LONG TERM EFFECTS OF SOCIAL INSURANCE ON ADULT MORTALITY: EVIDENCE FROM THE PROGRESA PROGRAM IN MEXICO

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Abstract

Research on the mortality effects of income-support social insurance programs for older adults has generated conflicting results, but this work has primarily focused on short-run effects. We analyze the older adult mortality effects of Mexico's pathbreaking Progresa conditional cash transfer social insurance program. We employ difference-in-differences models that exploit the geographic variation in program expansion to estimate lagged effects from one to ten years after increased coverage, focusing on high poverty municipalities. We find that Progresa substantially reduced mortality in the short-run, particularly among females, with the largest effects after three years. All-cause mortality effects attenuated at increasing lag lengths, with no sustained benefit in ten-year lag models. Results varied by cause of death though, with long-term benefits of earlier cash transfers sustained for female diabetes mortality even after a ten-year lag.

Introduction

Research on the mortality effects of income-support social insurance programs for older adults has generated conflicting results. Some studies suggest important health benefits, others find no effects, and still others find unintended adverse effects potentially linked to pathways such as increased obesity. Furthermore, evidence has focused predominantly on short-run effects rather than net long-run mortality effects.

Mexico offers a unique opportunity for studying the long-run effects of social insurance programs on adult mortality. The *Progresa* conditional cash transfer (CCT) program began in 1997, was renamed as Oportunidades in 2001 under the Fox administration, and again renamed as Prospera in 2007 under the Calderon administration before recent program retrenchment in 2019 under the Lopez Obrador administration. Progresa has drawn considerable attention from researchers and policymakers (Levy and Schady, 2013), and has served as a model for similar programs in more than 60 countries (Baird et al., 2014; Fiszbein et al., 2009; Parker and Todd, 2017). There are numerous studies of the short-term health effects of Progresa (Gertler, 2004; Lagarde et al., 2009; Parker and Todd, 2017; Rivera-Hernandez et al., 2016), but little evidence on its long-term effects (Parker and Todd, 2017); furthermore, effects on the health of *older* adults has been particularly understudied (Behrman and Parker, 2013; Parker and Todd, 2017).

In this paper we analyze effects of Progresa for middle-age and older adults, by gender, estimating lagged effects from one to ten years after program expansion. Income-support programs could impact mortality through a variety of mechanisms. These include improved financial access to health care, in a context in which many recipients were uninsured in the early years when most program expansions occurred. Increased cash could also affect non-medical pathways such as food consumption, which could improve health among under-nourished older adults, but could also increase obesogenic food intake in a context marked by rapidly increasing obesity. Indeed, some evidence has found that Progresa participation improved adult obesity (Fernald et al., 2008b), while other evidence found that higher cumulative Progresa cash transfers led to worse adult obesity

(Fernald et al., 2008a). Given this conflicting evidence on mechanisms, and the potential for different short-run versus long-run effects on consumption behavior, evidence on the time-path of mortality impacts is particularly useful. We also estimate cause-specific mortality effects for major cause-of-death groups in order to further help understand mechanisms.

Progresa Background

Progresa began in small rural communities in 1997. Its key feature is monetary transfers to poor families. Some of these transfers are conditional on children attending school; others are conditional on family members visiting health clinics. *Progresa* grew quickly to cover six million families, one-fourth of all families in Mexico. The program expanded into urban areas, though remained largely rural, with two-thirds of its household beneficiaries living in communities with less than 2,500 inhabitants. The average family in *Progresa* received about MXN$800 (US$90.20 PPP) monthly, which increased household income by more than 25 percent for many poor households. The program is means-tested, with both geographic and household-level targeting. All grants are given to the female head of the family.

Data and Methodology

Data

To investigate the effects of Progresa on adult mortality, nationwide vital statistics data on adult deaths (1990-2018) were drawn from the Mexican National Institute of Statistics and Geography (INEGI). INEGI is the national statistical agency and responsible for population censuses, collection of vital statistics, and a host of national surveys. It derives mortality data from a certification system provided by the Mexican Ministry of Public Health. These data include the municipality where the decedent resided, which we use to link to population denominators and program variables. Population denominators were estimated from census data

(1990, 2000, 2005, 2010, 2020), which are also available in INEGI. We also used a municipality-level poverty index, the Margination Index, constructed by the Mexican Population Council (CONAPO) (1990, 1995, 2000, 2005, 2010, 2015, 2020). The Margination Index classified all Mexican municipalities into 5 categories ranging from very low poverty to very high poverty, based on variables such as proportion of households with dirt floors and individual socioeconomic indicators.[1] Our regression analyses focused on marginalized municipalities (high and very high poverty) identified as eligible by Progresa in 1997. Linear interpolation was used to obtain data on the population, household, and Margination Index for the years when the data were not available. Municipality-level data of adult deaths, population, households, and the Margination Index were combined with administrative information (1997-2018) on the number of households enrolled in Progresa by year and by municipality, provided by Progresa administrative personnel. The municipality codes in all of data were re-coded back to 1990 boundaries to allow for consistent geographic definitions across the study period.

