Uninsured Deaths (Age 70+)}_{tl}}{\text{Pop. Age 60+}_{tl}}$ for locality l and year t. Uninsured defined as deceased with no insurance/social security or only *Seguro Popular*. Pop. Age 60+$_{tl}$ interpolated between census round years using locality specific linear growth rate. RQ refers to sample limited to localities with good reporting quality. Models are weighted by the population 60 and over and standard errors are clustered at the locality level and heteroskedaktic robust.
* p < 0.05, ** p < 0.01, *** p <0.001

Table A9: Estimates by Year: Eligible 2008 (Covariates Adjusted)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
x2003	0.0649	0.0569	0.00967	0.0177	0.0222	0.0562	-0.0582	-0.0570
	(0.0368)	(0.0508)	(0.0368)	(0.0507)	(0.0403)	(0.0537)	(0.0362)	(0.0481)
x2004	0.0790*	0.0432	0.00416	-0.0217	0.0286	0.0504	-0.0323	-0.0273
	(0.0369)	(0.0493)	(0.0400)	(0.0547)	(0.0422)	(0.0582)	(0.0388)	(0.0506)
x2005	0.108*	0.107	-0.0311	-0.0299	0.0801	0.0935	-0.0237	-0.00325
	(0.0424)	(0.0607)	(0.0450)	(0.0604)	(0.0460)	(0.0628)	(0.0465)	(0.0592)
x2006	0.0965*	0.107	0.000959	-0.0112	0.0794	0.0873	-0.0247	-0.0121
	(0.0437)	(0.0620)	(0.0470)	(0.0660)	(0.0487)	(0.0663)	(0.0514)	(0.0680)
x2007	0.0923*	0.0669	0.0284	-0.00119	0.0839	0.0862	-0.00297	0.0286
	(0.0441)	(0.0628)	(0.0511)	(0.0679)	(0.0513)	(0.0676)	(0.0588)	(0.0708)
x2008	0.156***	0.131	0.0578	-0.0103	0.120*	0.0779	0.0631	0.00000190
	(0.0473)	(0.0673)	(0.0492)	(0.0693)	(0.0525)	(0.0713)	(0.0560)	(0.0706)
x2009	0.196**	0.173	0.106	0.0799	0.146*	0.107	0.0362	-0.0400
	(0.0619)	(0.0924)	(0.0663)	(0.0895)	(0.0595)	(0.0836)	(0.0662)	(0.0877)
x2010	0.213**	0.131	0.111	0.0635	0.182**	0.131	0.0811	0.0211
	(0.0680)	(0.101)	(0.0728)	(0.101)	(0.0698)	(0.104)	(0.0761)	(0.100)
x2011	0.194**	0.0901	0.121	0.0636	0.210**	0.145	0.0664	0.0157
	(0.0697)	(0.105)	(0.0734)	(0.104)	(0.0703)	(0.102)	(0.0761)	(0.104)
Cause	Inf/Acc	Inf/Acc	Resp	Resp	Cancer	Cancer	Other	Other
Reporting Quality		X		X		X		X
FE	Loc	Loc	Loc	Loc	Loc	Loc	Loc	Loc

Data: INEGI Vital Statistics (2002-2011); INEGI Census Records (2005, 2010)
Specification: Estimating Equation listed on page 20. Dependent variable is $log(MR_{tl})$. Mortality Rate$_{tl}$ =1000 $\times \frac{\text{Uninsured Deaths (Age 70+)}_{tl}}{\text{Pop. Age 60+}_{tl}}$ for locality l and year t. Uninsured defined as deceased with no insurance/social security or only *Seguro Popular*. Pop. Age 60+$_{tl}$ interpolated between census round years using locality specific linear growth rate. RQ refers to sample limited to localities with good reporting quality. Models are weighted by the population 60 and over and standard errors are clustered at the locality level and heteroskedaktic robust.
* p < 0.05, ** p < 0.01, *** p <0.001

