Do Conditional Cash Transfers Reduce Hypertension?

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Abstract

Progresa has been a model for similar programs in more than 60 countries. There are numerous studies of the short-term health effects of Progresa, but little evidence on their long-term effects; furthermore, their effects on the health of older adults has been particularly understudied. In this paper, we analyze the effects of Progresa on middle-aged and older adults, by gender, two decades after the program Began. Results shows that Progresa had large benefits in terms of improved hypertension diagnosis and treatment among older adults. Cash transfers could facilitate better health care access and improve treatment for hypertension through effective medicine purchase. However, these improvements did not result in better hypertension outcomes with respect to actual blood pressure measurements. It is unclear whether this is due to insufficient medication dosage titration, or due to insufficient medication adherence.

I. Introduction

Hypertension and high blood pressure are responsible for 8.5 million related deaths worldwide (Zhou B et al., 2021a). They account for 14% of all global mortality and significant morbidity (Fisher and Curfman, JAMA 2018). Hypertension can be detected in the community and primary care facilities, and several effective drugs are available at low cost for treating patients (Suchard al, 2019). Improving treatment coverage for patients with hypertension is an objective of many global, regional, and national initiatives and programs (NCD-RisC, 2021).

Mexico offers a unique opportunity to study social programs' long-run effects on adult hypertension. Mexico introduced three important and influential social insurance programs within ten years, each with millions of aging beneficiaries. These programs were the Progresa-Oportunidades-Prospera[1] (POP) conditional cash transfer (CCT) program in 1997, the 70 y más unconditional cash transfer (UCT) program for older persons in 2007, and Seguro Popular, a public health insurance program (PHI) for the uninsured, in 2004. Researchers and policymakers have drawn considerable attention to these programs (Levy and Schady, 2013).

The hypertension effects of income-support and health insurance programs for older adults have generated conflicting results for Mexico (Barros, 2008). Some studies suggest important health benefits, others find no effects, and others find unintended adverse effects potentially linked to pathways such as increased obesity (Fernald et al., 2008). Furthermore, evidence has focused predominantly on short-run effects rather than net long-run effects. Nevertheless, without further action, an estimated increase of 151% in the number of individuals needing care for hypertension

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[1] The original name was *Progresa*, changed to *Oportunidades* under the Fox administration, and changed again to *Prospera* under the Calderon administration.

is expected by 2050 in Mexico (Sudharsanan and Geldsetzer, 2019).

This paper studies whether the Progresa CCT program improved diagnosis, treatment, and hypertension levels. Progresa has been 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 their long-term effects (Parker and Todd, 2017); furthermore, their effects on the health of older adults has been particularly understudied (Behrman and Parker, 2013; Parker and Todd, 2017). In this paper, we analyze the effects of Progresa on middle-aged and older adults, by gender, two decades after the program began.

II. Context

Progresa began in small rural communities in 1997. Its crucial feature is monetary transfers to low-income families, primarily household mothers. Specifically designed to reduce the number of people living in extreme poverty, the program sought to break the intergenerational transmission of poverty by investing in education, nutrition, and health services (Yaschine, 2019). Some transfers are conditional on children attending school; others are conditional on family members visiting health clinics. Several studies have demonstrated the positive impact of this program, boosting the use of preventive services overall and improving the health of rural populations (Gutiérrez et al., 2005; Parker & Todd, 2017)

By 2017, the program had served 6.6 million households (27 million individuals), representing 22.7% of the country’s population. The program has expanded into urban areas but remains largely rural, with two-thirds of its household beneficiaries living in communities with less than 2,500 inhabitants. The program was canceled in December 2018 by the federal administration (2018–2024). The average family in Progresa received about MXN$800 (US$90.20 PPP) monthly. The program was means-tested, with both geographic and household-level targeting.

Hypertension is still a growing public health concern in Mexico. The National Health and Nutrition Survey (ENSANUT) reported prevalence figures of 25.5%, of which 40.0% were unaware they had hypertension. Among those previously diagnosed with hypertension, 79.3% received pharmacological treatment, and only 45.6% were adequately controlled (Campos et al., 2018).

