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# Subjective well-being impact of old age pension in South Africa: A difference in difference analysis across the gender divide

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**Background:** South Africa provides old age pension (OAP), a non-contributory means-tested income transfer to persons aged 60 and above. More than two-thirds of the elderly population report receiving the OAP. Women have historically had a lower pension eligibility age of 60, while the eligibility of men decreased from 65 to 60 between 2008 and 2010.

**Aim:** This study analyses the impact of the OAP on the subjective well-being of the elderly in South Africa. The study aims at understanding the differential impact on the subjective well-being of male and female recipients.

**Methods:** The study adopts the difference in difference (DiD) impact evaluation framework to establish the impact of OAP using a sub-sample of data for elderly persons aged between 55 and 64, collected from the first four waves of the National Income Dynamics study. Linear and non-linear DiD models are estimated as robustness checks given the ordinal nature of the dependent variable.

**Results:** The OAP variable consistently produced positive and significant estimates for the sample as a whole. Further, anticipatory effect of OAP was not found to exist. A gender specific analysis indicates that female recipients have a positive and significant change in well-being as a result of OAP, while male recipients did not.

**Conclusion:** The difference in the well-being impact of OAP between male and female recipients can be attributed to the gender difference in the use and meaning of pensions. Our findings question the uniform criteria introduced for male and female recipients for OAP in South Africa.

**Keywords:** State transfers; old age pension; difference in difference; South Africa, impact evaluation.

## Introduction

The South African State provides old age pension[1] (OAP) which is a non-contributory means-tested income transfer to persons aged 60 years and above. This governmental support was introduced in 1928 for only white citizens and coverage was extended to the rest of the population only in the early 1990s (Legido-Quigley 2003). Women have historically had a lower pension eligibility age of 60 years and above, while the eligibility of men declined from 65 to 60 years between 2008 and 2010 (Schatz et al. 2012). The value and coverage of OAP has consistently risen since its implementation and stands at R1780 as announced in the 2019 budget. Sienaert (2008) and Woolard and Leibbrandt (2010) argue that the importance of the programme is underscored by the fact that more than two-thirds of the elderly population are pension recipients. The demand for the provision of social pensions is driven by poverty among the elderly as well as the breakdown in living arrangements (multi-generation), wherein younger individuals are either no longer able or willing to provide care for their aging parents (Case & Deaton 1998).

Although the desired policy outcome of social grants in South Africa – inclusive of the OAP – has been to redistribute income to the poor, elderly population and reduce income inequality, its role in life satisfaction has either been equated to or neglected in favour of economic well-being. There are a plethora of studies that have investigated the impact of grants on economic well-being impacts. For example, Ranchhod (2006) and Sienaert (2008) studied the OAP impact on labour supply, while Duflo (2000) studied the gender specific effects of pension income on child health; but very few studies have analysed the impact on subjective well-being. Given that the OAP grant

1.The OAP is one of eight grants in a broader social safety net system of income transfers. Other grants are: Social Relief of Distress, Grants-in-aid, Child Support Grant, Foster Care Grant, Care Dependency Grant, War Veteran's Grant and Disability Grant.

is over three times the value of the food poverty line (R547 in 2018), it represents a sizable source of income for the elderly and is therefore expected to produce positive and significant impacts on life satisfaction.

Ulloa, Moller and Sousa-Poza (2013) conducted an extensive review of the theoretical literature from economics, psychology and gerontology to provide insights into how subjective well-being evolves across an average lifespan. However, the study concedes that it is difficult to estimate, with certainty, whether the relationship between age and well-being across a lifespan is linear or convex. Based on a cross-country analysis Shin (2018) analyses the impact of public pension on well-being but does not find a significant relationship. One limitation of this study is that it does not identify a causal impact and further does not differentiate gender. Contrary to Shin (2018), Grogan and Summerfield (2019) used a fuzzy regression discontinuity methodology in a Russian sample and found pension to positively impact on the well-being of predominantly women. The study used a five-point scale to capture the life-satisfaction spectrum, however, the literature indicates that life satisfaction is ideally measured on a 10-point Cantril ladder scale (Ortiz-Ospina & Roser 2019). The only known study, to the best of the authors' knowledge, that directly relates OAP to subjective well-being of recipients in South Africa is Schatz et al. (2012). The study finds that despite improving financial well-being, the impact of pensions on subjective well-being is gendered and transitory. According to the study, well-being for recently pension-eligible women (aged 60–64 years) was higher compared to women in the pre-pension-eligible category (age 55–59 years), confirming the positive impact of pension on the elderly.

