

**Do income transfers for the old improve health?  
The impact of a non-contributory pension programme on old-age health in Colombia**

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**ABSTRACT**

Non-contributory pension programmes are a major social protection mechanism to alleviate poverty in old age. We examine the health impact of *Adulto Mayor*, a major program that provides cash transfers to old individuals living in poverty in Colombia, and benefits more than a million individuals. Based on data from the most recent Demographic Health Survey covering 19,000 old respondents, we use a “fuzzy” regression discontinuity design that exploits discrete thresholds for program eligibility on a household poverty index. We find strong evidence that municipality thresholds for programme eligibility increase the probability of enrolling into the program. However, we find little evidence that the programme has any beneficial effect on the physical or mental health of older beneficiaries. Our study has implications for understanding the causal relationship between income and health in old age and for the development of social protection programmes for the old in low- and middle-income countries.

## BACKGROUND

While many countries have implemented contributory pension schemes for employees in the formal sector, more than half of workers in low- and middle-income countries are in the informal sector and lack any social protection mechanism by the time they reach old age. In Latin America, approximately 38 million people are currently above the age of 65. Due to population ageing, however, it is estimated that more than 140 million people will be older than 65 by 2050, many of which will not have contributed to old age pensions. As a response to these trends, non-contributory cash transfers to vulnerable populations are increasingly used as a social protection mechanism to alleviate poverty in old age in Latin America (Inter-American Development Bank, 2014). Up till now, however, very few formal evaluations have been carried out to assess the impact of income transfer on the health and well-being of older people in low- and middle-income countries.

This paper contributes to the literature by assessing the impact of *Adulto Mayor*, a non-contributory pension programme recently introduced in Colombia and benefiting more than 1.2 million older individuals. We focus on the impact of the programme on the physical and mental health. An extensive body of literature suggests that income is associated with health, but whether policies that transfer income to the poor in old age improve health has not been established. For this purpose, we use a “fuzzy” regression discontinuity design that exploits discrete thresholds in a household poverty index. Program eligibility is determined by a scoring system known as SISBEN (beneficiary identification system) in combination with age-eligibility criteria requiring female beneficiaries to be older than 52 and male beneficiaries to be older than 57.

The discrete threshold eligibility for the program in each municipality enables us to adopt a regression discontinuity design provided certain considerations. It has been shown that, in practice, official SISBEN scores are manipulated (DNP,2001;2003; (Camacho & Conover, 2011)). Following Miller et al. 2009, we generate SISBEN scores for each individual using relevant variables from the 2010 Demographic and Health Survey (DHS) (Gasparini, Alejo, Haimovich, Olivieri, & Tornarolli, 2010)(Gasparini, Alejo, Haimovich, Olivieri, & Tornarolli, 2010)(Gasparini, Alejo, Haimovich, Olivieri, & Tornarolli, 2010)(Gasparini, Alejo, Haimovich, Olivieri, & Tornarolli, 2010). We then use these scores to instrument for receipt of cash transfer from *Adulto Mayor*. We implement this approach using a two-stage least square model that examines whether exogenous variation in program receipt cause by arbitrary thresholds has an impact on health.

The importance of PPSAM comes from its unprecedented increase in number of beneficiaries during the last years. In 2006 it reached 240.211 elderly poor and by 2010 it covered 496.721 beneficiaries (DNP, 2007 –Conpes105; Defensoria del Pueblo, 2012). By December 2012, the PPSAM has changed its name to “Colombia Mayor”, and covers 1.103 municipalities with 718.376 beneficiaries of the subsidy. By the end of 2013, the program reached around 1.27 million beneficiaries and the government of the Colombian president Manuel Santos has announced that by 2018, it intends to reach 2.4 million elderly poor over 65 years old throughout the country (Consortio Colombia Mayor, 2013; Ministerio de Trabajo, 2014). Figure 1 shows the number of beneficiaries of the PPSAM program over time and the substantial growth in beneficiaries the program has seen since 2011.