Progresa and mortality measures

The identification strategy was difference-in-differences estimation, using variation in the population proportion benefiting from Progresa across geographic areas and years (Parker & Vogl, 2018). The key explanatory variable of interest, the population proportion with Progresa, has within-municipality variation at both the extensive margin (program introduction) and the intensive margin (program intensity). Intensive margin variation may be endogenous though due to take-up behavior, thus following Conti and Ginja, we exploit only the extensive margin of program introduction in each municipality. We operationalize this as a binary variable which equals 1 only beginning the first year that the ratio of the Progresa beneficiary households to the total number of households in the municipality reaches 15 percent.

The dependent variable is adult mortality, which we operationalize as the age-adjusted death rate (AADR) of adults aged 50 and over. AADR is the ratio of the number of deaths in a given age group to the population of

[1] The Margination Index was based on the share living in communities with less than 5000 inhabitants, the share earning less than twice the minimum wage, the share illiterate, and the shares with less than primary school, without a toilet, without electricity, without running water, with crowding, and with a dirt floor.

that age group, expressed per 100,000 population, adjusting for the effects of differences in population age distributions that might influence health event rates (Curtin & Klein, 1995). The differential impacts of the program were examined by gender and by cause of death. The selected causes of death were based on the International Classification of Diseases-10 (ICD-10) classification of amenable causes (Nolte & McKee, 2011), and we included eight major causes that accounted for adult mortality in Mexico: (1) intestinal infections; (2) diabetes; (3) hypertensive disease; (4) cerebrovascular disease; (5) respiratory diseases; (6) pneumonia; (7) heart disease; and (8) accidents (traffic and other types). The effects on deaths caused by accidents were examined as a falsification test as it seems unlikely that they would be affected by the benefits of Progresa.

Model Estimation

To estimate the effects of Progresa on AADR, we estimated the following equation:

$$AADR_{mt} = \beta_0\, High\ Progresa\ intensity_{m,\,t-1} + \beta_1\, High\ Progresa\ intensity_{m,\,t+1} + X_{mt} + \delta_m + \gamma_t + \varepsilon_{mt}$$

Covariates (X_{mt}) were the proportion of assisted deaths, proportion of deaths at hospital, and Margination Index. Fixed effects for municipality (δ_m) and year (γ_t) were included to control for time-invariant unobservable municipality-level confounders and aggregate time trends. The treatment effect of Progresa on the treated was estimated by β_0. If unobserved time-varying municipality characteristics were correlated with program intensity, the estimates β_0 would be biased, thus we also included Progresa intensity in time t+1 to test for pre-intervention confounders. If β_1 is not significantly different from zero, this increases our confidence that the pre-intervention trends for AADR are statistically unrelated to Progresa expansion.

The analysis assumes that in the absence of Progresa, the differences of outcome variables among municipalities with different Progresa intensity were constant over time, and also that there were no spillover effects across municipalities. To examine both short- and longer-term effects of Progresa, we used 1, 3, 5, 7, and 10-year lagged specifications, estimating the extent to which the proportion of program beneficiaries in 1, 3, 5, 7, and 10 year-ago period affected adult mortality in the next period. All regressions were weighted by the size of the population aged over 50 in a municipality, and standard errors were clustered at the municipality level.

Results

Progresa Effects on All-Cause Mortality

The differential impacts of the program are examined by gender, given the program's delivery of benefits to women. Therefore, Tables 1 and 2 present the effects of Progresa on the AADR for marginalized areas, separately for females and males aged 50 and older. Columns (1-5) present the program's effect 1, 3, 5, 7, and 10 years later, controlling for year and municipality fixed effects and a set of covariates. Table 1, column (2) shows that the largest effects on female mortality occurred after a 3-year lag. The point estimate on 3-year lagged program intensity is statistically significant at the 0.1% level and is -71.57. This means that when a municipality reaches Progresa coverage equal to or above 15% of households, there is an estimated reduction of 71.57 deaths per 100,000 older females three years later. Columns (3-5) show that the program effect decreases at longer lag lengths, along with its significance, while column (1) presents a minor effect one year after Progresa introduction ($p<.10$). The estimated Progresa effect in the lead year t+1, test for pre-intervention confounding, is not significantly different from zero.

