Effects of a Non-contributory Pension Program for Elderly Population on Frailty and Functional Disability: Evidence from an Experiment in Mexico

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Abstract

In a context of rapid ageing in adverse circumstances, low- and middle-income countries have introduced non-contributory pensions as a way to increase older adults’ income and alleviate their already disadvantaged conditions.

Objective. This study presents the evaluation two social policy program for the elderly population in Mexico with a similar amount of cash transfer but different frequency of benefit payments (monthly vs every two months) using rich data before and after the interventions including objective markers and self-reported questions on health and well-being. The main outcome we use to explore the impact of the program is frailty, a condition associated with increased risk of functional decline among the elderly.

Results. We found a statistically significant decline in frailty in the monthly program and a lower decline but not statistically significant in the bimonthly program for women and men. This is consistent with the statistically significant decline in ADL and IADL for women and men in the monthly program and an increase in ADL and IADL for the bimonthly program.

Conclusions. Results show evidence of a greater decline in functional disability and frailty in the monthly program group in comparison to the bimonthly program. The latter may indicate that non-contributory pension programs have an impact in the health and wellbeing of the older population, particularly in terms of frailty and functional disability. We find stronger effects when the program is disbursed every month.
Introduction

Mexico will complete its demographic transition in the next 20-25 years, prompting a rapid increase in the percentage of the population 60 years and older. From 2010 to 2050 this age group will rise from representing 9 percent to 30 percent of total population. As with most Latin American countries, Mexico is experiencing what experts call a “mixed” epidemiological transition. This transition exhibits increasing trends in the prevalence of chronic diseases and a marked decrease in communicable diseases in some areas, but continuing moderate or high incidence of the latter in some regions of the country. In addition, there are no long-term care programmes that cater to specific health and social care needs of the older population.

Chronic illnesses are one of the largest challenges in the health system due to the number of patients, increased contributions to mortality, frequent premature disability and high-cost treatment (Córdova-Villalobos et al., 2008) and their incidence and prevalence had been the traditional way of measuring health. More recently, alternative ways of measuring health status is through evaluation of functional ability and frailty. Functional ability identifies difficulties in performing daily activities while frailty describes a condition associated with increased risk of functional decline among the elderly and is defined as the result of a decline in homeostatic reserve and resistance to stress (Fried et al., 2001 & 2004). In spite of the vast literature and empirical work generated around the subject of frailty, it has proven difficult to agree on a universal definition and measurement for frailty or frail status. In consequence, a wide range of definitions and methods applied to different population data are found within the empirical work on the subject.

However, efforts have concentrated on generating indicators of frailty or Frailty Indexes within different local contexts. There are two main estimation methods developed. First, Fried and colleagues (2001) developed and applied a phenotype of frailty in older adults using data from the Cardiovascular Health Study (USA) in a sample of men and women 65 years and older. They defined frailty as a clinical syndrome in which three or more of the following criteria are present: unintentional weight loss (10 lbs in past year), self-reported exhaustion, weakness (grip strength), slow walking speed, and low physical activity. Those with one or two are labelled as pre-frail.

An additional operationalisation of frailty has been carried out by Rockwood, Mitnitski and colleagues who propose a method for summarising health status and its variability by counting the deficits (symptoms, illnesses, etc.) present in individuals and inferring relative fitness or frailty on that basis (Rockwood, 2005; Rockwood et al., 2000; Mitnitski et al., 2002b; Mitnitski et al., 2002a; Mitnitski, Song, and Rockwood, 2004).
Regarding health and functional ability in Mexican older adults, data from the Mexican Health and Aging Study (MHAS) 2012 shows a highly independent population of adults 60 years and older, with 72.8 percent reporting no limitations in performing activities of daily living, 20.4 percent reporting limitations in 1-2 activities, and only 6.8 percent reporting difficulty in performing three or more activities (Diaz Venegas, De La Vega and Wong 2015). Using MHAS, Aguilar-Navarro and colleagues (2015) evaluate frailty following the definition of Fried and colleagues (2001) where individuals are categorised as frail if they meet at least three of the following criteria: weight loss, weakness, exhaustion, slow walking speed, and low physical activity. Their results show 11.6 percent of adults 60 years and older as non-frail, 51.2 percent as pre-frail (1 or 2 criteria), and 37.2 percent as frail (3 or more criteria).