III. Research design and methodology

a. Data

Following (Barham & Borry, 2013), we construct a person-level data set for adults above 50 years old, covering the 2000–2018 time period using the Health and Nutrition National Survey (acronym in Spanish: ENSANUT), Progresa administrative records, and census data. Next, we study the program's effect on the probability of having diagnosed their hypertension (HTA Diagnosed) and being treated with anti-hypertensive medications (HTA Treatment). Finally, we also examine the effect on the probability of having uncontrolled arterial hypertension (HTA Uncontrolled) by using the objectively measured hypertension rates.

The ENSANUT 2000, 2006, 2012, 2016, and 2018 surveys use a probabilistic multistage stratified cluster sampling design with state, regional, and national representativeness for urban and rural strata of all Mexican population. The data are publicly available from the National Institute of Public Health (INSP) and the Mexican Statistical Agency (INEGI) at the locality and municipality levels. The surveys were conducted between October and May in 1999-2000, 2005–2006 and

2011–2012, May and October in 2016, and July and June in 2018-2019. Detailed descriptions of the ENSANUT methodology are published elsewhere (Sepulveda et al., 2007, Olaiz-Fernandez et al., 2006, Romero-Martinez et al, 2013, Romero-Martinez et al., 2017, Romero-Martinez et al., 2019a, Romero-Martinez et al., 2019b). All participants provided informed consent prior to participating. The INSP Ethics Review Board of Mexico approved the study protocol.

The hypertension outcomes were self-reported by adults in response to the questions: *Has a doctor told you that you have high blood pressure or hypertension?* for the HTA Diagnosed outcome, and *Are you currently taking meds to control high blood pressure?* For the HTA Treatment outcome. Blood pressure was measured twice by a trained nurse in the dominant arm using a mercury sphygmomanometer on two different visits. The first reading was carried out after at least five minutes of rest seated. The second was taken five minutes apart from the first. On the first and second reading average, we define uncontrolled hypertension as having a systolic blood pressure ≥140 mmHg or a diastolic blood pressure ≥90 mmHg.

The intensity of treatment indicator, referred to as program penetration, is the ratio of households receiving Progresa benefits to the total number of households in a municipality. This variable ranges from zero to one, where one indicates that Progresa covers all households in a municipality.[2] For the numerator, we use Progresa administrative data on the number of households registered in a locality for the program each year. The data are aggregated to the municipality level using municipality identifiers in the administrative data. These data are not publicly available but

[2] There are a handful of observations that have values of program intensity slightly greater than one. These are mostly municipalities in which all localities in the municipality participated in the program. The ratio may be greater than one due to measurement error arising from the linear interpolation of the population data or due to locality boundaries being unclear when the administrative data was collected.

provided by the central Progresa administrative office. For the denominator, we use INEGI census data on the number of households in a municipality for 2000, 2005, 2010, and 2020. We linearly interpolated[3] the number of households to match the survey's years. While the study covers 2000–2018, we only used variation in program intensity for the ENSANUT waves.

The municipalities used as controls in the robustness analyses are the margination index[4] and the health care infrastructure variables. Data for the margination index is available every five years at the municipality level from Mexico's National Population Council (CONAPO) between 1995 and 2020. Again, we linearly interpolated values for years not available[5]. For the health infrastructure variables, data is available yearly from the Ministry of Health and Instituto Mexicano del Seguro Social (IMSS)-Oportunidades for 2000–2017 and are not publicly available[6]. These data are at the locality level but aggregated to the municipality level. The data allow us to control for the number of clinics, hospitals, mobile clinics, health brigades, medical residents, and doctors and nurses in contact with patients in a municipality.

Using these data sources, we construct a municipality-level pooled panel dataset for 2000, 2006, 2012, 2016, and 2018. However, municipality boundaries suffered changes during this period.

[3] Linear interpolation of the household data will not be an accurate estimation if there are sizable migration flows of the elderly that are correlated with Progresa. Given the short duration of the analysis, and that migration of the elderly is low, any measurement error should be minimized. In addition, Stecklov et al. (2005) find that for people under age 60, Progresa had no effect on domestic migration.

[4] The index uses the following variables: municipality density (population per square kilometer); the percentage of households with no piped water, with no electricity, with no wastewater disposal, and with a dirt floor; the percentage of the population over 14 that are illiterate; the percentage of the population over 4 who speak an indigenous language; the percentage of employed working in the primary sector; and the number of occupants per household.

[5] Due to the linear interpolation, if there is a large non-linear change in the covariates that is correlated with the treatment variable, the results could be biased. Given that Progresa localities were determined prior to the program based on pre-program characteristics, this possibility is minimized.