Table 2, column (2) similarly shows a point estimate of the effect of Progresa introduction on 3-year lagged male that is statistically significant at the 5% level, but at -39.60 it is almost half the magnitude of the female effect. Other lagged effects for men are smaller and statistically imprecise. Results for both males and females pooled are in the appendix Table 1; as expected, the pooled program effect on 3-year lagged mortality is in-between the male and female effect sizes, also significant only at 5%.

Impact of the program on selected causes of deaths

Tables 3-10 present the impact of Progresa on the AADR for the eight large amenable causes in Mexico. Table 9 shows the impact of Progresa on AADR due to heart diseases, the leading cause of death with around 200 deaths per 100,000. The point estimate after three years is -25.14 and -18.39 for females and males, respectively, and both are significant at 1%. The effects again decline over time, and significant up to the 7-year lag models.

However, the t+1 lead coefficient is marginally significant at the 10 percent level in several models, with negative coefficients that reduce confidence in the estimates for heart disease effects.

More striking are the Table 4 effects for diabetes, the second leading cause of death for females. These show the most significant gap between sexes, reaching 188.1 and a difference of 54.1 deaths per 100,000, respectively. After 5 and 7 year lags, the female mortality point estimate still shows a significant effect on AADR at 0.1% level of -28.68 and -24.34, respectively. The t+1 lead coefficients show significant confounding in some models, although these coefficients are uniformly positive, suggesting that if anything the causal mortality benefits are likely under-estimated.

Table 10 shows effects on deaths caused by accidents as a falsification test, as these seem unlikely to be substantially affected by Progresa. For both males and females, there is only one significant effect at the 5% level, which is small and positive, thus does not reduce our confidence in the potential causal interpretation of effects on other causes of death.

Discussion

Overall, we find that Progresa substantially reduced mortality in the short-run, particularly among females, with the largest effects after three years. All-cause mortality effects attenuated at increasing lag lengths, with no sustained benefit in ten-year lag models. Results varied by cause of death though, with long-term benefits of earlier cash transfers sustained for female diabetes mortality even after a ten-year lag.

Although our analyses are robust to various sensitivity and specification tests, there are still potential limitations which can be explored by future work. This includes controlling for additional possible time-varying confounders such as the Seguro Popular government health insurance expansion as well as expansion of non-contributory pension programs in Mexico.

Estimating the time path of mortality effects is important for understanding the full benefits of income-support social insurance programs such as Progresa. While similar cash support programs have now been

widely adopted elsewhere, they are subject to continued scrutiny by both academics and policy-makers, including in Mexico where political support for the program has now been lost.

Table 1. The effects of Progresa on the age adjusted death rate for adults aged over 50, female, marginalized areas, Mexico, 1990-2018 (n=45,981)

Female, mean in 1996: 2019.4	(1)	(2)	(3)	(4)	(5)
1-year lag Progresa (15%)	-33.71†				
	(19.68)				
3-year lag Progresa (15%)		-71.57***			
		(19.75)			
5-year lag Progresa (15%)			-48.61**		
			(17.63)		
7-year lag Progresa (15%)				-41.17*	
				(16.21)	
10-year lag Progresa (15%)					10.81
					(14.92)
Progresa lead (t+1)	-3.862	-11.63	-12.50	-12.32	-7.421
	(22.53)	(23.54)	(23.65)	(23.49)	(23.10)

Notes: All regressions included municipality and time fixed effects, and were weighted by the number of population aged over 50 in a municipality. Covariates included the proportion of assisted deaths, proportion of deaths at hospital, and continuous margination index, but not presented. Age adjusted death rate was the ratio of the number of deaths in a given age group to the population of that age group per 100,000 population. Lag of Progresa intensity was the percent of cumulative beneficiary households in each municipality and previous year. Robust standard errors clustered at municipality level are in the parentheses.

Source: Mexican Institute of Statistics Geography and Informatics (INEGI), Mexican Population Council (CONAPO) and Mexican census

*†p<0.1, *p<0.05, **p<0.01, ***p<0.001*

Table 2. The effects of Progresa on the age adjusted death rate for adults aged over 50, male, marginalized areas, Mexico, 1990-2018 (n=45,981)

Male, mean in 1996: 2303.4	(1)	(2)	(3)	(4)	(5)
1-year lag Progresa (15%)	-8.182				
	(21.99)				
3-year lag Progresa (15%)		-39.60*			
		(20.18)			
5-year lag Progresa (15%)			-9.664		
			(18.96)		
7-year lag Progresa (15%)				7.573	
				(17.97)	
10-year lag Progresa (15%)					11.24
					(17.01)
Progresa lead (t+1)	18.49	15.64	16.57	18.07	18.49
	(22.15)	(23.14)	(23.11)	(23.06)	(22.87)

Notes: All regressions included municipality and time fixed effects, and were weighted by the number of population aged over 50 in a municipality. Covariates included the proportion of assisted deaths, proportion of deaths at hospital, and continuous margination index, but not presented. Age adjusted death rate was the ratio of the number of deaths in a given age group to the population of that age group per 100,000 population. Lag of Progresa intensity was the percent of cumulative beneficiary households in each municipality and previous year. Robust standard errors clustered at municipality level are in the parentheses.