In a context of rapid ageing in adverse contexts such as in low- and middle-income countries, governments have introduced non-contributory pensions and cash transfer schemes as a way to increase older adults income, prevent them from going into poverty, or alleviating their already disadvantaged conditions (Willmore, 2007; Levy and Norbert, 2013). Thus, non-contributory pension programmes have been defined as a major social protection mechanism to alleviate poverty in old age (Help Age International, 2012). While these schemes started to be implemented only recently, a wide interest on their impact on poverty and well-being of recipients and their families has prompted an increasing number of studies and publications in this topic.

In particular, studies from Africa and Latin America have found that non-contributory pensions have a measurable and significant impact upon diverse outcomes such as poverty reduction and poverty prevention (Salinas-Rodríguez et al., 2014; Barrientos, 2003; ILO/Schwarzwer and Querino, 2002) and social investment (Barrientos and Lloyd-Sherlock, 2002). Other benefits identified as result of these pensions have been increased empowerment of pensioners due to their greater say in household functioning decisions once they receive the pension (Case and Menendez, 2007) and serving as insurance against risks to household consumption and investment (Barrientos and Lloyd-Sherlock, 2002).

However, much fewer studies have focused on the impact of non-contributory pensions on diverse health outcomes. For Brazil, Lloyd Sherlock (2006) notes that besides an impact on levels of poverty, non-contributory pensions also facilitate access to essential healthcare items such as prescription drugs, which are seldom freely available through the state health system, and thus having a direct impact on health conditions. Impact of non-contributory pensions and cash transfer schemes outside the economic sphere in Mexico, particularly of the Oportunidades and Setenta y más programmes have shown some results. Among them, the mental health of elderly adults has significantly improved (Galiani, Gertler and Bando, 2014), effects on reduction of depressive symptoms have been noted (Salinas Rodríguez et al.,
2014a), on vaccination coverage (Salinas-Rodríguez and Manrique-Espinoza, 2013) and an increase in empowerment observed (Salinas Rodríguez et al., 2014b).

While Mexico only started a universal, nationwide non-contributory pension in 2013, several states implemented their own local scheme at least a decade before. Distrito Federal (Mexico City) was the first one to implement a non-contributory pension in 2000 with other states following suit. In Yucatán, the non-contributory pension program was introduced in urban areas in 2008. The Yucatán’s implementation was designed to conduct an evaluation of the program’s impact on the health and wellbeing of the older population in parallel.

Even when studies have reported how the concepts of morbidity-frailty-disability-mortality are related and clearly interact in the ageing process, pinning down the relations between them has not proved to be simple. Equally, it is clear that the ageing process does not follow a clear and timed pattern, and has led to a “dynamic” view of the role frailty and disability play in later life. Thus, frailty functions as an optimal outcome indicator in trying to explore the effects of the non-contributory pension in health and well-being of older adults.

In this context, the aim of this study is to evaluate the effects of non-contributory pension programs. Specifically, to investigate if the program has an impact on frailty, a more comprehensive way to describe an older population’s situation, and one of the most used indicators of health and physical well-being in older adults. This paper exploits the introduction of two very similar permanent non-contributory pension programs in the State of Yucatán, Mexico, which have as the key difference between them, the frequency of the payments: Reconocer Urbano (monthly pension or high frequency) and 70 y Más (bimonthly (every two months or low frequency).

In order to evaluate its impacts, Reconocer Urbano was rolled out experimentally: first, two towns with similar characteristics were chosen; second, one of them (Valladolid) was randomly selected by the government of the State to receive the program in 2008 (see Aguila et al. 2014) for a more detailed description of the town matching and selection process). The control town, Motul, did not receive the program. We conducted baseline surveys (Wave 1 or W1) in Valladolid and Motul before the roll-out of the monthly pension program in Valladolid in December 2008. Towards the end of the first follow-up surveys (Wave 2 or W2), in the summer of 2009, the Federal government began extending 70 y Más, which originally targeted towns with less than 20,000 inhabitants, to towns with less than 30,000 inhabitants. As a result, on July 28 of 2009, households in Motul became eligible for the federal bimonthly pensions but not households in Valladolid because it had more than 30,000 inhabitants. In the first follow-up around 30 percent of the age eligible individuals in Motul report that they just started receiving 70 y Más. We consider that the contamination of the original control group is an
opportunity to understand the effects of the differences in frequency of payments of non-contributory pension programs so we decided to conduct a second follow-up survey in 2010 (Wave 3 or W3) in both Valladolid and Motul. By that time Valladolid was still only eligible to receive the monthly pensions.