Table A10: Estimates by Year: Eligible 2009 (No Covariate Adjustment)

	(1)	(2)	(3)	(4)	(5)	(6)
x2003	0.0625	0.0291	0.0797	0.0865	0.0353	-0.0134
	(0.0420)	(0.0376)	(0.0583)	(0.0597)	(0.0432)	(0.0394)
x2004	0.0425	0.0149	0.111*	0.0849	-0.00996	-0.0402
	(0.0410)	(0.0367)	(0.0538)	(0.0584)	(0.0427)	(0.0395)
x2005	0.0212	-0.00589	0.0235	-0.0124	0.00916	-0.0134
	(0.0372)	(0.0367)	(0.0505)	(0.0573)	(0.0396)	(0.0404)
x2006	0.0376	0.0342	0.0445	0.0546	0.0207	0.0130
	(0.0418)	(0.0463)	(0.0578)	(0.0664)	(0.0433)	(0.0487)
x2007	0.0494	-0.0243	0.0902	-0.0114	0.0205	-0.0419
	(0.0449)	(0.0444)	(0.0604)	(0.0669)	(0.0458)	(0.0472)
x2008	0.0534	0.0244	0.110*	0.0712	0.0149	-0.00836
	(0.0384)	(0.0366)	(0.0504)	(0.0524)	(0.0408)	(0.0417)
x2009	0.0176	-0.00992	0.0258	-0.00689	0.00447	-0.0211
	(0.0396)	(0.0443)	(0.0513)	(0.0654)	(0.0428)	(0.0470)
x2010	0.0810*	0.0634	0.135*	0.133*	0.0394	0.00938
	(0.0409)	(0.0373)	(0.0572)	(0.0617)	(0.0423)	(0.0385)
x2011	0.0853*	0.0590	0.111*	0.0705	0.0641	0.0477
	(0.0385)	(0.0401)	(0.0496)	(0.0636)	(0.0414)	(0.0425)
Cause	All	All	Circ	Circ	Non Circ	Non Circ
Reporting Quality		X		X		X
FE	Loc	Loc	Loc	Loc	Loc	Loc

Data: INEGI Vital Statistics (2002-2011); INEGI Census Records (2005, 2010)

Specification: Estimating Equation listed on page 20. Dependent variable is $log(MR_{tl})$. Mortality Rate$_{tl}$ =1000 $\times \frac{\text{Uninsured Deaths (Age 70+)}_{tl}}{\text{Pop. Age 60+}_{tl}}$ for locality l and year t. Uninsured defined as deceased with no insurance/social security or only *Seguro Popular*. Pop. Age 60+$_{tl}$ interpolated between census round years using locality specific linear growth rate. RQ refers to sample limited to localities with good reporting quality. Models are weighted by the population 60 and over and standard errors are clustered at the locality level and heteroskedaktic robust.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A11: Estimates by Year: Eligible 2009 (No Covariate Adjustment)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
x2003	-0.0196	-0.0505	0.0634	0.0324	0.0127	-0.0540	0.0387	-0.0205
	(0.0584)	(0.0668)	(0.0677)	(0.0717)	(0.0718)	(0.0829)	(0.0562)	(0.0656)
x2004	-0.0519	-0.117	0.0422	0.00288	0.0432	0.0447	-0.0899	-0.118
	(0.0568)	(0.0649)	(0.0658)	(0.0767)	(0.0716)	(0.0872)	(0.0627)	(0.0698)
x2005	-0.0291	-0.0828	0.0244	0.0343	0.107	0.0774	-0.0631	-0.0833
	(0.0557)	(0.0670)	(0.0716)	(0.0788)	(0.0615)	(0.0790)	(0.0683)	(0.0772)
x2006	-0.0581	-0.0745	0.0306	-0.0364	0.0982	0.154	-0.00818	-0.0111
	(0.0577)	(0.0758)	(0.0655)	(0.0827)	(0.0614)	(0.0820)	(0.0658)	(0.0813)
x2007	-0.0497	-0.0870	0.112	0.0338	0.0234	-0.0180	-0.00145	-0.0754
	(0.0524)	(0.0639)	(0.0714)	(0.0881)	(0.0658)	(0.0808)	(0.0704)	(0.0864)
x2008	0.0225	0.0151	0.0400	-0.0174	0.0231	-0.00259	-0.0285	-0.0279
	(0.0543)	(0.0620)	(0.0704)	(0.0827)	(0.0605)	(0.0763)	(0.0624)	(0.0727)
x2009	0.0153	0.0496	0.0682	0.0145	-0.0137	-0.0988	-0.0470	-0.0297
	(0.0609)	(0.0711)	(0.0717)	(0.0746)	(0.0616)	(0.0804)	(0.0636)	(0.0887)
x2010	-0.0265	-0.0543	0.0893	0.0107	0.0443	0.0389	0.00900	0.0133
	(0.0533)	(0.0657)	(0.0659)	(0.0788)	(0.0631)	(0.0746)	(0.0640)	(0.0701)
x2011	-0.00462	-0.0811	0.0779	0.00629	0.0948	0.121	0.0456	0.0733
	(0.0597)	(0.0763)	(0.0631)	(0.0790)	(0.0622)	(0.0826)	(0.0624)	(0.0873)
Cause	Inf/Acc	Inf/Acc	Resp	Resp	Cancer	Cancer	Other	Other
Reporting Quality		X		X		X		X
FE	Loc	Loc	Loc	Loc	Loc	Loc	Loc	Loc