The program provides direct cash payment to beneficiaries’ bank accounts. In addition, the programme offers basic social services including access to welfare centers for the elderly, indigenous

shelters, and other Welfare programs. The program is funded by the national government but it can receive co-financing from the regional government (Ministerio(Ministerio de Trabajo de Colombia, 2014)(Ministerio de Trabajo de Colombia, 2014)(Ministerio de Trabajo de Colombia, 2014)(Ministerio de Trabajo de Colombia, 2014). The average amount of the subsidy can oscillate between 40.000-75.000 Colombian pesos (around 20 – 37 USD). The average amount of the direct subsidy has been 62.391 Colombian pesos, around 30.50 USD paid every two months (Defensoria del Pueblo de Colombia, 2012)(Defensoria del Pueblo de Colombia, 2012)(Defensoria del Pueblo de Colombia, 2012)(Defensoria del Pueblo de Colombia, 2012)).

## Data

The Demographic and Health Survey (DHS) is a nationally representative household survey that collects data on several indicators of population, health and nutrition. The standard DHS surveys have large sample ranging from 5.000 to 30.000 households. They are usually carried out between periods of 5 years to allow for comparison across time (USAID, 2014). In the case of Colombia, DHS surveys have been carried out in periods of 5 years starting in 1986 and ending in 2010. We use the latest DHS survey, which has a full sample of approximately 200.000 individuals.

For our estimation purposes, we focus on the individuals above 52 years old, which is the age at which female individuals qualify for receiving the program. The sample size for this age group is around 31.000 individuals. From these, 22.000 individuals are urban dwellers, and around 9.000 live in rural areas. The 2010 DHS in Colombia has a specific module focused on older adults, which asks specific questions regarding physical, mental and emotional well-being, as well as access to services targeted to the old. The number of respondents of this segment is approximately 18.000 older individuals. For summary statistics refer to Appendix B.

## Methods

The program eligibility threshold introduces an abrupt discontinuity across otherwise similar households, enabling us to study changes in health outcomes and service utilization that could be attributed to receipt of program benefits. Because there are individuals that receive the pension that should not be receiving it (cross-overs), and individuals who do not receive it who should receive it (no-shows), it is appropriate to use a fuzzy regression discontinuity design. We use a 2SLS approach, whereby we simulate PPSAM pension eligibility in the first stage equation, focusing on urban households, as follows:

$$reception_{ih} = \alpha + \varphi below_h + \beta SISBEN\_diff_h + \sum_k \delta_k estrato_{hk} + \eta' Controls_{ih} + \mu_d + \varepsilon_{ih}$$

where,

*reception* is an indicator variable for whether an individual *i* in household *h* receives the PPSAM pension

*below* is an indicator variable for SISBEN II scores falling below the national eligibility threshold

*SISBEN\_diff* is the SISBEN II estimated scores normalized such that the threshold is 0

*estrato* is a dummy variable that is used in Colombia for socio-economic stratification of households for the payment of electricity

$\mu_d$  is department specific fixed effects

*Controls* is a vector of covariates that includes age, gender, affiliation to an insurance scheme and  $\epsilon_{ih}$  is the standard error term

After having simulated the PPSAM pension reception in the first stage equation, it is possible to link the simulated reception of the benefit with outcomes of interest:

$$outcome_{ih} = \rho + \lambda reception_{ih} + \theta SISBEN\_diff_h + \sum_k \psi_k estrato_{hk} + \pi' Controls_{ih} + \mu_d + \epsilon_{ih}$$

where,

*outcome* is the health, service utilization of food security outcome of interest. The coefficient that estimates the effect of being a beneficiary of the PPSAM pension is given by  $\lambda$ .