Source: Mexican Institute of Statistics Geography and Informatics (INEGI), Mexican Population Council (CONAPO) and Mexican census

*$p<0.05$

Table 3. The effects of Progresa on the age adjusted death rate for adults aged over 50 due to intestinal infections by gender, marginalized areas, Mexico, 1990-2018 (n=45,981)

Female, mean in 1996: 38.9	(1)	(2)	(3)	(4)	(5)
1-year lag Progresa (15%)	-3.677*				
	(1.874)				
3-year lag Progresa (15%)		-0.510			
		(1.572)			
5-year lag Progresa (15%)			0.608		
			(1.625)		
7-year lag Progresa (15%)				-3.206*	
				(1.540)	
10-year lag Progresa (15%)					-2.690*
					(1.341)
Progresa lead (t+1)	1.626	1.098	1.170	0.823	0.851
	(2.291)	(2.289)	(2.291)	(2.300)	(2.281)
Male, mean in 1996: 36.5	(1)	(2)	(3)	(4)	(5)
1-year lag Progresa (15%)	-3.030				
	(1.913)				
3-year lag Progresa (15%)		-1.546			
		(1.538)			
5-year lag Progresa (15%)			-2.137		
			(1.461)		
7-year lag Progresa (15%)				-1.710	
				(1.343)	
10-year lag Progresa (15%)					-1.514
					(1.313)
Progresa lead (t+1)	-1.144	-1.629	-1.737	-1.720	-1.713
	(2.154)	(2.132)	(2.131)	(2.140)	(2.142)

Notes: All regressions included municipality and time fixed effects, and were weighted by the number of population aged over 50 in a municipality. Covariates included the proportion of assisted deaths, proportion of deaths at hospital, and continuous margination index, but not presented. Age adjusted death rate was the ratio of the number of deaths in a given age group to the population of that age group per 100,000 population. Cause of death is classified based on Nolte & McKee (2011). Variations in amenable mortality--trends in 16 high-income nations. Health policy (Amsterdam, Netherlands), 103(1), 47–52. https://doi.org/10.1016/j.healthpol.2011.08.002. Lag of Progresa intensity was the percent of cumulative beneficiary households in each municipality and previous year. Robust standard errors clustered at municipality level are in the parentheses.

Source: Mexican Institute of Statistics Geography and Informatics (INEGI), Mexican Population Council (CONAPO) and Mexican census

*†p<0.1, *p<0.05, **p<0.01, ***p<0.001*

Table 4. The effects of Progresa on the age adjusted death rate for adults aged over 50 due to diabetes by gender, marginalized areas, Mexico, 1990-2018 (n=45,981)

Female, mean in 1996: 188.1	(1)	(2)	(3)	(4)	(5)
1-year lag Progresa (15%)	-5.107				
	(5.667)				
3-year lag Progresa (15%)		-15.09*			
		(6.906)			
5-year lag Progresa (15%)			-28.68***		
			(7.205)		
7-year lag Progresa (15%)				-24.34***	
				(6.176)	
10-year lag Progresa (15%)					-11.34*
					(5.605)
Progresa lead (t+1)	13.48†	12.11†	10.42	10.52	11.64
	(7.273)	(7.357)	(7.500)	(7.366)	(7.242)
Male, mean in 1996: 134.4	(1)	(2)	(3)	(4)	(5)
1-year lag Progresa (15%)	-0.401				
	(6.361)				
3-year lag Progresa (15%)		-16.81**			
		(6.257)			
5-year lag Progresa (15%)			-4.610		
			(5.613)		
7-year lag Progresa (15%)				-7.913	
				(5.485)	
10-year lag Progresa (15%)					-5.559
					(6.010)
Progresa lead (t+1)	17.83**	17.04**	17.40**	17.05**	17.22**
	(5.999)	(6.100)	(6.115)	(6.057)	(5.997)

Please see the notes in previous table.