Schatz et al. (2012)'s study suffers from several methodological issues that may compromise the reliability of the findings. The first of these problems relates to the data used in the study. In the data used, there was no direct measure of pension receipt leading the authors to rely on age eligibility requirement to indicate that the grant was received. This is a problem because the South African OAP has age and income thresholds which must be met for an individual to qualify. Therefore, attaining the legal age of 60 years does not necessarily imply that the individual qualifies for a grant. Consequently, they admit that their results represent intent to treat and not necessarily average treatment on the treated effects. The second problem has to do with the model implemented, wherein the logistic regressions used do not necessarily establish causal effect. Further, the study suffers from being regionally constrained as it was conducted in the Agincourt sub-district in rural north-east South Africa near the border with Mozambique and cannot be said to be wholly representative of South Africa.

In this study we make several improvements to Schatz et al. (2012) due to the availability of the National Income Dynamics Study (NIDS) longitudinal data set which contains more detailed information on actual grant recipients enabling an impact assessment of the OAP. We also test for gender differences, based on the arguments made by Schatz et al. (2012) that the differences in gender roles and gendered poverty stresses pre- and post-pension receipt can result in statistically significant differences. Further, since men are more likely to have income prior to pension receipt, their pensions do less for household members' health and well-being compared to women (Case & Deaton 1998; Duflo 2003). We thus also expect the impact of OAP to be lower for men than for women. Furthermore, we also test for anticipation effect for men and women. The analysis is undertaken within a quasi-experimental setting which produces the causal average treatment on the treated. It is for these reasons that this study makes an original contribution to literature.

# Data and variables

## Data

The empirical analysis makes use of data from the NIDS conducted by the Southern Africa Labour and Development Research Unit (SALDRU). It is the first national panel study to document the dynamic structure of a sample of household members in South Africa (Leibbrandt, Woolard & De Villiers 2009). A total of 29 733 core sample members are tracked over four waves from 2008 to 2015 (Chinhema et al. 2016), allowing for analysis of key changes in peoples' experiences of their incomes, expenditure, assets, access to services, education, health and other dimensions of well-being.

The sample for the current study is restricted to an unbalanced panel of 1277 individuals aged between 55 and 64 years over the first four NIDS waves. The starting point for this quasi-experimental design is the identification of treatment[2] and control groups. Individuals in the treatment group consists of all elderly persons aged[3] between 60 and 64 years who receive pension on turning 60 years. There are two initial periods (prior to turning 60) without grant income proceeded by two post periods with grant income. Control group A (*Treat A*) is composed of individuals who are 55–59 years old and earn a monthly income of less than R12 300 which is also the government threshold at which co-residing couples qualify to receive the grant (SASSA 2017). The main reason for including this group is to check for the anticipatory effect of the OAP.

For the purpose of this study, individuals are weighted in accordance with the panel weights correcting for potential over-concentration or under-concentration of observations due to non-responses and attrition in the panel over the four waves (Chinhema et al. 2016). In general, the distribution of life satisfaction scores is similar regardless of whether the weights are applied (Kannemeyer 2016). Given the unbalanced nature of the panel data set (1277 individuals accounting for 2931 observations over the four waves), the panel weight serves the purpose of correcting for this bias.

## Variables

The dependent variable in this study is subjective well-being which is measured as the level of satisfaction that an

2.In this study, treatment refers to taking up the OAP.

3.Ages are separated into 5-year intervals to capture effect of recent grant take-up.

individual currently experiences. Within the adult questionnaire of the NIDS data set, individuals 15 years and above are asked to rate the current level of general life satisfaction on a scale from 1 to 10, where 1 represents 'very dissatisfied' and 10 represents 'very satisfied'. Following Woolridge (2012), we consider the variable as cardinal in nature given that the number of categories is more than eight. As such, linear estimation techniques are considered appropriate. Nevertheless, as a robustness check we collapse the response categories to three to account for measurement bias and apply ordinal regression techniques.