Official national threshold for qualifying for the PPSAM pension is a SISBEN score below 47 points. However, in practice, given the co-financing nature between the national and local governments of the program, the *de-facto* municipality thresholds are lower. To account for this, we estimate municipality specific thresholds by identifying for each municipality the 95<sup>th</sup> percentile of the SISBEN score among the beneficiaries of the PPSAM pension.<sup>1</sup> We use this as the threshold, imposing the condition that no threshold can be above 47 points.

### **Preliminary Results**

Table 1 shows our preliminary results. OLS estimates suggest that individuals receiving the programme are more likely to report having emotional problems, having difficulty concentrating and have other social issues relating to others. To account for endogenous participation in the program, the 2SLS estimation isolates the effect of receiving the pension exploiting the discrete SISBEN eligibility thresholds. Table 1 shows the preliminary results for the 2SLS regressions for several outcomes using within 10 points above and below the threshold. The highly significant coefficient of the instrument and the high F statistic indicate that the instrument strongly predicts program participation, satisfying one of the requirements for the Instrumental variable approach.

The first row of the Table shows the coefficients of the second stage for the impact of the programme on health outcomes. Second-stage coefficients in the 2SLS are not significant at conventional levels, with the exception of column (5), that uses as dependent variable an indicator for having learning difficulties. In this case, the coefficient has an unexpected sign, indicating that receiving the pension increases by 51% the probability of reporting learning difficulties. There is no evidence that the programme influences any of the physical or mental health outcomes examined.

### **Preliminary Conclusion**

Our study is innovative by exploiting discrete score thresholds for program eligibility to assess the health impact of Adulto Mayor, a non-contributory pension program targeting the old. We find that eligibility thresholds strongly predict program participation, however, we find no evidence that the program led to benefits on physical or mental health for beneficiaries. These results are preliminary, however, and further analysis will be carried out to assess potential heterogeneous effects. Our results raise questions on the potential reach of income transfer programmes and the relationship between income and health in old age.

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<sup>1</sup> (Chay, McEwan, & Urquiola, 2003) outline the approach to estimating the cut-offs when they are in fact not known.

**Table 1 .2SLS Regression Results for Outcomes of Interest for a bandwidth of 10 SISBEN points around threshold**

<i>Outcome</i>	<i>Self-Reported Bad Health (1)</i>	<i>Use of Health Services (2)</i>	<i>Illness in Last Month (3)</i>	<i>Is unable to concentrate (4)</i>	<i>Has Difficulty learning (5)</i>	<i>Has difficulty with friendships (6)</i>	<i>Has enough income (7)</i>
Reception of PPSAM (Second Stage estimate)	0.09 [0.31]	0.00 [0.02]	-0.08 [0.30]	-0.11 [0.20]	0.51** [0.35]	0.01 [0.13]	-0.04 [0.20]
Below Eligibility Threshold (First Stage Estimate)	0.05*** [0.01]	0.07*** [0.01]	0.07*** [0.01]	0.07*** [0.02]	0.07*** [0.02]	0.07*** [0.02]	0.080*** [0.02]
First Stage F-Statistic	19.89	15.83	15.83	15.83	15.83	15.83	15.83
OLS Estimate	0.04** [0.02]	0.00 [0.02]	0.02 [0.02]	0.02 [0.02]	-0.06*** [0.02]	-0.01 [0.01]	-0.06*** [0.01]
Observations	16.377	9.685	9.685	9.865	9.865	9.865	9.865
<i>Outcome</i>	<i>Difficulty to engage in community (8)</i>	<i>Reports emotional distress (9)</i>	<i>Cried or wanted to cry (10)</i>	<i>Reports Feeing uneasy (11)</i>	<i>Reports feeling joyful of living (12)</i>	<i>Has brain problems diagnosed (13)</i>	<i>Reports having clear mind (14)</i>
Reception of PPSAM (Second Stage estimate)	-0.01 [0.20]	0.16 [0.24]	-0.29 [0.26]	-0.16 [0.21]	-0.04 [0.17]	-0.13 [0.13]	-0.01 [0.26]
Below Eligibility Threshold (First Stage Estimate)	0.07*** [0.01]	0.07*** [0.01]	0.07*** [0.01]	0.07*** [0.01]	0.07*** [0.01]	0.07*** [0.01]	0.07*** [0.01]
First Stage F-Statistic	32.76	15.83	15.65	15.65	15.62	15.83	15.62
OLS Estimate	0.04** [0.02]	0.07*** [0.01]	0.04** [0.02]	0.03** [-0.02]	-0.03** [0.01]	0.00 [0.01]	-0.06*** [0.02]
Observations	9.865	9.685	9.620	9.655	9.654	9.654	9.654