[6] These data do not include information on the total health care infrastructure in Mexico, as they only cover the providers that care for Progresa beneficiaries.

Thus, new municipalities are recoded and combined back to 1995, resulting in a consistent panel of municipalities from 2000 to 2018 of 2400 municipalities each year.

b. Identification strategy

We estimate the impact of Progresa on hypertension-related outcomes at the person level, using municipality level variation, rather than the locality level – the level at which it was rolled out – due to data limitations. As a result, the treatment variable, program intensity, combines two sources of variation. The first is the variation in treatment status across municipalities over time, and the second results from the percent of households benefiting from the program differing between municipalities.

Municipalities were incorporated into the program over time, starting in 1997. Therefore, we use municipalities yet to be treated as a comparison to identify the program effect using this municipality variation. The identifying assumption, in this case, is that the trends in hypertension-related outcomes between municipalities incorporated between waves would be the same in the absence of the program. In addition, as a robustness check, we lagged the dependent variable for one year to verify that the treatment variable was not correlated to trends prior to the program.

Using these sources of variation, the treatment variable, program intensity, ranges from zero to one, where one indicates that Progresa covered 100% of households in a municipality. The average program intensity for municipalities started at 12% in 2000 and reached 30% by 2018.

c. Empirical model

We implemented a generalized difference-in-differences (DiD) linear probability model controlling for the municipality and wave fixed effects, where the person-level average treatment effect is estimated using the following equation:

$$HTA_{i,t,m} = \alpha_t + \delta_m + \beta_0 Progresa_{m,t} + \epsilon_{m,t,i}, \quad (1)$$

where HTA is the hypertension-related outcome for a person i in municipality m in time t, and Progresa is the measure of the intensity of treatment or program penetration (percent of households receiving Progresa transfers in a municipality)[7]. Year fixed effects, α_t, are included to control for general time trends common to all municipalities and municipality fixed effects[8], δ_m, are included to capture time-invariant municipality-level unobservables. The error term is clustered at the municipality level to account for likely intracluster and serial correlation and the heteroskedasticity inherent in models with aggregated data.

The coefficient β_0 shows the program's effect if the program penetration rose from zero to one (i.e., 100% of households in a municipality are Progresa beneficiaries). The estimate of the treatment effect will be unbiased if no unobserved time-varying municipality characteristics are correlated with the treatment variable. However, to further test that time-varying unobservables are not biasing the results, we include municipality controls and individual municipality time trends in the regression model as a robustness check.

IV. Results

[7] This specification assumes that the treatment effect is linear.

[8] To the extent that non-eligibles (non-poor in a locality) benefit from the improved supply of health care services or the health education program, the program effects may be over-estimated. Bobonis and Finan (2002) find no evidence of health spillover effects on the non-eligibles in Progresa localities using the Progresa randomized evaluation database.

From 2000 to 2018, more older adults reported that physicians diagnosed their hypertension and treated it with anti-hypertensive medications, but measured hypertension did not improve. Table 3-7 presents the effects of Progresa on the hypertension-related outcomes for those aged 50 and older. Columns (1-3) present the pooled effect of the program, and columns (4-6) and (7-9) show the program's effect on males and females, respectively.

Table 3 and 4, in column (1), show a positive and statistically significant point estimate on program penetration at the 1% level on the probability of being diagnosed and receiving treatment. For example, a ten-percentage point expansion in Progresa raised diagnosis by 2.2 percentage points and treatment by 2.6 percentage points of hypertension for people aged 50 and older. In 2018, Progresa coverage reached an average of 30%, so the average municipality program effect represents an increase of approximately y% (HTA_diagnosed_in_2000*1.238 *0.3) in the probability of being diagnosed concerning the 2000 level of HTA_diagnosed_in_2000%.

5.2. Robustness checks

This section explores many threats to the validity of the estimates (columns 2-3, 5-6, 8-9). First, we test whether the point estimates are sensitive to the inclusion of time-varying municipality characteristics in columns (2), (4), and (7) by controlling for variables that are likely correlated with poverty, such as the margination index and health care infrastructure. These controls may be endogenous if Progresa led to these variables' changes, so we only include the controls as a robustness check. The supply of healthcare services increased to ensure that the quality of services did not deteriorate with the increase in healthcare service utilization resulting from the program (Bautista- Arredondo et al., 2006) and that beneficiaries could meet the health conditionalities. Health care expanded in both treatment and comparison municipalities. However, if the expansion timing varies, it is difficult to determine whether the improvements in diagnosis and treatment are due solely to the CCT program.