Data: INEGI Vital Statistics (2002-2011); INEGI Census Records (2005, 2010)
Specification: Estimating Equation listed on page 20. Dependent variable is $log(MR_{tl})$. Mortality $\text{Rate}_{tl} = 1000 \times \frac{\text{Uninsured Deaths (Age 70+)}_{tl}}{\text{Pop. Age 60+}_{tl}}$ for locality l and year t. Uninsured defined as deceased with no insurance/social security or only *Seguro Popular*. Pop. Age $60+_{tl}$ interpolated between census round years using locality specific linear growth rate. RQ refers to sample limited to localities with good reporting quality. Models are weighted by the population 60 and over and standard errors are clustered at the locality level and heteroskedaktic robust.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A12: Estimates by Year: Eligible 2009 (Covariates Adjusted)

	(1)	(2)	(3)	(4)	(5)	(6)
x2003	0.0196	0.0119	0.0196	0.0507	0.00295	-0.0212
	(0.0382)	(0.0463)	(0.0480)	(0.0590)	(0.0278)	(0.0380)
x2004	-0.0105	-0.0145	0.0392	0.0380	-0.0380	-0.0467
	(0.0501)	(0.0576)	(0.0535)	(0.0654)	(0.0349)	(0.0460)
x2005	-0.0398	-0.0421	-0.0614	-0.0776	-0.0215	-0.0194
	(0.0555)	(0.0605)	(0.0583)	(0.0681)	(0.0397)	(0.0537)
x2006	-0.0288	0.00303	-0.0641	-0.0122	-0.00661	0.00608
	(0.0725)	(0.0922)	(0.0732)	(0.0909)	(0.0505)	(0.0701)
x2007	0.0283	-0.0936	0.0168	-0.0703	-0.00360	-0.0691
	(0.0882)	(0.112)	(0.0838)	(0.104)	(0.0556)	(0.0753)
x2008	0.0257	-0.00862	0.0185	-0.00747	0.00249	-0.000612
	(0.0667)	(0.0826)	(0.0692)	(0.0878)	(0.0463)	(0.0637)
x2009	-0.0517	-0.0764	-0.0935	-0.0833	-0.00973	-0.0223
	(0.0822)	(0.103)	(0.0888)	(0.113)	(0.0571)	(0.0790)
x2010	0.0717	0.0369	0.0397	0.0789	0.0347	0.00801
	(0.0985)	(0.116)	(0.107)	(0.126)	(0.0654)	(0.0920)
x2011	0.0629	0.0253	0.00796	0.000187	0.0595	0.0437
	(0.0997)	(0.124)	(0.106)	(0.133)	(0.0661)	(0.0975)
Cause	All	All	Circ	Circ	Non Circ	Non Circ
Reporting Quality		X		X		X
FE	Loc	Loc	Loc	Loc	Loc	Loc