**Methods**

**Study Design and Participants**

The government of Yucatan was interested in providing a non-contributory pension and after conducting financial sustainability analysis concluded they could provide a pension of $550 pesos ($67 USD) per month at purchasing power parity (2013 PPP). The amount of the pension is similar to other countries in Latin America such as Colombia and Peru where in 2013 USD PPP the amounts of their programs were $44 and $75 respectively (Help Age International, 2014), but clearly below any basic pension in high-income economies such as the United States and European countries.

The cash transfer programme was designed as an income supplement program for all individuals 70 years and older living in urban areas of more than 20,000 inhabitants in the State of Yucatan, Mexico. The transfer provides an amount equal to 31% of minimum wages and about 44% of average household income in Yucatan for elderly receiving benefits in the treatment group, representing a significant income supplement. A federal program already covered towns in Yucatan with less than 20,000 inhabitants so this program was designed for those with more than this number of residents. The Government of Yucatan made the decision in 2008 to implement the program in Valladolid as the first treatment city, where all residents age 70 and older were eligible to receive the non-contributory pension benefit. RAND and the government of Yucatan chose the locality of Motul as a control group for evaluation purposes because they were most similar. Valladolid was assigned to treatment and Motul to control. The study was double blind because the interviewers did not know which town would receive the pension during the baseline interview.

Before announcement and program implementation, we designed and conducted a baseline survey (W1) of elderly adults age 70 or older living in these two towns from August and September 2008. Interviews were conducted at their homes in either Spanish or Mayan, the two local languages. Eligible adults in the treatment town, Valladolid, started receiving income benefits in December 2008. The first follow-up survey (W2) in Motul and Valladolid were conducted in June and July 2009, six months after the program introduction. The second follow-up survey (W3) in Valladolid and Motul was conducted in June, July, and August 2010,
one and a half years after Valladolid started receiving the monthly pension and approximately one year after elderly in Motul started receiving the bimonthly pension program.

At the start of the experiment, federal social security pensions were only given to elderly in towns smaller than 20,000 inhabitants. Unexpectedly, the federal government started providing pensions in some towns with more than 20,000 inhabitants. Motul was one of these towns, Valladolid was not. The result was that some of the control households had just received their first federal pension at the time of the interview, whereas others had not. We have excluded the households that did receive the federal pension at the time of follow-up from the comparison. If we include them, results hardly change, most likely because the federal pension was too recent to have much of an impact already.

The federal government program 70 y Más is a national non-contributory pension program similar to Reconocer Urbano. The program provides a bimonthly cash payment equal to MXN$1,000 or US$127.80 at 2013 PPP to individuals 70 and older. The program is run by the Ministry of Social Development (Secretaría de Desarrollo Social or SEDESOL) and was introduced in 2007 to rural localities with less than 2,500 inhabitants. In 2008, 70 y Más was extended to towns with up to 20,000 inhabitants and in 2009 to towns of up to 30,000 inhabitants. In 2012, the program 70 y Más was extended to the whole country for individuals 70 years old or older without other social security benefits, covering almost 80,000 localities across Mexico and more than 3.5 million beneficiaries.

Motul became eligible for 70 y Más after the 2009 changes in the eligibility criteria. In July 2009, individuals aged 70 or over in Motul began receiving the non-contributory pension from 70 y Más. Valladolid remained ineligible for the federal government program until 2012.

The questionnaire used for the interviews is comparable to the Mexican Health and Aging Study (MHAS) and the Health and Retirement Survey (HRS). Anthropometric measurements for every age-eligible respondent, including height, weight, and waist circumference were collected, as well as performance measures for lung capacity, gait speed and grip strength.