In the ordinary least square (OLS) regressions and fixed effects (FE) models, the target variable is the binary dummy variable for OAP recipient. The NIDS adult data questionnaire provides alternative indicators of the variable. In one instance respondents are asked to state if they currently receive the OAP grant while in another the actual amount of grant received is stated. The preferred approach in capturing the variable is to create a dummy which equals 1 if the elderly person receives OAP, and 0 otherwise. Based on the poverty alleviation and empowerment effects cited in literature (Case & Menendez 2007; Duflo 2003), we expect the OAP variable to have a positive and significant coefficient.

Due to the multi-determinant nature of the dependent variable, other covariates have been included in the various models in accordance with factors that determine life satisfaction in the literature. Income is a key determinant of well-being (Herrera, Razafindrakoto & Roubaud 2006; Hinks & Gruen 2007; Inkeles 1960). The measure of absolute income was constructed as total household monthly income (adjusted for inflation) divided by the household size (per capita income). We also include the square of per capita income to account for the diminishing returns to income that are suggested in the literature (Kollamparambil 2019). Both per capita income and its square are divided by 1000.

It has been recognised that individual utility or welfare functions may be interdependent, and that relative or comparison income may play an important role in determining well-being. Subjective well-being is predicted to be diminished by the higher income of others, through feelings of relative deprivation or reduced status (Posel & Casale 2011). The subjective measure of relative income is directly observable in the NIDS data. All adults are asked to assess their relative economic rank in South Africa by identifying their position on a six-rung ladder from poorest (1) to richest (6). The expected sign for the relative income variable is positive.

South African literature (Ebrahim, Botha & Snowball 2013; Hinks & Gruen 2007; Moller 1998) highlights that well-being differs substantially across races, with the black African race group experiencing lowest levels of well-being. As such we include a dummy variable taking the value 1 for the black race and 0 for others. The coefficient is expected to be negative and significant.

Health status has been noted as one of the most important determinants of subjective well-being and its significance is usually stronger than other variables such as income, education and unemployment (Gerdthman & Johannesson 2001). Kollamparambil (2019) notes that in the South African context health is a critical determinant of well-being. Perceived health status is measured subjectively and ranked as excellent (5), very good (4), good (3), fair (2) or poor (1). Gender is included in the estimations as a dummy variable, 1 being male and 0 otherwise. Studies in other country contexts have observed men to have higher levels of life satisfaction compared with woman (Meisenberg & Woodley 2015), however, in the South African case this has not come out statistically significant in recent studies (Kollamparambil 2019).

Marital status is obtained from the adult questionnaire where responses were classified as married, living with a partner, widow/widower, divorced/separated and never married. We collapsed these response categories by creating a dummy variable equal to 1 if the individual is currently married or living with partner and 0 otherwise. Blanchflower and Oswald (2004) and Myers (1999) provide evidence that married persons have higher subjective well-being than persons who are either separated, divorced or widowed. Botha and Booysen (2013) also find married individuals to have higher levels of life satisfaction in the South African context. The study further finds that married women report greater life satisfaction compared to women in other relationship arrangements.

There are various ways the education variable could be constructed but to give a simple and clearer measure, the various levels of education are converted into a single continuous variable measuring the total number of years of schooling the individual has obtained. Because education has both economic and non-economic benefits, it is assumed years of schooling will result in positive impacts on life satisfaction (Knight, Song & Gunatilaka 2009; Ravallion & Lokshin 1999; Throop 2011). Years of schooling is therefore expected to have a positive and significant impact on life satisfaction in South African literature (Ebrahim et al. 2013; Kollamparambil 2019).

Evidence on the impact of engaging in religious affiliations has produced consistent positive and significant impacts on life satisfaction (Clark & Lelkes 2005; Hayo 2004). The importance of religious activities in the NIDS data set is categorised as *not important at all*, *unimportant*, *important* and *very important*. Out of these four categories, a dummy variable is coded as 1 if the individual finds religious activities important or very important and 0 if not important at all or unimportant. Based on the South African studies that have highlighted the important role religion plays in the well-being of individuals (Kollamparambil 2019), we expect the coefficient to be positive and significant.

We also include a variable that measures individuals' perceived safety in their communities (Powdthavee 2005). Naturally, if they feel their neighbourhood is unsafe and that

crime in their neighbourhoods is high, this is expected to impact negatively on their subjective well-being.