Data: INEGI Vital Statistics (2002-2011); INEGI Census Records (2005, 2010)
Specification: Estimating Equation listed on page 20. Dependent variable is $log(MR_{tl})$. Mortality Rate$_{tl}$ =1000 $\times \frac{\text{Uninsured Deaths (Age 70+)}_{tl}}{\text{Pop. Age 60+}_{tl}}$ for locality l and year t. Uninsured defined as deceased with no insurance/social security or only *Seguro Popular*. Pop. Age 60+$_{tl}$ interpolated between census round years using locality specific linear growth rate. RQ refers to sample limited to localities with good reporting quality. Models are weighted by the population 60 and over and standard errors are clustered at the locality level and heteroskedaktic robust.
* p < 0.05, ** p < 0.01, *** p <0.001

Table A13: Estimates by Year: Eligible 2009 (Covariates Adjusted)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
x2003	-0.0284	-0.0362	0.0636	0.0432	-0.0358	-0.0750	0.00635	-0.0355
	(0.0592)	(0.0759)	(0.0611)	(0.0788)	(0.0643)	(0.0832)	(0.0518)	(0.0631)
x2004	-0.0452	-0.0933	0.0409	0.0375	-0.0176	-0.0165	-0.107	-0.125
	(0.0596)	(0.0791)	(0.0655)	(0.0870)	(0.0750)	(0.103)	(0.0625)	(0.0776)
x2005	0.000364	-0.0153	0.0213	0.0660	0.0451	0.0397	-0.0959	-0.121
	(0.0675)	(0.0898)	(0.0733)	(0.0978)	(0.0788)	(0.108)	(0.0701)	(0.0858)
x2006	-0.0230	-0.00341	0.0354	-0.00539	0.0596	0.127	-0.0473	-0.0556
	(0.0714)	(0.0993)	(0.0780)	(0.111)	(0.0833)	(0.116)	(0.0879)	(0.108)
x2007	0.000268	0.000826	0.111	0.0400	-0.00409	-0.0585	-0.0436	-0.169
	(0.0721)	(0.0994)	(0.0844)	(0.118)	(0.0898)	(0.129)	(0.0983)	(0.124)
x2008	0.0836	0.121	0.0585	0.0237	0.0291	0.0245	-0.0748	-0.0901
	(0.0766)	(0.104)	(0.0863)	(0.121)	(0.0871)	(0.117)	(0.0870)	(0.111)
x2009	0.118	0.190	0.0657	0.0442	0.00864	-0.0393	-0.104	-0.142
	(0.0974)	(0.134)	(0.105)	(0.145)	(0.109)	(0.149)	(0.106)	(0.137)
x2010	0.108	0.103	0.105	0.0349	0.116	0.150	-0.0808	-0.133
	(0.108)	(0.156)	(0.119)	(0.171)	(0.121)	(0.172)	(0.123)	(0.145)
x2011	0.133	0.101	0.101	0.0283	0.188	0.225	-0.0575	-0.0871
	(0.118)	(0.176)	(0.121)	(0.177)	(0.121)	(0.171)	(0.125)	(0.160)
Cause	Inf/Acc	Inf/Acc	Resp	Resp	Cancer	Cancer	Other	Other
Reporting Quality		X		X		X		X
FE	Loc	Loc	Loc	Loc	Loc	Loc	Loc	Loc

Data: INEGI Vital Statistics (2002-2011); INEGI Census Records (2005, 2010)

Specification: Estimating Equation listed on page 20. Dependent variable is $log(MR_{tl})$. Mortality $\text{Rate}_{tl} = 1000 \times \frac{\text{Uninsured Deaths (Age 70+)}_{tl}}{\text{Pop. Age 60+}_{tl}}$ for locality l and year t. Uninsured defined as deceased with no insurance/social security or only *Seguro Popular*. Pop. Age $60+_{tl}$ interpolated between census round years using locality specific linear growth rate. RQ refers to sample limited to localities with good reporting quality. Models are weighted by the population 60 and over and standard errors are clustered at the locality level and heteroskedaktic robust.