Table 5. The effects of Progresa on the age adjusted death rate for adults aged over 50 due to hypertensive disease by gender, marginalized areas, Mexico, 1990-2018 (n=45,981)

Female, mean in 1996: 69.6	(1)	(2)	(3)	(4)	(5)
1-year lag Progresa (15%)	-6.718*				
	(3.391)				
3-year lag Progresa (15%)		-2.307			
		(3.130)			
5-year lag Progresa (15%)			-4.170		
			(2.960)		
7-year lag Progresa (15%)				0.0876	
				(2.960)	
10-year lag Progresa (15%)					0.432
					(2.963)
Progresa lead (t+1)	-5.045	-6.070†	-6.312†	-5.961†	-5.926†
	(3.405)	(3.434)	(3.432)	(3.444)	(3.482)
Male, mean in 1996: 49.7	(1)	(2)	(3)	(4)	(5)
1-year lag Progresa (15%)	-2.906				
	(3.051)				
3-year lag Progresa (15%)		-4.464			
		(3.553)			
5-year lag Progresa (15%)			-5.493†		
			(3.170)		
7-year lag Progresa (15%)				-0.758	
				(2.812)	
10-year lag Progresa (15%)					0.553
					(2.824)
Progresa lead (t+1)	-1.556	-2.165	-2.425	-2.040	-1.915
	(3.192)	(3.283)	(3.320)	(3.219)	(3.218)

Please see the notes in previous table.

Table 6. The effects of Progresa on the age adjusted death rate for adults aged over 50 due to cerebrovascular disease by gender, marginalized areas, Mexico, 1990-2018 (n=45,981)

Female, mean in 1996: 175.0	(1)	(2)	(3)	(4)	(5)
1-year lag Progresa (15%)	-0.704				
	(4.748)				
3-year lag Progresa (15%)		-12.08**			
		(4.418)			
5-year lag Progresa (15%)			-4.196		
			(4.360)		
7-year lag Progresa (15%)				-10.07*	
				(4.174)	
10-year lag Progresa (15%)					12.59**
					(4.057)
Progresa lead (t+1)	-10.11†	-10.73*	-10.55*	-11.14*	-8.946†
	(5.244)	(5.345)	(5.352)	(5.287)	(5.322)
Male, mean in 1996: 163.8	(1)	(2)	(3)	(4)	(5)
1-year lag Progresa (15%)	-9.161*				
	(4.493)				
3-year lag Progresa (15%)		-11.02*			
		(4.488)			
5-year lag Progresa (15%)			3.503		
			(4.306)		
7-year lag Progresa (15%)				-3.715	
				(4.416)	
10-year lag Progresa (15%)					6.324
					(4.522)
Progresa lead (t+1)	-1.604	-3.347	-2.578	-3.210	-2.232
	(5.338)	(5.375)	(5.353)	(5.260)	(5.302)

Please see the notes in previous table.

Table 7. The effects of Progresa on the age adjusted death rate for adults aged over 50 due to respiratory diseases by gender, marginalized areas, Mexico, 1990-2018 (n=45,981)

Female, mean in 1996: 91.6	(1)	(2)	(3)	(4)	(5)
1-year lag Progresa (15%)	-6.261				
	(4.593)				
3-year lag Progresa (15%)		-5.708			
		(4.196)			
5-year lag Progresa (15%)			-6.272		
			(4.147)		
7-year lag Progresa (15%)				-2.543	
				(4.094)	
10-year lag Progresa (15%)					6.491†
					(3.631)
Progresa lead (t+1)	-10.19*	-11.30*	-11.57**	-11.29*	-10.40*
	(4.409)	(4.500)	(4.466)	(4.484)	(4.444)
Male, mean in 1996: 106.5	(1)	(2)	(3)	(4)	(5)
1-year lag Progresa (15%)	-9.948*				
	(4.882)				
3-year lag Progresa (15%)		-3.889			
		(4.339)			
5-year lag Progresa (15%)			-4.412		
			(4.412)		
7-year lag Progresa (15%)				1.391	
				(4.117)	
10-year lag Progresa (15%)					2.026
					(4.013)
Progresa lead (t+1)	-0.813	-2.353	-2.545	-2.054	-1.980
	(4.941)	(4.989)	(4.976)	(4.990)	(4.918)

Please see the notes in previous table.

Table 8. The effects of Progresa on the age adjusted death rate for adults aged over 50 due to pneumonia by gender, marginalized areas, Mexico, 1990-2018 (n=45,981)

Female, mean in 1996: 84.8	(1)	(2)	(3)	(4)	(5)
1-year lag Progresa (15%)	3.412				
	(2.980)				
3-year lag Progresa (15%)		2.423			
		(2.661)			
5-year lag Progresa (15%)			1.025		
			(2.349)		
7-year lag Progresa (15%)				-2.684	
				(2.328)	
10-year lag Progresa (15%)					-5.079*
					(2.276)
Progresa lead (t+1)	0.665	1.241	1.219	0.886	0.626
	(3.989)	(4.023)	(4.026)	(4.016)	(3.996)
Male, mean in 1996: 91.2	(1)	(2)	(3)	(4)	(5)
1-year lag Progresa (15%)	-0.599				
	(3.091)				
3-year lag Progresa (15%)		-5.918*			
		(2.803)			
5-year lag Progresa (15%)			-0.972		
			(2.585)		
7-year lag Progresa (15%)				1.560	
				(2.566)	
10-year lag Progresa (15%)					-1.620
					(2.611)
Progresa lead (t+1)	3.470	3.129	3.307	3.532	3.225
	(3.369)	(3.447)	(3.447)	(3.404)	(3.381)

Please see the notes in previous table.