The point estimates on the program penetration between the models are not significantly different, providing evidence that changes in the health care supply are not the mechanism driving the results. In addition, the similarity in results with and without observable time-varying characteristics provides some confidence that differences in the time varying observables are not biasing the results.

$$HTA_{i,t,m} = \alpha_t + \delta_m + \beta_0 Progresa_{m,t} + \beta_1 Progresa_{m,t+1} + \epsilon_{m,t,i}, \quad (2)$$

Second, we test whether future expansions in the program are related to current outcomes. Thus, we lead the Progresa penetration variable as a falsification test captured by β_1 in equation (2). If β_1 is not significantly different from zero, then the post-intervention trends for hypertension-related outcomes are statistically similar across municipalities. The lead coefficient on the treatment variable in columns (3), (6), and (9) is negative and not significantly different from zero, while the current Progresa penetration variable is still positive and significant.

Finally, Tables 8-12 include sensitivity analyses. We first test our results using the lagged program penetration variable on columns (1) and (2), finding a positive and significant effect on our hypertension-related outcomes. The effects are consistent with the coefficient found for the current Progresa penetration variable but suggest the program had an immediate and a larger impact on diagnosis and treatment. Additionally, health care infrastructure variables were not available in 2018. Thus in columns (3) and (4), we test whether our results change once we drop the 2018 data.

Again, the point estimates on the treatment variable excluding 2018 are similar to those in Tables 3-7.

V. Discussion

Results shows that Progresa had large benefits in terms of improved hypertension diagnosis and treatment among older adults. Cash transfers could facilitate better health care access and improve treatment for hypertension through effective medicine purchase. However, these improvements did not result in better hypertension outcomes with respect to actual blood pressure measurements. It is unclear whether this is due to insufficient medication dosage titration, or due to insufficient medication adherence.

Income support programs in low-income settings could substantially improve health care access and prevention among older adults, including for high priority conditions such as hypertension. Further research is needed to better understand how to ensure that improved access also results in improved health.

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Table 1: Weighted dependent variables

	Females					Males				
	2000	2006	2012	2016	2018	2000	2006	2012	2016	2018
HTA	0.384	0.352	0.38	0.406	0.452	0.21	0.22	0.27	0.251	0.291
HTA Treatment	0.266	0.273	0.322	0.353	0.383	0.136	0.164	0.222	0.209	0.223
HTA Uncontrolled	0.517	0.388	0.38	0.329	0.362	0.47	0.394	0.399	0.309	0.326
Systolic	132.145	131.711	131.505	131.441	133.913	130.755	131.078	130.995	131.49	131.843
Diastolic	83.941	81.026	81.144	74.569	75.073	83.732	81.58	82.348	75.258	75.263

Note 1: HTA stands for Hypertension Arterial

Note 2: Systolic and Diastolic blood pressures are average between 1st and 2nd measurement.

Table 2: Weighted independent variables

	2000	2006	2012	2016	2018
Progresa current	0.117	0.197	0.191	0.194	0.271
Progresa lead	0.144	0.193	0.189	0.191	0.271
Progreas lag	0.111	0.203	0.195	0.201	0.279
Sex (1 = female)	0.523	0.539	0.527	0.525	0.553
Age	62.414	62.884	62.454	62.118	63.649
No education	0.247	0.216	0.172	0.168	0.188
Some primary	0.393	0.352	0.292	0.254	0.3
Primary	0.167	0.202	0.204	0.215	0.217
Secondary	0.068	0.086	0.14	0.165	0.154
High School	0.02	0.062	0.078	0.082	0.066
Higher education	0.104	0.081	0.114	0.116	0.074
Hospitals	1.371	1.666	1.726	1.854	1.131
Health Brigades	0.227	0.252	0.053	0.04	0.022
Medical Residents	41.754	48.55	49.533	58.507	25.888
Doctors	226.767	201.233	263.216	298.347	159.463
Nurses	311.127	399.509	515.187	592.948	323.443
Margination Index	-1.076	-1.084	-1.075	-1.001	-0.581