* p < 0.05, ** p < 0.01, *** p <0.001

Table A14: Changes in Vital Statistics Reporting

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Post	-0.257***	0.408	-0.0715***	-0.256***	0.503	-0.0709***	-0.266***	0.379	-0.0742***
	(0.0229)	(0.257)	(0.00649)	(0.0234)	(0.272)	(0.00659)	(0.0252)	(0.286)	(0.00711)
Post X Community	0.136***	-0.767**	0.0356***	0.0733**	-0.590*	0.0183*	0.0625	0.574	0.0203
	(0.0276)	(0.268)	(0.00785)	(0.0267)	(0.281)	(0.00752)	(0.0481)	(0.438)	(0.0135)
Constant	0.118***	5.714***	0.372***	0.246***	4.953***	0.405***	0.427***	4.393***	0.454***
	(0.00721)	(0.0369)	(0.00206)	(0.00484)	(0.0274)	(0.00138)	(0.00689)	(0.0652)	(0.00193)
Observations	21132	21132	21132	24123	24123	24123	2617	2617	2617
Eligible	2007	2007	2007	2008	2008	2008	2009	2009	2009
DV	Score	Lag	Medico	Score	Lag	Medico	Score	Lag	Medico
FE	Loc	Loc	Loc	Loc	Loc	Loc	Loc	Loc	Loc

Data: INEGI Vital Statistics (2002-2011)
Specification: Sample includes localities eligible in 2007, 2008, 2009, and control localities eligible in 2012. Dependent variable for columns (1), (4), and (7) are reporting score, the sum or normalized mean of percentage of death certificates signed by a doctor and lag time in days between date of death and date the death was registered (reverse coded). Dependent variable for columns (2), (5), and (8) ("Lag") is the number of days between date death is registered in the SEER system and date death occurs. Dependent variable for columns (3), (6), and (9) is the percentage of death certificates signed by a medical doctor. All variables are calculated for deaths of individuals 70 years of age and older.
Estimation: Difference in difference estimates β_2 are from the following model: $Y_{tl} = \lambda_l + \beta_1 POST_{tl} + \beta_2 POST \times COMMUNITY_{rl} + \varepsilon_{tl}$ where $POST_{tl}$ is dummy for the post period (either post 2007, post 2008, or post 2009) and community is a dummy for localities eligible for "70 y Mas" in either 2007, 2008, or 2009. Standard errors are clustered at the locality level and heteroskedaktic robust. * p < 0.05, ** p < 0.01, *** p <0.001

References

[1] Acemoglu, D., Finkelstein, A., and Notowidigdo, M. J. INCOME AND HEALTH SPENDING: EVIDENCE FROM OIL PRICE SHOCKS. *Review of Economics and Statistics 95*, 4 (2013), 1079–1095.

[2] Aguila, E., Borges, A., Kapteyn, A., Robles, R., and Weidmer, B. A Noncontributory Pension Program for Older Persons in Yucutan, Mexico. Tech. rep., 2014.

[3] Aguila, E., Díaz, C., Fu, M., Kapteyn, A., and Pierson, A. Living Longer in Mexico : Income Security and Health. Tech. rep., 2011.

[4] Aguila, E., Kapteyn, A., and Perez-arce, F. Consumption Smoothing and Frequency of Benefit Payments of Cash Transfer Programs. *American Economic Review: Papers and Proceedings* (2016).

[5] Aguila, E., Kapteyn, A., and Smith, J. P. Effects of income supplementation on health of the poor elderly: The case of Mexico. *PNAS 112*, 1 (2015).