The size of the household determines the support structure or responsibility of the elderly and hence is expected to impact on individual well-being (Díaz-Venegas, Sáenz & Wong 2017). In South Africa and most African countries, it is not unusual to find extended family members living with a breadwinner who supports them financially (Malde, Scott & Vera-Hernández 2015). Besides the heavy financial burden of extended family, frequent quarrelling and fighting are more prevalent in larger families and these are expected to negatively affect life satisfaction of the individuals in the household. Detailed definitions of variables included in the analysis are provided in Table 1-A1, in Appendix 1.

# Econometric methodology

The causal impacts of the old age grant on subjective well-being is established in this article using a quasi-experimental difference-in-difference (DiD) regression design. Particular attention is paid to overcome the differences in unobservable characteristics between programme participants and non-participants through propensity score matching (PSM) (Wapenaar & Kollamparambil 2019). In doing this, the estimation procedure eliminates the problem of sample selection bias – the possibility that those who are eligible or who take up the grant are systematically different from those who do not qualify (White & Sabarwal 2014). This framework, along with robustness checks, establishes an argument for causality.

Various models are estimated, each increasing in sophistication and robustness by improving in capacity to account for potential biases of the treatment estimate generated by confounding factors, endogeneity and non-random self-selection into treatment (Mulcahy & Kollamparambil 2016). Due to the ordinal nature of the life satisfaction variable, the use of linear models that assume the cardinality of subjective well-being scores is brought into question. However, Woolridge (2012) suggests that OLS may be used with numerically labelled scales that have more points, usually 8 and above.

A limitation often mentioned about the Cantril ladder measure is that it assumes that the distance between response categories is equal. Moreover, there is an inherent subjective element in the association of each category on the ladder with the level of well-being. These two elements result in measurement bias which can be minimised by rearranging the 10-point scale into fewer categories. Therefore, as a robustness check we create three categories on subjective well-being and undertake non-linear ordinal DiD estimations as well.

The methodologies employed in this article all take into consideration the panel structure of the data, controlling for individual-specific effects and time invariant unobservable characteristics. These models are presented in the following sections.

## Model 1

To account for the socio-demographic and socio-economic factors that determine life satisfaction, we employ a pooled ordinary least square regression (POLS) which is modelled as follows:

$$y_i = \beta_0 + \beta_0\, 0AP_i + \delta X_i + dT + \varepsilon_i \qquad \text{[Eqn 1]}$$

$y_i$ is life satisfaction for individual $i$, OAP is a dummy 1 for receiving pension income and 0 for not receiving pension. $X_i$ is a vector of explanatory variables explaining individual $i$ and T is the time trend variable. The panel data structure is ignored for this baseline estimation.

## Model 2

Given that within the panel data structure, the same individuals are interviewed in every wave, we expect some year-to-year correlation with a given individual. Thus, the model suffers latent person-level effects which this model can more adequately account for. The FE model takes care of this by eliminating the time invariant individual FE.

The FE model is specified as:

$$\Delta\, y_{it} = \Delta\, X_{it}\beta + \ddot{\mu}_{it} \qquad \text{[Eqn 2]}$$

$\ddot{\mu}_{it}$ is the demeaned residual, $y_{it}$ is life satisfaction for individual $i$ at time $t$, $X_{it}$ is a vector of covariates including OAP variable for individual $i$ at time $t$. Fixed effects models, however, do not estimate the coefficients of time invariant variables and do not establish causal effects.

## Model 3

The third model employed is the linear DiD regression approach which attempts to mimic an experimental research design using observational data. As discussed earlier, the sample consists of individuals aged between 55 and 64 years; individuals who begin receiving OAP in the third period (when turning 60 years) is defined as the treatment group. They therefore have two initial periods without grant income proceeded by two post periods with grant income. On the other hand, we have the control group that are never exposed to treatment as they do not qualify for OAP based on income criteria.

Based on Woolridge (2012), the DiD model for estimating treatment effects is specified as follows:

$$y_{it} = \beta_o + \beta_1 Post_{it} + \beta_2 Treat_{it} + \beta_3\left(Post_{it} * Treat_{it}\right) + \beta_4 X_{it} + \mu_1 + \varepsilon_{it}$$

[Eqn 3]

$y_{it}$ is life satisfaction for individual $i$ at time $t$. $Post_{it}$ is an indicator variable that takes a value of 1 if the measurement of individual $i$ is in the post-programme period (third and fourth periods) or 0 if it is in the baseline period (first and second periods). *Treat* represents an indicator variable that takes the value of 1 if individual $i$ belongs to the treatment group or 0 if the individual $i$ belongs to the control group,

while the interaction term $Post_{it} * Treat_{it}$ measures programme impacts with the simple DiD estimation. $X_{it}$ is a vector of time varying covariates, $\mu_1$ represents individual level fixed effect and $\varepsilon_{it}$ is the error term. The limitation we are still left with regards the self-selection of individuals into the treatment group due to the confounding factors. We account for this bias using a PSM method.