Note: Health infrastructure variables are means of totals per municipality

Table 3: Doctor ever told had hypertension

	(1) All	(2) All	(3) All	(4) Females	(5) Females	(6) Females	(7) Males	(8) Males	(9) Males
Progresa	0.2330^{**}	0.2593^{**}	0.3857^{*}	0.2149	0.2170	0.4128	0.2685^{*}	0.3086^{*}	0.3727
penetration	(0.08974)	(0.09234)	(0.16883)	(0.14324)	(0.14542)	(0.27473)	(0.13070)	(0.13617)	(0.25751)
Progresa lead			-0.1800			-0.2757			-0.0923
(t+1)			(0.20242)			(0.31817)			(0.29242)
Constant	-0.1726^{***}	-0.1871^{**}	-0.1738^{**}	-0.0010	0.0170	0.0376	-0.2184^{***}	-0.2458^{**}	-0.2389^{**}
	(0.04096)	(0.06542)	(0.06556)	(0.05586)	(0.09496)	(0.09844)	(0.05457)	(0.08598)	(0.08914)
Municipality	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Observations	53377	52761	52761	30968	30608	30608	22409	22153	22153

Standard errors in parentheses

Linear regression models Controlling for municipality and wave fixed effects, weighted by sampling weights

Individual Demographic controls for age, sex, and education attainment

Municipality controls for total hospitals, medical residents, health brigades, nurses, doctors, and margination index

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

Table 4: Hypertension treatment reported in the full sample

	(1) All	(2) All	(3) All	(4) Females	(5) Females	(6) Females	(7) Males	(8) Males	(9) Males
Progresa	0.2996^{***}	0.3162^{***}	0.4308^{*}	0.3720^{**}	0.3687^{**}	0.6986^{**}	0.2110	0.2320	0.1071
penetration	(0.07747)	(0.08316)	(0.16931)	(0.11344)	(0.11770)	(0.26044)	(0.11700)	(0.12578)	(0.21480)
Progresa lead			-0.1630			-0.4647			0.1800
(t+1)			(0.20397)			(0.30386)			(0.24214)
Constant	-0.3230^{***}	-0.3269^{***}	-0.3148^{***}	-0.1880^{***}	-0.1412	-0.1066	-0.3374^{***}	-0.3734^{***}	-0.3870^{***}
	(0.04120)	(0.06296)	(0.06333)	(0.05443)	(0.09295)	(0.09498)	(0.05217)	(0.08006)	(0.07892)
Municipality	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Observations	53377	52761	52761	30968	30608	30608	22409	22153	22153

Standard errors in parentheses

Linear regression models Controlling for municipality and wave fixed effects, weighted by sampling weights

Individual Demographic controls for age, sex, and education attainment

Municipality controls for total hospitals, medical residents, health brigades, nurses, doctors, and margination index

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

Table 5: Hypertension uncontrolled (average systolic and diastolic measurements above 140/90, respectively)

	(1) All	(2) All	(3) All	(4) Females	(5) Females	(6) Females	(7) Males	(8) Males	(9) Males
Progresa penetration	0.2016	0.1601	-0.0277	0.2241	0.1902	-0.0772	0.1445	0.0978	-0.1006
	(0.11729)	(0.12307)	(0.21282)	(0.15835)	(0.15868)	(0.27626)	(0.17663)	(0.18792)	(0.31763)
Progresa lead (t+1)			0.2667			0.3770			0.2851
			(0.24654)			(0.32605)			(0.35835)
Constant	-0.0290	-0.0370	-0.0596	-0.0867	-0.0148	-0.0464	0.0946	-0.0061	-0.0319
	(0.05146)	(0.07433)	(0.07516)	(0.06051)	(0.09081)	(0.09451)	(0.08405)	(0.11597)	(0.11808)
Municipality	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Observations	37824	37335	37335	22634	22340	22340	15190	14995	14995

Standard errors in parentheses
Linear regression models Controlling for municipality and wave fixed effects, weighted by sampling weights
Individual Demographic controls for age, sex, and education attainment
Municipality controls for total hospitals, medical residents, health brigades, nurses, doctors, and margination index
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6: Average systolic blood pressure measurement (1s and 2nd)