[6] Amuedo-Dorantes, C., and Juarez, L. Old-Age Government Transfers and the Crowding Out of Private Gifts: The 70 and Above Program for the Rural Elderly in Mexico. 2013.

[7] Amuedo-Dorantes, C., and Juarez, L. Old-Age Government Transfers and the Crowding Out of Private Gifts: The 70 and Above Program for the Rural Elderly in Mexico. *Southern Economic Journal 81*, 3 (2015), 782–802.

[8] Andersson, E., Lundborg, P., and Vikström, J. Income receipt and mortality Evidence from Swedish public sector employees. *Journal of Public Economics 131* (2015), 21–32.

[9] Arroyave, I., Cardona, D., Burdorf, A., and Avendano, M. The impact of increasing health insurance coverage on disparities in mortality: Health care reform in Colombia, 1998-2007. *American Journal of Public Health 103*, 3 (2013), 100–106.

[10] Avitabile, C. Does Conditionality Matter for Adult Health? Evidence from a Randomized Experiment. 2010.

[11] Balan-Cohen, A. The Effect of Income on Elderly Mortality: Evidence from the Old Age Assistance Program in the United States. 2008.

[12] Baldacci, E., Callegari, G., Coady, D., Ding, D., Kumar, M., Tommasino, P., and Woo, J. Public Expenditures on Social Programs and Household Consumption in China. 2010.

[13] Barham, T., and Rowberry, J. Living longer: The effect of the Mexican conditional cash transfer program on elderly mortality. *Journal of Development Economics 105* (2013), 226–236.

[14] Barofsky, J. Universal Health Coverage for the Poor : A Cost-Benefit Analysis of Mexico ' s Seguro Popular. 2015.

[15] Barros, R. Wealthier but not much Healthier: Effects of a Health Insurance Program for the Poor in Mexico. 2008.

[16] Behrman, J. R., and Parker, S. W. Is Health of the Aging Improved by Conditional Cash Transfer Programs? Evidence From Mexico. *Demography 50*, 4 (2013), 1363–1386.

[17] Berniell, I., de la Mata, D., and Machado, M. P. The Impact of a Permanent Income Shock on the Situation of Women in the Household: the Case of a Pension Reform in Argentina. 2016.

[18] Bertrand, M., Duflo, E., and Mullainathan, S. How Much Should We Trust Differences-in-Differences Estimates? *The Quarterly Journal of Economics* (2004).

[19] Cameron, A. C., Gelbach, J. B., and Miller, D. L. Bootstrap-based improvements for inference with clustered errors. *Review of Economics and Statistics 90*, 3 (2008), 414–427.

[20] Cattaneo, M., Titiunik, R., and Vazquez-Bare, G. Power Calculations for Regression Discontinuity Designs. *The Stata Journal* (2017).

[21] Chen, L., Caballero, B., Mitchell, D. C., Loria, C., Lin, P.-h., Champagne, C. M., Elmer, P. J., Ard, J. D., Batch, B. C., Anderson, C. A. M., and Appel, L. J. Reducing Consumption of Sugar-Sweetened Beverages Is A Prospective Study Among United States Adults. *Circulation 121* (2010).

[22] Cheng, L., Liu, H., Zhang, Y., and Zhong, Z. The Health Implications of Social Pensions: The Health Implications of Social Pensions: Evidence from China's New Rural Pension Scheme. 2016.

[23] Cutler, D., Deaton, A., and Lleras-Muney, A. The Determinants of Mortality. *Journal of Economic Perspectives 20*, 3 (2006), 97–120.

[24] Dullemen, C. E. V., Nagel, I., and Bruijn, J. M. G. Are the Chinese Saving for Old Age ? *Journal of Population Ageing* (2016).

[25] Ekelund, U., Griffin, S., and Wareharm, N. Physical Activity and Metabolic Risk in Individuals With a Family History of Type 2. *Diabetes Care 30*, 2 (2007).