Propensity score matching DiD (PSM-DiD) (Model 3.1) mimics randomisation by creating a sample of units who received the treatment comparable on all observed covariates to a sample of units who did not receive the treatment. This is done by collapsing the different observable covariates into a single balancing score $0 < P(T=1 \mid X) = P(X) < 1$ for everyone representing the likelihood of treatment. Individual propensity scores are computed with the *psmatch2* Stata command utilising the logit regression and these are used to weigh the subsequent DiD regressions. The PSM-DiD estimation hence is considered to be the most robust of all our estimators. Nevertheless, we benchmark it against OLS, FE and DiD estimators for purposes of comparison.

Lastly, the literature suggests there is a possibility that individuals who are a few years away from qualifying for the grant might behave differently in anticipation of this new income source which can possibly bias our estimates (Salinas-Rodríguez et al. 2014). It is for this reason that we further estimate anticipation effects. Treatment group A is composed of individuals who are 55–59 years old having a monthly income of less than R12 300 – the government threshold at or below which couples qualify to receive OAP. That is, Model 4 replaces *Treat* with *Treat A* to capture anticipatory effects:

$$y_{it} = \beta_o + \beta_1 Post_{it} + \beta_2 Treat\ A_{it} + \beta_3 \left( Post_{it} * Treat\ A_{it} \right) + \beta_4 X_{it} + \mu_1 + \varepsilon_{it} \quad \text{[Eqn 4]}$$

Equations 3 and 4 are also estimated separately for male and female respondents to garner gender differences in the impact of OAP.

To ensure the internal validity of DiD results, the parallel trend assumption must be tested. Parallelism requires that the conditional pre-treatment trends in the dependent variable should be equivalent for the treatment and control groups (White & Sabarwal 2014). This was tested using regression and the results are shown in Table 1.

The method of testing the parallel trend assumption adopted is developed by Pischke (2005:7). The test interacts the treatment variable with time dummies for each period excluding the interaction of the last pre-treatment period. As is evident from Table 1, the coefficient of D1 is not statistically significant indicating that the treatment and control groups had similar outcome trends prior to the treatment and that any changes experienced between treatment and control after the treatment period is due to receiving the grant.

**TABLE 1:** Parallel lines assumption result: Quasi-experimental sample.

| Variable | Coefficient | Standard error |
|---|---|---|
| **Time** | **-0.0711** | **0.109** |
| D1 | 0.1964 | 0.219 |
| D3 | 0.0131 | 0.138 |
| D4 | 0.561*** | 0.125 |
| **Married** | **0.160** | **0.112** |
| Years of schooling | 0.037*** | 0.010 |
| **Health** | **0.0826**** | **0.040** |
| Male | 0.0025 | 0.098 |
| **Medical aid** | **0.2987*** | **0.177** |
| **Relative income** | **0.614***** | **0.049** |
| Income per capita | 0.047*** | 0.012 |
| Income per capita squared | -0.1012*** | 0.024 |
| **Religion** | **0.4572***** | **0.068** |
| **Crime** | **-0.0373** | **0.031** |
| Household size | 0.0266 | 0.014 |

Note: Wald test probability > $Chi^2 = 0.0000$.
D, denotes the National Income dynamics study wave.
*, $p < 0.10$; **, $p < 0.05$; ***, $p < 0.01$.