\*Significant at the 10% level    \*\*Significant at the 5% level    \*\*\*Significant at the 1% level

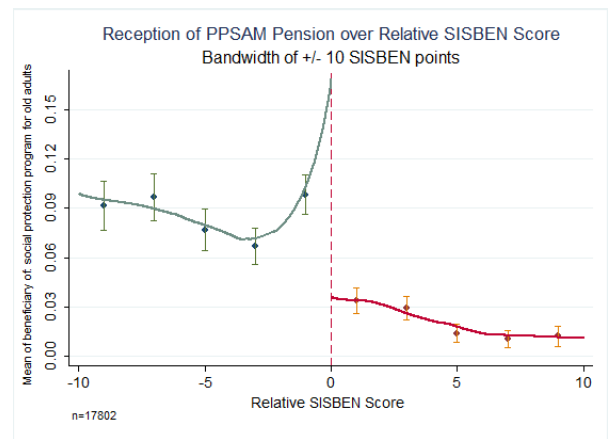
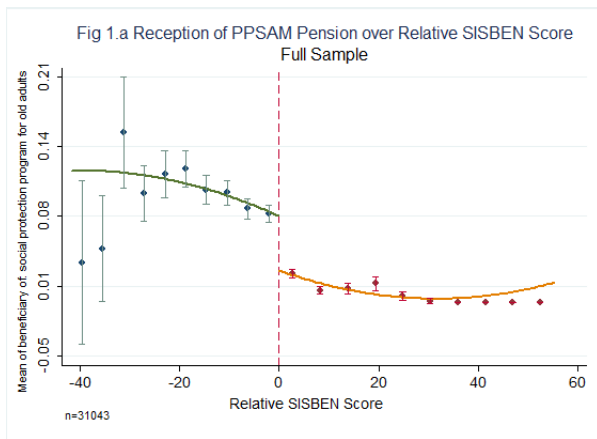
The top row indicates what dependent variable was used in the estimation. The first row indicates the second stage estimates for receiving the PPSAM pension, using as instrument an indicator variable that takes the value of 1 if a person falls below the national threshold of SISBEN scores for program eligibility. All specifications include age, gender, distance from threshold, SISBEN scores, “estrato” dummies and department fixed effects. Robust standard errors are shown in brackets.