Table 9. The effects of Progresa on the age adjusted death rate for adults aged over 50 due to heart disease by gender, marginalized areas, Mexico, 1990-2018 (n=45,981)

Female, mean in 1996: 201.3	(1)	(2)	(3)	(4)	(5)
1-year lag Progresa (15%)	-23.54***				
	(6.964)				
3-year lag Progresa (15%)		-25.14**			
		(7.802)			
5-year lag Progresa (15%)			-18.71**		
			(7.135)		
7-year lag Progresa (15%)				-12.47†	
				(6.804)	
10-year lag Progresa (15%)					-8.083
					(7.093)
Progresa lead (t+1)	-9.861	-14.20†	-14.64†	-14.26†	-13.91†
	(7.791)	(8.252)	(8.162)	(8.169)	(8.210)
Male, mean in 1996: 231.6	(1)	(2)	(3)	(4)	(5)
1-year lag Progresa (15%)	-12.61†				
	(7.004)				
3-year lag Progresa (15%)		-18.39**			
		(7.063)			
5-year lag Progresa (15%)			-18.26*		
			(7.119)		
7-year lag Progresa (15%)				-15.03*	
				(7.391)	
10-year lag Progresa (15%)					-5.336
					(6.794)
Progresa lead (t+1)	-8.822	-11.36	-12.06	-11.95	-11.09
	(7.314)	(7.733)	(7.710)	(7.632)	(7.511)

Please see the notes in previous table.

Table 10. The effects of Progresa on the age adjusted death rate for adults aged over 50 due to accidents (traffic and other types) by gender, marginalized areas, Mexico, 1990-2018 (n=45,981)

Female, mean in 1996: 10.3	(1)	(2)	(3)	(4)	(5)
1-year lag Progresa (15%)	-0.471				
	(1.215)				
3-year lag Progresa (15%)		-0.0398			
		(1.148)			
5-year lag Progresa (15%)			2.170*		
			(1.074)		
7-year lag Progresa (15%)				1.298	
				(1.106)	
10-year lag Progresa (15%)					0.431
					(0.959)
Progresa lead (t+1)	0.0399	-0.0266	0.153	0.0954	0.0183
	(1.248)	(1.261)	(1.277)	(1.271)	(1.267)
Male, mean in 1996: 36.4	(1)	(2)	(3)	(4)	(5)
1-year lag Progresa (15%)	0.198				
	(2.650)				
3-year lag Progresa (15%)		0.811			
		(2.246)			
5-year lag Progresa (15%)			-0.125		
			(2.429)		
7-year lag Progresa (15%)				4.465*	
				(2.126)	
10-year lag Progresa (15%)					1.652
					(2.033)
Progresa lead (t+1)	-0.228	-0.165	-0.211	0.214	-0.0348
	(2.371)	(2.419)	(2.409)	(2.413)	(2.408)

Please see the notes in previous table.

Appendix

A1. The effects of Progresa on the age adjusted death rate for adults aged over 50, marginalized areas, Mexico, 1990-2018 (n=45,981)

AADR (+50), all	(1)	(2)	(3)	(4)	(5)
1-year lag Progresa (15%)	-15.87				
	(20.31)				
3-year lag Progresa (15%)		-49.55*			
		(20.17)			
5-year lag Progresa (15%)			-19.84		
			(18.97)		
7-year lag Progresa (15%)				-9.871	
				(18.81)	
10-year lag Progresa (15%)					19.47
					(17.83)
Progresa lead (t+1)	17.22	12.87	13.40	14.12	16.98
	(21.56)	(23.62)	(23.97)	(24.02)	(23.81)

Notes: All regressions included municipality and time fixed effects, and were weighted by the number of population aged over 50 in a municipality. Covariates included the proportion of assisted deaths, proportion of deaths at hospital, and continuous margination index, but not presented. Age adjusted death rate was the ratio of the number of deaths in a given age group to the population of that age group per 100,000 population. Lag of Progresa intensity was the percent of cumulative beneficiary households in each municipality and previous year. Robust standard errors clustered at municipality level are in the parentheses.
*Source***:** Mexican Institute of Statistics Geography and Informatics (INEGI), Mexican Population Council (CONAPO) and Mexican census
*†p ‹ .10; *p ‹ .05; **p ‹ .01; ***p ‹ .001*

A2. The effects of Progresa on the age adjusted death rate for adults aged over 50 due to intestinal infections, marginalized areas, Mexico, 1990-2018 (n=45,981)

AADR (+50), all	(1)	(2)	(3)	(4)	(5)
1-year lag Progresa (15%)	-3.678*				
	(1.450)				
3-year lag Progresa (15%)		-1.274			
		(1.158)			
5-year lag Progresa (15%)			-0.897		
			(1.189)		
7-year lag Progresa (15%)				-2.551*	
				(1.157)	
10-year lag Progresa (15%)					-2.450*
					(1.087)
Progresa lead (t+1)	0.612	0.0502	0.0322	-0.131	-0.139
	(1.667)	(1.665)	(1.669)	(1.676)	(1.662)

Please see the previous notes.