The institutional review board at RAND approved the research project and the data-safeguarding procedures. Participants provided free and informed written consent separately for the self-reported questionnaire and measurement of biomarkers (Aguila et. al, 2015).

To build the sampling frame for this study, we first carried out a complete listing of all households in each town and screened them in order to identify households with age-eligible adults. In collaboration with INEGI, the National Institute for Statistics and Geography (the federal agency in Mexico responsible for conducting the population census in addition to many other surveys) they provided maps of the towns selected for each phase of Reconocer Urbano, and updated these maps as necessary (a cartographer accompanied our data collection team, updating the maps as households were being listed).
The listing of households in Valladolid and Motul was conducted during June and July 2008. This created the sampling frame for the baseline survey. We compared the information (total number of households, number of households with age-eligible individuals and age-eligible individuals in the households) collected during the listing in Valladolid and Motul with the information of the Mexican Census 2005. Overall, the number of observations is very similar between our listing and the Census 2005, with small differences, mainly as a result of the different years of data collection (2005 vs. 2008) (Aguila et al. 2014).

The response rates at baseline were 91.54 percent in Valladolid and 95.32 percent in Motul; in the first follow-up survey response rates were 87.9 percent and 81.9 percent; and in the second follow-up the response rates were 80.6 percent and 78.5 percent, respectively. From the original sample interviewed at baseline in Valladolid of 1,348 individuals, 69 persons died, 19 changed addresses, 30 could not be contacted and 66 refused to be interviewed between baseline and first follow-up. The baseline sample in Motul comprised 1,146 respondents. Between baseline and first follow-up 64 persons died, and 17 changed addresses, 1 was too sick to be interviewed, 35 could not be contacted, and 101 refused to be interviewed. Between first and second follow-up surveys, 70 persons died, 23 changed addresses, 6 were too ill to be interviewed, 65 could not be contacted, and 114 refused to be interviewed in Valladolid, and 59 persons died, 28 changed addresses, 46 were unable to be contacted, and 98 refused to be interviewed in Motul. We conducted an attrition analysis comparing demographic characteristics of the baseline respondents with the panel respondents and we did not find statistically significant differences (Aguila et al. 2015).

**Frailty**

Given its ability to predict adverse outcomes (Bergman et al., 2007) frailty was chosen as our main indicator to investigate the possible effects of the non-contributory pension in the state of Yucatan. Definition: Using the information available in the study, we generated a frailty indicator following a slight modification of Fried’s frailty phenotype (Fried et al., 2001). The definition of the criteria included in the phenotype are as follows.

**Weight loss.** Defined through self-reported, unintentional weight loss ≥3 kg in the three months before the interview. Respondents who responded losing three or more kilograms were classified as positive with this criterion.

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1 The response rate reported is AAPOR RR2, defined as the number of complete interviews (including proxy interviews) divided by the number of interviews (complete plus partial) plus the number of non-interviews (refusal and break-off plus non-contacts plus others) plus all cases of unknown eligibility following the guidelines of the American Association for Public Opinion Research (American Association for Public Opinion Research 2011) for calculating non-response rates.
Grip strength (weakness). Measured in kilograms using a hand-held dynamometer taking into account the dominant hand of the subject. A total of two measurements were taken for each participant. For men and women separately, according to body mass index quartiles, those in the lowest grip strength quartile for each BMI quartile were classified as positive for this criterion.

Exhaustion (poor endurance and energy). The study in Yucatán includes the CIDI-SF depression test (Kessler et al., 1998), where we used the question: Did you feel more tired out or did you have less energy than is usual for you? These responses were used to determine the exhaustion criterion in the frailty phenotype. Participants who responded “Yes” to this question were classified as positive for this criterion.

Walking speed (slowness). Assessed through a timed 12 feet long walk, at normal pace, after the interviewer placed measuring tape alongside the space where the walk took place. The test was completed two times and the faster time performed was used. For men and women separately, according to mean height, those in the lowest walking time quartile were classified as positive for this criterion.