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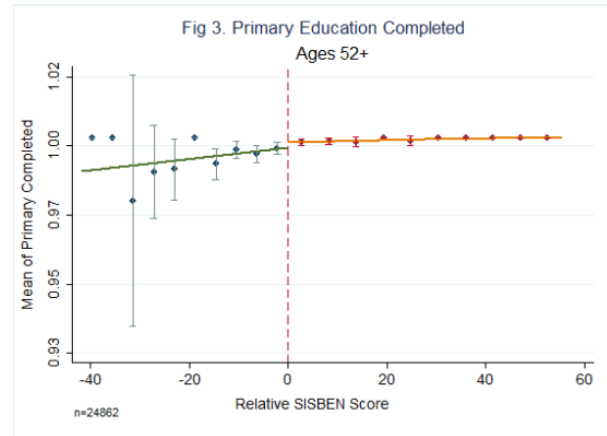
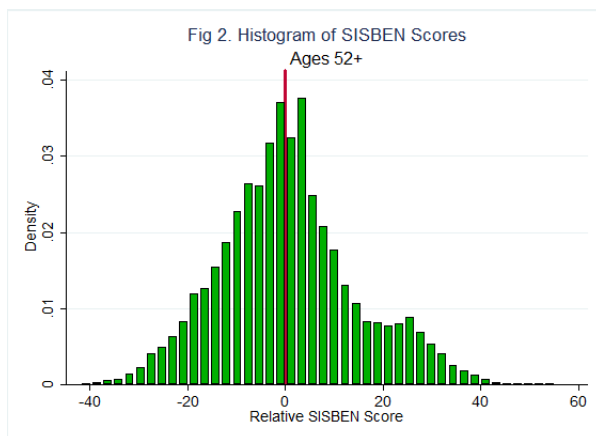
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## Appendix A. Graphical Analysis

The regression discontinuity design can be graphically assessed prior to conducting the formal regressions. For this abstract, we present the graphical analysis justifying the appropriateness of the specification strategy. The first step is to assess whether there is a jump at the discontinuity in the assignment of the treatment. This can be seen in Fig 1.a and 1.b using the full sample and a bandwidth of 10 points are used respectively. Fig 1.a has a quadratic line of best fit displayed, while Fig 1.b also include locally weighted scatterplot smoothing (LOWESS) estimates across the chosen bandwidth. It can be seen that in the first case, there is an approximate jump of 7%, while the LOWESS estimate yields a higher jump at around 12%.

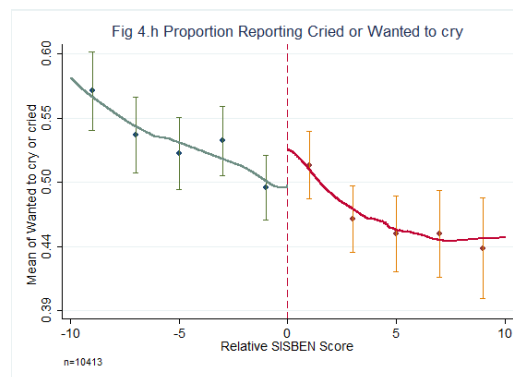
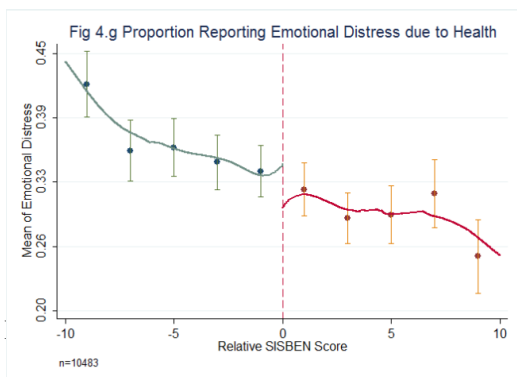
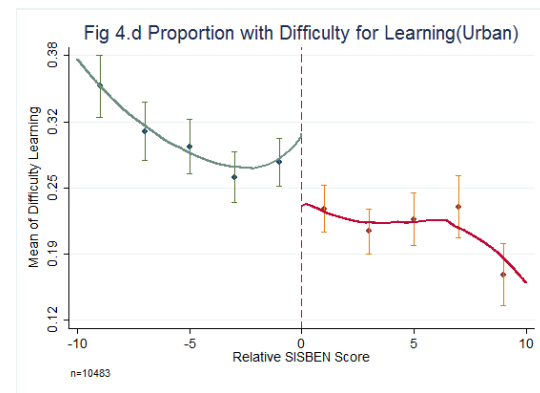
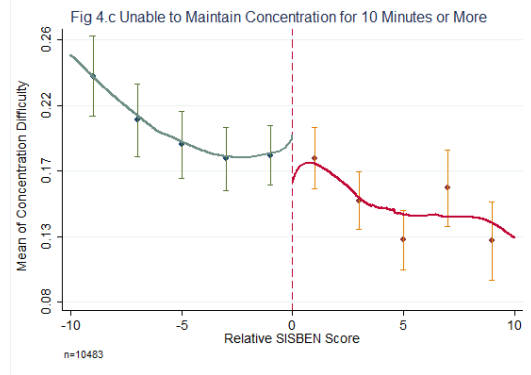
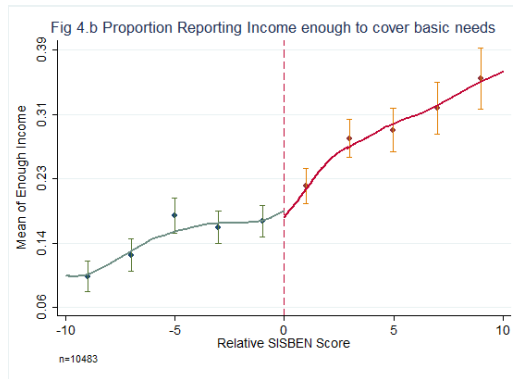
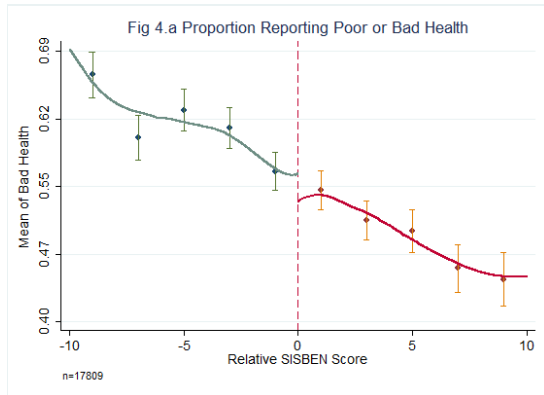