A3. The effects of Progresa on the age adjusted death rate for adults aged over 50 due to diabetes, marginalized areas, Mexico, 1990-2018 (n=45,981)

AADR (+50), all	(1)	(2)	(3)	(4)	(5)
1-year lag Progresa (15%)	-3.226				
	(4.575)				
3-year lag Progresa (15%)		-16.38**			
		(5.146)			
5-year lag Progresa (15%)			-16.87***		
			(4.861)		
7-year lag Progresa (15%)				-16.23***	
				(4.153)	
10-year lag Progresa (15%)					-8.002*

					(3.925)
Progresa lead (t+1)	15.76**	14.60**	13.93*	13.81**	14.51**
	(5.313)	(5.398)	(5.468)	(5.355)	(5.331)

Please see the previous notes.

A4. The effects of Progresa on the age adjusted death rate for adults aged over 50 due to hypertensive disease, marginalized areas, Mexico, 1990-2018 (n=45,981)

AADR (+50), all	(1)	(2)	(3)	(4)	(5)
1-year lag Progresa (15%)	-5.274*				
	(2.515)				
3-year lag Progresa (15%)		-2.759			
		(2.525)			
5-year lag Progresa (15%)			-4.166†		
			(2.173)		
7-year lag Progresa (15%)				-0.165	
				(2.179)	
10-year lag Progresa (15%)					0.693
					(2.283)
Progresa lead (t+1)	-2.825	-3.671	-3.893	-3.566	-3.481
	(2.350)	(2.434)	(2.449)	(2.427)	(2.440)

Please see the previous notes.

A5. The effects of Progresa on the age adjusted death rate for adults aged over 50 due to cerebrovascular disease, marginalized areas, Mexico, 1990-2018 (n=45,981)

AADR (+50), all	(1)	(2)	(3)	(4)	(5)
1-year lag Progresa (15%)	-4.613				
	(3.532)				
3-year lag Progresa (15%)		-10.72**			
		(3.385)			
5-year lag Progresa (15%)			0.635		
			(3.317)		
7-year lag Progresa (15%)				-5.694†	
				(3.285)	
10-year lag Progresa (15%)					10.01**
					(3.354)
Progresa lead (t+1)	-5.153	-6.257	-5.736	-6.316	-4.786
	(4.179)	(4.334)	(4.318)	(4.239)	(4.261)

Please see the previous notes.

A6. The effects of Progresa on the age adjusted death rate for adults aged over 50 due to respiratory diseases, marginalized areas, Mexico, 1990-2018 (n=45,981)

AADR (+50), all	(1)	(2)	(3)	(4)	(5)
1-year lag Progresa (15%)	-8.569*				
	(3.792)				
3-year lag Progresa (15%)		-5.253†			
		(3.168)			
5-year lag Progresa (15%)			-5.768†		
			(3.272)		
7-year lag Progresa (15%)				-1.406	
				(3.308)	
10-year lag Progresa (15%)					3.734
					(2.919)
Progresa lead (t+1)	-5.326	-6.735†	-6.980*	-6.636†	-6.132†
	(3.440)	(3.528)	(3.489)	(3.502)	(3.468)

Please see the previous notes.

A7 The effects of Progresa on the age adjusted death rate for adults aged over 50 due to pneumonia, marginalized areas, Mexico, 1990-2018 (n=45,981)

AADR (+50), all	(1)	(2)	(3)	(4)	(5)
1-year lag Progresa (15%)	1.432				
	(2.309)				
3-year lag Progresa (15%)		-1.822			
		(2.084)			
5-year lag Progresa (15%)			0.000792		
			(1.959)		
7-year lag Progresa (15%)				-0.643	
				(1.921)	
10-year lag Progresa (15%)					-3.548†
					(1.905)
Progresa lead (t+1)	1.906	2.024	2.103	2.044	1.748
	(3.064)	(3.114)	(3.121)	(3.087)	(3.071)

Please see the previous notes.