	(1) All	(2) All	(3) All	(4) Females	(5) Females	(6) Females	(7) Males	(8) Males	(9) Males
Progresa penetration	4.3554	3.2494	-3.2057	7.0057	7.0794	-0.7539	-0.5286	-3.6924	-12.3216
	(4.76984)	(4.93321)	(8.86822)	(6.53348)	(6.33234)	(11.90413)	(5.79565)	(6.35354)	(13.46238)
Progresa lead (t+1)			9.1645			11.0331			12.3982
			(10.47919)			(14.61173)			(15.33040)
Constant	113.8128^{***}	111.5589^{***}	110.7822^{***}	111.9161^{***}	109.8008^{***}	108.8781^{***}	117.6092^{***}	115.4282^{***}	114.3072^{***}
	(2.23713)	(2.95516)	(3.09395)	(2.80409)	(3.88304)	(3.99377)	(3.03572)	(4.14678)	(4.25952)
Municipality	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Observations	37957	37462	37462	22714	22417	22417	15243	15045	15045

Standard errors in parentheses
Linear regression models Controlling for municipality and wave fixed effects, weighted by sampling weights
Individual Demographic controls for age, sex, and education attainment
Municipality controls for total hospitals, medical residents, health brigades, nurses, doctors, and margination index
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 7: Dependent Variable: Average diastolic blood pressure measurement (1s and 2nd)

	(1) All	(2) All	(3) All	(4) Females	(5) Females	(6) Females	(7) Males	(8) Males	(9) Males
Progresa penetration	0.5533 (3.39468)	-1.9099 (3.65351)	-13.9845 (7.32290)	5.4854 (4.61819)	3.9360 (4.81420)	-9.0503 (9.46236)	-6.5660 (4.32822)	-9.9811* (4.41789)	-21.4522** (8.25943)
Progresa lead (t+1)			17.1496* (7.91848)			18.3024 (10.19334)			16.4950 (9.55848)
Constant	85.8488*** (1.36911)	86.4012*** (1.92730)	84.9506*** (1.94436)	82.0085*** (2.01099)	84.7444*** (2.73167)	83.2094*** (2.75852)	89.5762*** (1.67762)	88.1678*** (2.54500)	86.6796*** (2.62217)
Municipality	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Observations	38018	37527	37527	22773	22477	22477	15245	15050	15050

Standard errors in parentheses
Linear regression models Controlling for municipality and wave fixed effects, weighted by sampling weights
Individual Demographic controls for age, sex, and education attainment
Municipality controls for total hospitals, medical residents, health brigades, nurses, doctors, and margination index
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 8: Doctor ever told had hypertension

	(1) Full Sample	(2) Full Sample	(3) Sample w.o 2018	(4) Sample w.o 2018
Progresa penetration	0.2349* (0.09266)		0.2307* (0.10020)	0.3404 (0.17911)
Progresa lead (t+1)				-0.1631 (0.22921)
Progresa lag (t-1)		0.1959* (0.08575)		
Constant	0.3364*** (0.02154)	-0.1744** (0.06574)	-0.0731 (0.08557)	-0.0569 (0.08582)
Individual Demographic	No	Yes	Yes	Yes
Municipality	No	Yes	Yes	Yes
Observations	53738	52761	43105	43105

Standard errors in parentheses

Linear regression models Controlling for municipality and wave fixed effects, weighted by sampling weights
Individual Demographic controls for age, sex, and education attainment
Municipality controls for total hospitals, medical residents, health brigades, nurses, doctors, and margination index
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9: Hypertension treatment reported in the full sample

	(1) Full Sample	(2) Full Sample	(3) Sample w.o 2018	(4) Sample w.o 2018
Progresa penetration	0.3036***		0.3846***	0.4487*
	(0.08002)		(0.08991)	(0.18293)
Progresa lead (t+1)				-0.0953
				(0.23534)
Progresa lag (t-1)		0.2680**		
		(0.08321)		
Constant	0.2616***	-0.3199***	-0.2938***	-0.2843***
	(0.01917)	(0.06458)	(0.08170)	(0.08366)
Individual Demographic	No	Yes	Yes	Yes
Municipality	No	Yes	Yes	Yes
Observations	53738	52761	43105	43105

Standard errors in parentheses
Linear regression models Controlling for municipality and wave fixed effects, weighted by sampling weights
Individual Demographic controls for age, sex, and education attainment
Municipality controls for total hospitals, medical residents, health brigades, nurses, doctors, and margination index
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 10: Hypertension uncontrolled (average systolic and diastolic measurements above 140/90, respectively)

	(1) Full Sample	(2) Full Sample	(3) Sample w.o 2018	(4) Sample w.o 2018
Progresa penetration	0.1951		0.1771	0.0536
	(0.12034)		(0.15892)	(0.25635)