The second step is to assess the distribution of scores to identify potential gaming below the threshold. This can be seen in Fig 2. Although there is a higher density right below the threshold compared to right above it, the difference is about 5%, not substantial enough to indicate gaming. This will be further investigated in the final version of the paper. Third, we assess the discontinuity on a variable that should not vary at the threshold of the PPSAM pension. The variable selected is completion of primary education, shown in Fig 3 below. The graph indicates that there is no jump at the discontinuity for the selected non-outcome.

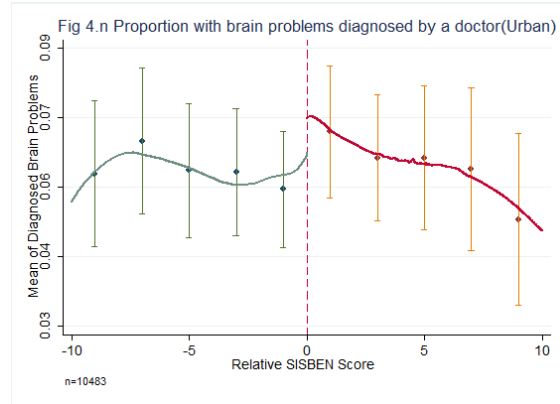
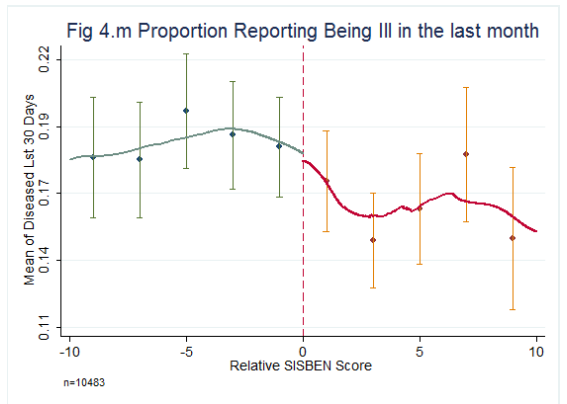
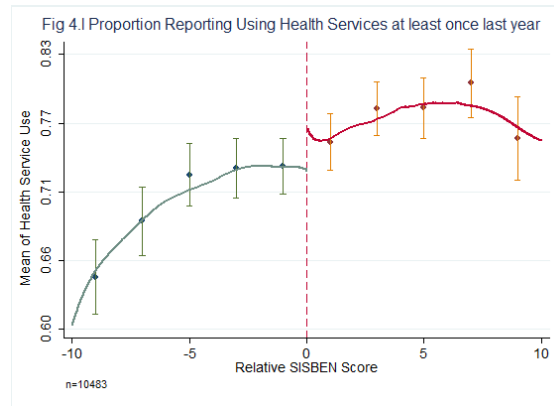
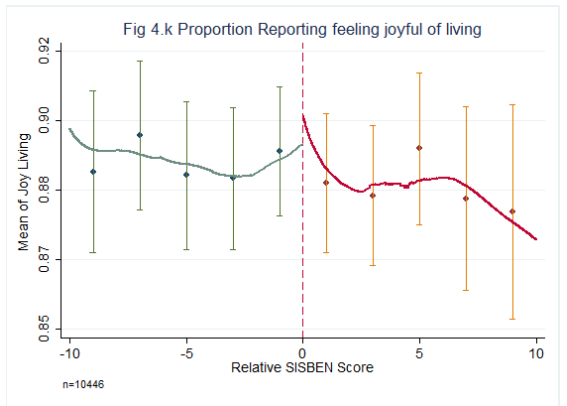
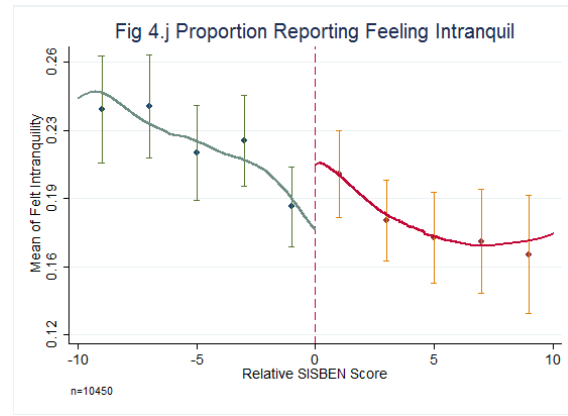
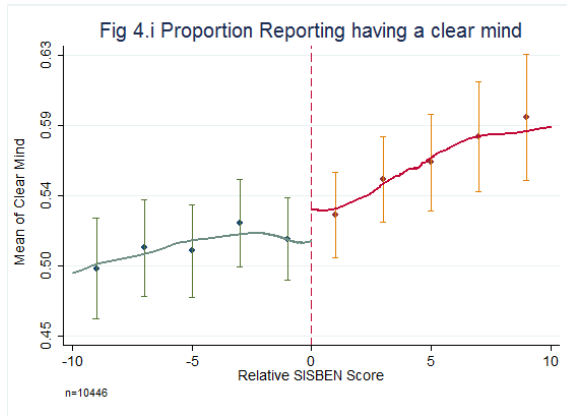
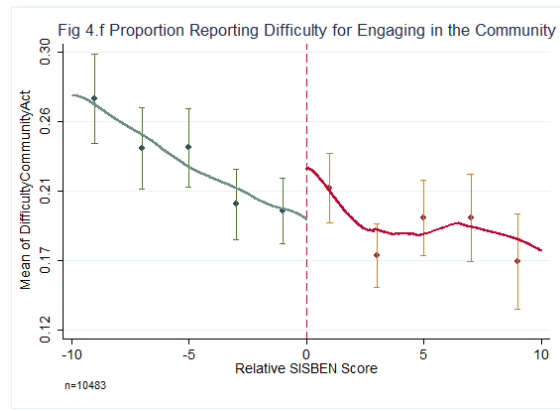
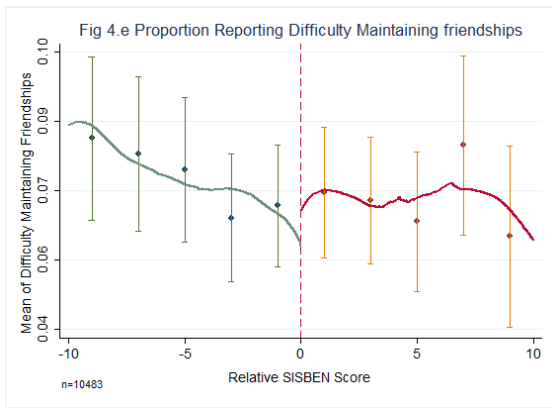