A8 The effects of Progresa on the age adjusted death rate for adults aged over 50 due to heart disease, marginalized areas, Mexico, 1990-2018 (n=45,981)

AADR (+50), all	(1)	(2)	(3)	(4)	(5)
1-year lag Progresa (15%)	-18.54**				
	(5.928)				
3-year lag Progresa (15%)		-22.72***			
		(6.404)			
5-year lag Progresa (15%)			-18.67***		
			(5.642)		
7-year lag Progresa (15%)				-14.89*	
				(6.279)	
10-year lag Progresa (15%)					-7.660
					(5.793)
Progresa lead (t+1)	-10.05	-13.59*	-14.13*	-13.98*	-13.37*
	(6.389)	(6.894)	(6.858)	(6.761)	(6.684)

Please see the previous notes.

A9. The effects of Progresa on the age adjusted death rate for adults aged over 50 due to accidents (traffic and other types), marginalized areas, Mexico, 1990-2018 (n=45,981)

AADR (+50), all	(1)	(2)	(3)	(4)	(5)
1-year lag Progresa (15%)	-0.556				
	(1.546)				
3-year lag Progresa (15%)		0.232			
		(1.253)			
5-year lag Progresa (15%)			0.924		
			(1.320)		
7-year lag Progresa (15%)				2.536*	
				(1.232)	
10-year lag Progresa (15%)					1.122
					(1.117)
Progresa lead (t+1)	-0.0810	-0.147	-0.0817	0.0774	-0.0452
	(1.349)	(1.376)	(1.373)	(1.380)	(1.373)

Please see the previous notes.

A10. 1-year lag of Progresa on the age adjusted death rate for adults aged over 50 by gender, marginalized areas, Mexico, 1990-2018 (n=45,981)

	(1) female	(2) female	(3) female	(4) male	(5) male	(6) male
1-year lag of Progresa (15%)	-31.07	-34.22†	-33.71†	-4.930	-5.744	-8.182
	(19.64)	(20.49)	(19.68)	(22.08)	(22.66)	(21.99)
Progresa lead (t+1)	3.038		-3.862	27.06		18.49
	(22.97)		(22.53)	(22.83)		(22.15)
Covariates	N	Y	Y	N	Y	Y

Please see the previous notes

A11. 3-year lag of Progresa on the age adjusted death rate for adults aged over 50 by gender, marginalized areas, Mexico, 1990-2018 (n=45,981)

	(1) female	(2) female	(3) female	(4) male	(5) male	(6) male
3-year lag of Progresa (15%)	-71.13***	-71.11***	-71.57***	-39.99*	-40.22*	-39.60*
	(19.71)	(19.48)	(19.75)	(20.10)	(19.89)	(20.18)
Progresa lead (t+1)	-4.343		-11.63	24.64		15.64
	(24.00)		(23.54)	(23.84)		(23.14)
Covariates	N	Y	Y	N	Y	Y

Please see the previous notes

A12. 5-year lag of Progresa on the age adjusted death rate for adults aged over 50 by gender, marginalized areas, Mexico, 1990-2018 (n=45,981)

	(1) female	(2) female	(3) female	(4) male	(5) male	(6) male
5-year lag of Progresa (15%)	-49.94**	-47.73**	-48.61**	-13.09	-10.83	-9.664
	(17.67)	(17.19)	(17.63)	(18.84)	(18.70)	(18.96)
Progresa lead (t+1)	-5.363		-12.50	25.30		16.57
	(24.12)		(23.65)	(23.79)		(23.11)
Covariates	N	Y	Y	N	Y	Y

Please see the previous notes

A13. 7-year lag of Progresa on the age adjusted death rate for adults aged over 50 by gender, marginalized areas, Mexico, 1990-2018 (n=45,981)

	(1) female	(2) female	(3) female	(4) male	(5) male	(6) male
7-year lag of Progresa (15%)	-41.99**	-40.25*	-41.17*	5.867	6.222	7.573
	(16.20)	(15.94)	(16.21)	(17.94)	(17.78)	(17.97)
Progresa lead (t+1)	-5.158		-12.32	26.92		18.07
	(23.94)		(23.49)	(23.73)		(23.06)
Covariates	N	Y	Y	N	Y	Y

Please see the previous notes

A14. 10-year lag of Progresa on the age adjusted death rate for adults aged over 50 by gender, marginalized areas, Mexico, 1990-2018 (n=45,981)

	(1) female	(2) female	(3) female	(4) male	(5) male	(6) male
10-year lag of Progresa (15%)	7.539	11.35	10.81	4.804	9.882	11.24
	(15.26)	(15.12)	(14.92)	(16.91)	(17.00)	(17.01)
Progresa lead (t+1)	-0.503		-7.421	26.86		18.49
	(23.51)		(23.10)	(23.51)		(22.87)
Covariates	N	Y	Y	N	Y	Y

Please see the previous notes

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