Physical activity. Because the study does not include detailed questions on time spent on physical activities and its intensity, we use as proxy the question: On average during the last month have you exercised or done hard physical work three or more times a week? This question includes various activities such as sports, heavy household chores, or other physical work. Those who responded “No” to the question were classified as positive for this criterion.

After generating each of the individual criteria, we constructed a summary measure with minimum value zero (no deficits) and maximum of five (all deficits) as a first indicator to explore transitions between baseline and follow-up waves. Following the original definition by Fried and colleagues (2001), an additional variable was created by classifying respondents into three categories: not frail, pre-frail, and frail.

Outcomes

Two disability domains were explored: activities of daily living (ADLs) and instrumental activities of daily living (IADLs). For ADLs, participants report their ability (or lack of) to perform four tasks from the Katz ADL scale (Katz, 1976): bathing, walking, transferring themselves from bed to chair, and feeding themselves. For IADLs, participants report their ability to perform four activities according to Lawton and Brody’s Instrumental Activities of Daily Living Scale: preparing a hot meal, shopping for groceries, managing own money and administering their own medication (Lawton and Brody, 1969).
Covariates

We include age, gender (1 = male, 0 = female), marital status (1 = married or consensual union, 0 = otherwise), Mayan speaker (1 = Mayan, 0 = Spanish), number of household members, and years of education.

Statistical Analysis

Given that the two towns are similar in terms of their location in the State of Yucatan—and their socioeconomic and demographic characteristics—we would expect the introduction of the pension programs to have similar effects if the programs had been exactly the same. Therefore, we attribute the differences in the outcome variables to the difference in the design of these two programs: namely, the periodicity of the payments (monthly and bimonthly). First, we analyse the mean difference in the changes between W1 and W3 between the two groups. The comparison is subject to the caveat that by W3 the monthly program had operated for longer because the monthly program started in December 2008 and the bimonthly program started in July 2009. To the extent that some recipients take a long time to adapt their behaviour, the W1-W3 comparison would tend to overestimate the impact of the monthly program in comparison to the bimonthly program. This would not affect outcomes whose effect is fully realized within one year.

Second, we compare the changes in outcomes that occurred between W1 and W2. By comparing W1 and W2, we analyze short-term changes following the introduction of the monthly pension program. While in W1 none of the towns were receiving pensions, by W2 the elderly of Valladolid had been receiving monthly pension payments for approximately six months, while the elderly in Motul during the fieldwork for W2 started receiving the bimonthly program. We assume negligible effects of the bimonthly program for elderly in Motul who started receiving the pension while we were collecting the W2 data. We conducted robustness analysis by including and excluding individuals in Motul who received the bimonthly pension during W2 and we did not find statistically significant differences, likely because the program in Motul was too recent to have an impact already.

Third, we analyze changes between W2 and W3 to compare the effects of the introduction of the bimonthly program in comparison with the monthly program. It is important to note here that, to the extent that certain effects of the monthly program take more than six months to fully realize, the W3-W2 comparison does not fully capture the effects of the bimonthly program, i.e. Valladolid is an imperfect control group for the introduction of the bimonthly program in Motul.

We examine mean differences in outcomes between first and second follow-up surveys and baseline in the monthly program minus mean differences between first and second follow-up surveys and baseline in the bimonthly program (Diff-in-Diff). Diff-in-Diff assumes that there are
no important differences between both towns that interact with the outcomes we are measuring.

**Findings**

This preliminary results show that the frailty index declined for women and men in the monthly program between W1 and W3, 18 months after the introduction of the intervention. The effects are larger for women. We observe a small decline in the frailty index for the bimonthly program but it is not statistically significant. The decline in frailty for the monthly program is driven by the decline in low energy or poor endurance. This may indicate that the non-contributory pension program is improving overall wellbeing. In the estimates comparing W1 and W2, we start observing a decline in low energy or poor endurance for women and men in the monthly program. The comparison between W2 and W3, shows a decline in frailty for the bimonthly program that is statistically significant at the 10% level. A modest decline in frailty for the bimonthly program 12 months after the introduction of the non-contributory pension program is also observed. This seems to be driven by a decline in slowness (improved gait speed) for women and no effects on men (Figure 1).