Finally, we have looked at several potential outcomes of interest using this graphical approach. These graphs can be observed below in Fig 4.a through Fig 4.n. The graphs are focused on the 10 point bandwidth around the threshold. The preliminary outcomes of interest include self-reported health, sufficiency of income, ability to concentrate, maintain friendships and engage in community activities. Also, variables related to emotional wellbeing and service utilization are also included. The graphs indicate that of the outcomes presented, a discontinuity in the expected direction can be found in the variables related to community engagement, wanting to cry or having cried, feeling uneasy and being diagnosed with a brain problem by a doctor. These jumps are not substantial and this is reflected in the confidence intervals intersecting across the bins above and below the threshold.

It is important to mention that this is a preliminary graphical analysis that looks at all the sample above the age of 52. It is important to analyze the urban-rural differences as well as combining some of the reported outcomes into single more comprehensive indicators of mental health.







*Appendix C. Summary statistics*

<i>Variable</i>	<i>Full Sample</i>			<i>Receiving PPSAM Pension</i>			<i>Not Receiving PPSAM Pension</i>		
	<b>Mean</b>	<b>SD</b>	<b>N</b>	<b>Mean</b>	<b>SD</b>	<b>N</b>	<b>Mean</b>	<b>SD</b>	<b>N</b>
Received PPSAM Pension	0.06	0.23	31.112	-	-	-	-	-	-
Self-Reporting Bad Health	0.52	0.49	31.112	0.70	0.46	1.171	0.52	0.49	29.341
Income sufficient to cover needs	0.22	0.41	17.574	0.09	0.29	1.630	0.23	0.42	15.930
Difficulty concentrating	0.18	0.38	17.574	0.27	0.44	1.630	0.17	0.37	15.930
Difficulty learning	0.26	0.43	17.574	0.41	0.49	1.630	0.25	0.43	15.930
Difficulty maintain friendships	0.07	0.25	17.574	0.10	0.24	1.630	0.07	0.24	15.930
Difficulty engaging in community	0.21	0.40	17.574	0.33	0.47	1.630	0.19	0.39	15.930
Emotional distress due to health	0.33	0.47	17.574	0.48	0.49	1.630	0.07	0.24	15.930
Wanted to cry or cried	0.49	0.49	17.574	0.59	0.49	1.615	0.48	0.49	15.828
Clear mind	0.53	0.49	17.507	0.41	0.49	1.619	0.54	0.49	15.874
Felt uneasy	0.20	0.39	17.515	0.27	0.44	1.627	0.19	0.39	15.874
Felt joyful of living	0.88	0.32	17.507	0.85	0.34	1.619	0.88	0.31	15.874
With diagnosed brain problems	0.07	0.27	17.574	0.08	0.27	1.630	0.06	0.24	15.930
Last month medical service utilization	0.72	0.44	17.574	0.71	0.45	1.630	0.72	0.44	15.930
Illness in last month	0.17	0.37	17.574	0.21	0.40	1.630	0.16	0.37	15.930