Progresa lead (t+1)				0.1853
				(0.31388)
Progresa lag (t-1)		0.0960		
		(0.10786)		
Constant	0.3098***	-0.0221	-0.0452	-0.0664
	(0.02881)	(0.07288)	(0.10669)	(0.11054)
Individual Demographic	No	Yes	Yes	Yes
Municipality	No	Yes	Yes	Yes
Observations	38148	37335	29269	29269

Standard errors in parentheses
Linear regression models Controlling for municipality and wave fixed effects, weighted by sampling weights
Individual Demographic controls for age, sex, and education attainment
Municipality controls for total hospitals, medical residents, health brigades, nurses, doctors, and margination index
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 11: Average systolic blood pressure measurement (1s and 2nd)

	(1) Full Sample	(2) Full Sample	(3) Sample w.o 2018	(4) Sample w.o 2018
Progresa penetration	3.7733		3.8500	2.3875
	(4.95221)		(6.08081)	(10.03077)
Progresa lead (t+1)				2.1945
				(12.59406)
Progresa lag (t-1)		1.5121		
		(4.25303)		
Constant	132.2042***	111.9788***	107.8804***	107.6293***
	(1.13516)	(2.85396)	(4.60392)	(4.86568)
Individual Demographic	No	Yes	Yes	Yes
Municipality Level	No	Yes	Yes	Yes
Observations	38282	37462	29309	29309

Standard errors in parentheses
Linear regression models Controlling for municipality and wave fixed effects, weighted by sampling weights
Individual Demographic controls for age, sex, and education attainment
Municipality controls for total hospitals, medical residents, health brigades, nurses, doctors, and margination index

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

Table 12: Average diastolic blood pressure measurement (1s and 2nd)

	(1) Full Sample	(2) Full Sample	(3) Sample w.o 2018	(4) Sample w.o 2018
Progresa penetration	0.0693		-1.6749	-12.7358
	(3.30021)		(5.27413)	(8.94641)
Progresa lead (t+1)				16.6205
				(9.31369)
Progresa lag (t-1)		-3.1500		
		(3.88323)		
Constant	75.5643***	86.7679***	81.7117***	79.8086***
	(0.73788)	(1.97170)	(2.94390)	(2.92299)
Individual Demographic	No	Yes	Yes	Yes
Municipality Level	No	Yes	Yes	Yes
Observations	38344	37527	29375	29375

Standard errors in parentheses
Linear regression models Controlling for municipality and wave fixed effects, weighted by sampling weights
Individual Demographic controls for age, sex, and education attainment
Municipality controls for total hospitals, medical residents, health brigades, nurses, doctors, and margination index
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Appendix

Table A1.

	Females					Males				
	2000	2006	2012	2016	2018	2000	2006	2012	2016	2018
Treated after diagnosed	0.384	0.352	0.38	0.406	0.452	0.21	0.22	0.27	0.251	0.291
Controled if treated	0.266	0.273	0.322	0.353	0.383	0.136	0.164	0.222	0.209	0.223
Undiagnosed	0.517	0.388	0.38	0.329	0.362	0.47	0.394	0.399	0.309	0.326
Treated if uncontrolled	132.145	131.711	131.505	131.441	133.913	130.755	131.078	130.995	131.49	131.843

Note: Controlled stands for blood pressure measurements in the controlled range.

Regressions

Dependent Variable: HTA_treated_DX

	(1) All	(2) All	(3) All	(4) Females	(5) Females	(6) Females	(7) Males	(8) Males	(9) Males
Progresa penetration	0.4443^{**}	0.4597^{**}	0.5897	0.5053^{**}	0.5307^{**}	1.1288^{**}	0.3462	0.3083	-0.1524
	(0.16400)	(0.17351)	(0.32896)	(0.18043)	(0.18415)	(0.37417)	(0.33003)	(0.35371)	(0.53762)
Progresa lead (t+1)			-0.1792			-0.8051			0.6710
			(0.38202)			(0.44985)			(0.56928)
Constant	0.2262^{***}	0.2004	0.2130	0.3451^{***}	0.3929^{**}	0.4494^{**}	0.0417	-0.0443	-0.1011
	(0.05948)	(0.11467)	(0.11811)	(0.06253)	(0.13567)	(0.14011)	(0.10739)	(0.20044)	(0.19643)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual Demographic	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Municipality	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes

Level									
Observations	17220	17072	17072	11807	11708	11708	5413	5364	5364

Standard errors in parentheses
Linear regression models Controlling for municipality and wave fixed effects, weighted by sampling weights
Individual controls: Age, sex and education attainment
Municipality controls: Totals of Hospitals, Medical Residents, Health Brigades, Nurses, Doctors and Margination Index
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Dependent Variable: HTA_controlled_if_treated

	(1) All	(2) All	(3) All	(4) Females	(5) Females	(6) Females	(7) Males	(8) Males	(9) Males
Progresa penetration	-0.2218	-0.1786	-0.1055	-0.5316	-0.6921	-0.5330	-0.0975	0.2273	0.2569
	(0.33075)	(0.33216)	(0.59890)	(0.43572)	(0.41069)	(0.67881)	(0.55678)	(0.60448)	(1.48603)
Progresa lead (t+1)			-0.0982			-0.2124			-0.0393
			(0.71902)			(0.72031)			(1.72533)
Constant	0.6189^{***}	0.4331^{**}	0.4413^{**}	0.6184^{***}	0.4896^{**}	0.5076^{**}	0.5877^{**}	0.5022	0.5053
	(0.10685)	(0.16166)	(0.16743)	(0.13089)	(0.17957)	(0.18478)	(0.18871)	(0.35427)	(0.36286)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual Demographic	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Municipality Level	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Observations	9159	9088	9088	6522	6478	6478	2637	2610	2610

Standard errors in parentheses
Linear regression models Controlling for municipality and wave fixed effects, weighted by sampling weights
Individual controls: Age, sex and education attainment
Municipality controls: Totals of Hospitals, Medical Residents, Health Brigades, Nurses, Doctors and Margination Index
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Dependent Variable: HTA_unDX

	(1) All	(2) All	(3) All	(4) Females	(5) Females	(6) Females	(7) Males	(8) Males	(9) Males
Progresa penetration	0.0219	-0.0075	-0.0659	-0.0572	-0.0910	-0.1035	0.0779	0.0527	-0.1049
	(0.09355)	(0.10105)	(0.17998)	(0.12366)	(0.12329)	(0.22413)	(0.16449)	(0.18369)	(0.30994)
Progresa lead (t+1)			0.0819			0.0175			0.2241
			(0.19658)			(0.24032)			(0.32494)
Constant	0.1355**	0.1184	0.1120	0.0116	0.0565	0.0551	0.2317**	0.1658	0.1473
	(0.04493)	(0.06646)	(0.06680)	(0.05052)	(0.08782)	(0.09158)	(0.07818)	(0.10129)	(0.10157)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual Demographic	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Municipality Level	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Observations	36503	36053	36053	21976	21702	21702	14527	14351	14351

Standard errors in parentheses
Linear regression models Controlling for municipality and wave fixed effects, weighted by sampling weights
Individual controls: Age, sex and education attainment
Municipality controls: Totals of Hospitals, Medical Residents, Health Brigades, Nurses, Doctors and Margination Index
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Dependent Variable: HTA_treated_if_uncontrolled

	(1) All	(2) All	(3) All	(4) Females	(5) Females	(6) Females	(7) Males	(8) Males	(9) Males
Progresa penetration	0.2291	0.2550	0.4846	0.3038	0.3556	0.7425*	0.1092	0.0667	0.1324
	(0.14379)	(0.14845)	(0.30080)	(0.18872)	(0.18286)	(0.35822)	(0.24085)	(0.25412)	(0.48284)
Progresa lead (t+1)			-0.3186			-0.5347			-0.0925
			(0.34212)			(0.40810)			(0.53952)
Constant	0.1213	0.1101	0.1344	0.3946***	0.3731*	0.4146**	-0.0855	-0.0508	-0.0435
	(0.06489)	(0.11191)	(0.11407)	(0.07587)	(0.14972)	(0.15484)	(0.10357)	(0.15359)	(0.15212)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual Demographic	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Municipality Level	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Observations	23775	23518	23518	15129	14963	14963	8646	8555	8555

Standard errors in parentheses

Linear regression models Controlling for municipality and wave fixed effects, weighted by sampling weights

Individual controls: Age, sex and education attainment

Municipality controls: Totals of Hospitals, Medical Residents, Health Brigades, Nurses, Doctors and Margination Index

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