**TABLE 2:** Summary statistics of societal, individual and household characteristics (panel weighted).

| Variable | Sample | Observations | Mean† | Standard deviation |
|---|---|---|---|---|
| Old age pension | Whole | 2931 | 0.383 | - |
| Marital status (married) | Treated | 1123 | 0.265 | - |
| | Control | 1808 | 0.373 | - |
| Health status | Treated | 1130 | 3.044 | 1.102 |
| | Control | 1801 | 3.141 | 1.146 |
| Medical aid | Treated | 1123 | 0.061 | - |
| | Control | 1808 | 0.157 | - |
| Relative income | Treated | 1140 | 2.386 | 0.896 |
| | Control | 1791 | 2.499 | 0.992 |
| Income per capita | Treated | 1123 | 1.955 | 15.340 |
| | Control | 1808 | 2.247 | 4.841 |
| Importance of religion | Treated | 1130 | 3.466 | 0.652 |
| | Control | 1801 | 3.439 | 0.675 |
| Crime | Treated | 1127 | 3.125 | 1.459 |
| | Control | 1804 | 2.963 | 1.443 |
| Life satisfaction | Treated | 1128 | 5.175 | 2.340 |
| | Control | 1803 | 5.157 | 2.439 |
| Male | Treated | 1123 | 0.269 | - |
| | Control | 1808 | 0.345 | - |
| African | Treated | 1125 | 0.813 | - |
| | Control | 1806 | 0.777 | - |
| Household size | Treated | 1123 | 5.226 | 3.313 |
| | Control | 1808 | 4.820 | 3.175 |

Note: Treated are individuals receiving OAP, Controls are individuals not receiving OAP.
†, For binary variables, mean indicates the probability of outcome.

## Descriptive statistics

The panel weighted means and standard deviations for the variables included in the models are shown in Table 2. Panel weights are used to address the attrition bias of individuals over the four waves (Chinhema et al. 2016). These have been separated into cohorts who receive OAP and those that do not. This is done to illustrate observable differences in the covariates between the treatment and control groups.

# Results

The overall significance of all the estimated models are found to be significant at the 1% significance level. Within the OLS,

the variable of interest is OAP which has a positive coefficient of 0.375 and is statistically significant in Model 1 at the 1% level of significance. Accounting for FE in Model 2 we experience a reduction of the coefficient to 0.257, statistically significant at the 5% level. These first two results indicate that receiving OAP contributes positively to the life satisfaction of the elderly. However, there exists an upward bias in the life satisfaction variable induced by omitted variables associated with time invariant unobservables and self-selection biases that inhibit consistent and efficient estimates (Wapenaar & Kollamparambil 2019).

Turning focus to Models 3 and 3.1, which are the simple DiD as well as a DiD combined with propensity score, the new variable of interest becomes *Treat*Post*. These models fare better than the first two models at estimating robust coefficients because they eliminate confounding factors which cause biased estimates. The coefficient of the *Treat* variable in the DiD model is insignificant confirming that there are no signs of structural differences in outcomes for the treatment and control groups. Comparing coefficients from these two models, it is seen that the estimates from both models are almost identical after correction for biases and self-selection into treatment. However, we make use of the DiD PSM estimation for interpretation as it better accounts for the lack of randomisation in selection of individuals into the treated and control groups. The coefficient of interest (*Treat*Post*) in the PSM-DiD model is positive and statistically significant at the 95% confidence level indicating that OAP increases life satisfaction by an average of 0.478 points on the 10-point life satisfaction scale.

Among the control variables included, it is clear that black Africans have substantially lower life satisfaction compared to other races. Regarding the societal variables, the most significant contributor of life satisfaction to the elderly is the income perception of the individual which shows how they rank themselves in relation to others based on income level. The variable is statistically significant at the $p < 0.01$ level in all models estimated which implies that the life satisfaction of elderly persons is significantly influenced when they compare themselves to others. These results among the older age groups are similar to the existing studies among the South African population as a whole (Kollamparmabil 2019; Posel & Casale 2011).

As expected, income tends to increase retirement satisfaction. The DiD coefficient of income per capita is positive and statistically significant at the 1% level. However, the marginal effects are small with a R1000 increase in per capita household income only contributing 0.032 points increase in life satisfaction on the 10-point scale. The results also show that life satisfaction follows an inverted U-shaped relationship with the income variable. At initial levels of income, life satisfaction increases as income increases, reaching a maximum and then dropping thereafter at higher levels of income. Wu and Tam (2015) refer to this as the 'winner's curse' where individuals spend more time on activities that increase income but bring less pleasure (e.g. work and commuting) at the cost of activities that enhance happiness (Kahneman et al. 2006).