[26] Evans, W., and Moore, T. Liquidity, Economic Activity, and Mortality. *Review of Economics and Statistics 94*, May (2012), 400–418.

[27] Evans, W. N., and Moore, T. J. The Short-term Mortality Consequences of Income Receipt. *Journal of Public Economics 95*, 11-12 (2011), 1410–1424.

[28] Farahani, M., Subramanian, S., and Canning, D. Effects of State-Level Public Spending on Mortality in India. *Health Economics 19*, 11 (2010), 1300–1317.

[29] Fernald, L. C. H. Socio-economic status and body mass index in low-income Mexican adults. *Social Science and Medicine 64*, 10 (2007), 2030–2042.

[30] Fernald, L. C. H., Hou, X., and Gertler, P. J. Oportunidades program participation and body mass index, blood pressure, and self-reported health in Mexican adults. *Preventing Chronic Disease 5*, 3 (2008).

[31] Fung, T. T., Malik, V., Rexrode, K. M., Manson, J. E., Willett, W. C., and Hu, F. B. Sweetened beverage consumption and risk of coronary heart disease. *American Journal of Clinical Nutrition 89* (2009).

[32] Galiani, S., Gertler, P., and Bando, R. Non-contributory pensions. *Labour Economics 38* (2016), 47–58.

[33] Galiani, S., Gertler, P., and Bando, R. Non-contributory pensions. *Labor Economics 38* (2016), 47–58.

[34] Gerdtham, U. G., and Ruhm, C. J. Deaths rise in good economic times: Evidence from the OECD. *Economics and Human Biology 4*, 3 (2006), 298–316.

[35] Gracner, T. *Essays in Development and Health Economics*. PhD thesis, University of California, Berkeley, 2016.

[36] Grossman, M. On the Concept of Health Capital and the Demand for Health. *Journal of Political Economy 80*, 2 (1972).

[37] Guiraud, V., Ben Amor, M., Mas, J.-L., and Touze, E. Triggers of Ischemic Stroke: A Systematic Review. *Stroke 41* (2010).

[38] Hall, R., and Jones, C. The Value of Life and The Rise in Health Spending. *Quarterly Journal of Economics*, February (2007), 39–72.

[39] Hamilton, M. T., Hamilton, D. G., and Zderic, T. W. Role of Low Energy Expenditure and Sitting in Obesity, Metabolic Syndrome, Type 2 Diabetes, and Cardiovascular Disease. *Diabetes 56*, November (2007), 2655–2667.

[40] Jensen, R. T., and Richter, K. The health implications of social security failure: Evidence from the Russian pension crisis. *Journal of Public Economics 88*, 1-2 (2004), 209–236.

[41] Juárez, L., and Pfutze, T. The Effects of a Non-Contributory Pension Program on Labor Force Participation: The Case of 70 y Más in Mexico. *Economic Development and Cultural Change* (2015).

[42] Lakin, J. Mexico ' s Health System : More Comprehensive Reform Needed. *PLoS Medicine 6*, 8 (2009), 8–10.

[43] Leroy, J. L., Gadsden, P., González de Cossío, T., and Gertler, P. 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 Journal of Nutrition 143*, 3 (2013), 378–83.

[44] Lipovetzky, N., Hod, H., Roth, A., and Yehezkiel, K. Heavy Meals as a Trigger for a First Event of the Acute Coronary Syndrome: A Case-Crossover Study. *Isreali Medical Association Journal 6* (2004).

[45] Malik, V., Popkin, B., Bray, G., Depres, J., Willett, W., and Hu, F. B. Sugar-Sweetened Beverages and Risk of Metabolic Syndrome and Type 2 Diabetes. *Diabetes Care 33*, 11 (2010).

[46] Meng, X. Unemployment, Consumption Smoothing, and Precautionary Saving in Urban China. *Journal of Comparative Economics 31* (2003), 465–485.