In terms of Activities of Daily Living (ADL), we observe a statistically significant decline between W3 and W1 in the proportion of women reporting difficulty eating and using the toilet in the monthly program. We also observe a decline in the proportion of men reporting difficulty in eating by themselves. The ADL score (0-6) also declines for women and men in the monthly program. In contrast, we observe an increase in the proportion of men reporting difficulty eating and using the toilet in the monthly program and for women a decline in the proportion reporting difficulties with getting dressed. There are no effects for the monthly program between W2 and W3. For the bimonthly program we observe an increase in all the indicators of ADL for men and women between W2 and W3. These results may indicate a more immediate effect in the monthly program in terms of declining ADL in comparison to the bimonthly program.

For Instrumental Activities of Daily Living (IADL), we observe a slightly stronger decline for men than for women in the monthly program between W3 and W1. We find that the proportion of men reporting a difficulty with preparing a hot meal and shopping for groceries declines and for women only the proportion reporting a difficulty with preparing a hot meal. Also the IADL score (0-5) decreases (less difficulties), albeit more for men than for women in the monthly program. Similarly to ADL, we find an increase in IADL score and the proportion of men and women reporting a difficulty with preparing a hot meal, shopping for groceries, and managing
and taking medication. When comparing W1 and W2, we find a decline in the proportion of women and men reporting a difficulty shopping for groceries and in the IADL score in the monthly program. For men we also find a decline in reporting a difficulty preparing a hot meal. Indicators of IADL increase for men and women in the bimonthly program between W2 and W3. These findings may indicate that there is an immediate effect reducing ADL and IADL in the monthly within six months and we do not find evidence of any effects in the bimonthly program.

Initial results show evidence of a decline in functional disability and frailty in the monthly program in comparison to the bimonthly program. The latter may indicate that non-contributory pension programs have an impact in the health and wellbeing of the older population, particularly in terms of frailty and functional disability. Finally, the effect is stronger when the program is disbursed more frequently.

Discussion

According to the Life Cycle Hypothesis (LCH), main tool in economics to analyze household consumption decisions, an individual smoothes its marginal utility of consumption across periods to maximize utility during his or her life span. According to the LCH after an increase on permanent income (introduction of the non-contributory pension), individuals adjust their budget constraints to smooth consumption across periods and the frequency of benefits payments should not affect consumption smoothing between pay checks. In a previous study for this case, Aguila et al. (2016) find that compared to the bimonthly program, the monthly program increased doctor visits, reduced the incidence of hunger spells and lessened the need for support from charities. Under the bimonthly program expenditures on food and beverages significantly decreased near the end of the pay-cycle, while in comparison with the monthly program expenditures on more expensive non-cereal food as well as ownership of durable goods are higher. These findings suggest individuals’ in a more frequently disbursed program spend more on food and medicines than in the bimonthly program and that may explain the stronger effects we find in this study in terms a higher decline in frailty, ADL, and IADLS’s.

Acknowledgements

We thank the staff on the ground in Yucatan—supervisors, directors, coordinators, interviewers, programmers, and administrators—who made the project possible.

Funding. This research was supported by funding from the State of Yucatan and by Grants R01AG035008, P01AG022481, and R21AG033312 from the National Institute on Aging and various units at the RAND Corporation.

Competing interests. None declared.
Figure 1. Transitions in frailty indicators and Frailty Index score, for men and women and location of program.

**Valladolid (monthly program)**

**Female**

- Involuntary weight loss
- Weakness (grip strength)
- Low energy/poor endurance
- Slowness (gait speed)
- Low physical activity level
- Frailty Index

**Male**

- Involuntary weight loss
- Weakness (grip strength)
- Low energy/poor endurance
- Slowness (gait speed)
- Low physical activity level
- Frailty Index

**Motul (bimonthly program)**

**Female**

- Involuntary weight loss
- Weakness (grip strength)
- Low energy/poor endurance
- Slowness (gait speed)
- Low physical activity level
- Frailty Index

**Male**

- Involuntary weight loss
- Weakness (grip strength)
- Low energy/poor endurance
- Slowness (gait speed)
- Low physical activity level
- Frailty Index
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