[47] Moon, J. R., Glymour, M. M., Subramanian, S., Avendaño, M., and Kawachi, I. Transition to retirement and risk of cardiovascular disease: prospective analysis of the US health and retirement study. *Social Science & Medicine 75*, 3 (2012), 526–30.

[48] Nawrot, T. S., Perez, L., Künzli, N., Munters, E., and Nemery, B. Public health importance of triggers of myocardial infarction : a comparative risk assessment. *The Lancet 377*, 9767 (2011), 732–740.

[49] Pan-American Health Organization (PAHO). Mexico. In *Health in the Americas*. 2012, pp. 439–455.

[50] Rehkopf, D. H., Strully, K. W., and Dow, W. H. The short-term impacts of earned income tax credit disbursement on health. *International Journal of Epidemiology 43*, 6 (2014), 1884–1894.

[51] Rohwedder, S., and Willis, R. J. Mental Retirement. *Journal of Economic Perspectives 24*, 1 (2010), 119–138.

[52] Ruhm, C. Are Recessions Good for Your Health? *Quarterly Journal of Economics*, May (2000).

[53] Ruhm, C. Recessions , healthy no more ? *Journal of Health Economics 42* (2015), 17–28.

[54] Salinas-Rodriguez, A., Torres-Pereda, M. D. P., Manrique-Espinoza, B., Moreno-Tamayo, K., and Solis, M. M. T. R. Impact of the non-contributory social pension program 70 y mas on older adults' mental well-being. *PLoS ONE 9*, 11 (2014), 1–10.

[55] Salm, M. The Effect of Pensions on Longevity: Evidence from Union Army Veterans. *Economic Journal 121*, 552 (2011), 595–619.

[56] Schochet, P. Z. Statistical Power for Regression Discontinuity Designs. Tech. rep., National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education., 2008.

[57] Secretaría de Desarrollo Social (SEDESOL). Meta Evaluación 2007-2012 del Programa 70 y Más Informe Final Universidad Autónoma de Chiapas Centro Universidad-Empresa.

[58] Servan-Mori, E., Heredia-Pi, I., Monta, J., and Avila, L. Access to Medicines by Seguro Popular Beneficiaries: Pending Tasks towards Universal Health Coverage. *PLoS ONE 10*, 9 (2015), 1–13.

[59] Smith, K., and Goldman, N. Socioeconomic differences in health among older adults in Mexico. *Social Science & Medicine 65*, 7 (2007), 1372–85.

[60] Snyder, S., and Evans, W. The Impact of Income on Mortality: Evidence from the Social Security Notch. *National Bureau of Economic Research Working Paper Series No. 9197* (2002).

[61] Spenkuch, J. L. Moral hazard and selection among the poor: Evidence from a randomized. *Journal of Health Economics 31*, 1 (2012), 72–85.

[62] Stoian, A., and Fishback, P. Welfare spending and mortality rates for the elderly before the Social Security era. *Explorations in Economic History 47*, 1 (2010), 1–27.

[63] White, J. S., and Basu, S. Does the benefits schedule of cash assistance programs affect the purchase of temptation goods? Evidence from Peru. *Journal of Health Economics 46* (2016), 70–89.

[64] Whitlock, G., Lewington, S., Sherliker, P., Clarke, R., Emberson, J., Halsey, J., Qizilbash, N., Collins, R., and Peto, R. Body-mass Index and Cause-Specific Mortality in 900,000 Adults: Collaborative Analyses of 57 Prospective. *The Lancet 373* (2009), 1083–1096.

[65] Wong, R., and Alfredo, P. Aging in Mexico. In *International Handbook of Population Aging*. 2009, pp. 691–704.

[66] World Health Organization (WHO). Strengthening civil registration and vital statistics for births, deaths and causes of death. Tech. rep., 2013.

[67] Zunzunequi, M. V., Alvarado, B.-E., Beland, F., and Vizzandjee, B. Explaining health differences between men and women in later life: A cross-city comparison in Latin America and the Caribbean. *Social Science & Medicine 68*, 2 (2009), 235–242.