As expected, life satisfaction of elderly persons with better health status is also significantly higher. Years of schooling and importance of religion also have significant positive effects on life satisfaction in all the estimated models. Gender, on the other hand, is not found to be statistically significant in any of the estimates. These results are in keeping with the results of the nationally representative sample analysed by Kollamparambil (2019). Lastly, household size increases subjective well-being by an average of 0.046 points in the chosen model of PSM-DiD indicating the supportive role of South African households. Botha and Booysen (2014) did not find a significant association between household size and subjective well-being in their analysis of adults over 16 years of age. Clearly, however, our results indicate that the relationship between household size and the older population group is positive and significant. The increase in dependence on family of the elderly possibly explains this significant result.

The anticipatory effect of OAP is not found to be important as indicated by the insignificant coefficient of *Treat*Post* variable in Model 4.

The gender specific analysis results presented in Table 4 and Table 5 show clear differences in the impact of OAP on men and women. Female recipients of OAP show positive and significant (at 1% confidence level) increase in their well-being whereas there was no significant effect on male recipients. The preferred PSM-DiD model indicates that OAP increases life satisfaction of women by 0.679 points on a scale of 1–10, which is higher than what was found for the whole sample in Table 3. The gender difference in the impact of OAP is as anticipated as the use and meaning of pensions, as with access to and control over other economic resources, is likely to be gendered (Maitra & Ray 2003; Posel, Fairburn & Lund 2006). Schatz et al. (2012) make the same argument on the grounds of differences in gender roles and gendered stresses and strains pre- and post-pension receipt. According to the study, pension is a reliable source of income which may allow women to fulfill caregiving and social reproductive roles, thus improving perceptions of overall happiness and satisfaction. Since men are more likely to have income prior to pension receipt, and their pensions do less for household members' health and well-being (Case & Deaton 1998; Duflo 2003), the well-being impact of pension to men is not expected to be as important as for women. Even when employed, women often earn lower wages and defer spending decisions to a male in the household, making pension income a new, reliable resource within women's control (Ståhlberg, Kruse & Sundén 2005). Moreover, the pension may ease financial strains and extensive care work that women take on (more than men) related to adult

**TABLE 3:** Life satisfaction results: Whole sample.

| Variables | Model 1 | | Model 2 | | Programme effects | | | | Anticipation effects: Model 4 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Model 3 | | Model 3.1 | | | |
| | OLS | Standard error | FE | Standard error | DiD | Standard error | PSM-DiD | Standard error | DiD Treat A | Standard error |
| Old age pension (OAP) | 0.375*** | 0.103 | 0.257** | 0.122 | - | - | - | - | - | - |
| Post | - | - | - | - | -0.147 | 0.178 | -0.144 | 0.196 | -0.0930 | 0.162 |
| Treat (OAP) | - | - | - | - | -0.101 | 0.108 | -0.0826 | 0.116 | 0.112 | 0.157 |
| Treat*Post (DiD) | - | - | - | - | 0.426** | 0.206 | 0.478** | 0.224 | -0.165 | 0.189 |
| African | -1.246*** | 0.106 | - | - | -1.247*** | 0.106 | -1.176*** | 0.120 | -1.250*** | 0.108 |
| Married | 0.00564 | 0.0965 | -0.278** | 0.141 | 0.0111 | 0.0921 | 0.0290 | 0.102 | -0.000811 | 0.0928 |
| Years of schooling | 0.0241** | 0.00948 | 0.0832* | 0.0501 | 0.0231** | 0.00949 | 0.0314*** | 0.0106 | 0.0212** | 0.00959 |
| Health status | 0.0903** | 0.0370 | 0.0513 | 0.0522 | 0.0868** | 0.0370 | 0.0972** | 0.0429 | 0.0863** | 0.0370 |
| Male | 0.0666 | 0.0907 | - | - | 0.0606 | 0.0907 | 0.110 | 0.0994 | 0.0381 | 0.0929 |
| Medical aid | 0.319** | 0.156 | -0.282 | 0.304 | 0.290* | 0.156 | 0.244 | 0.179 | 0.218 | 0.158 |
| Relative income | 0.626*** | 0.0466 | 0.513*** | 0.0646 | 0.628*** | 0.0466 | 0.656*** | 0.0506 | 0.617*** | 0.0468 |
| Income per capita | 0.0223 | 0.0137 | 0.0272 | 0.0226 | 0.0228* | 0.0137 | 0.0315** | 0.0153 | 0.0171 | 0.0140 |
| Income per capita squared | -0.0539* | 0.0281 | -0.0623 | 0.0454 | -0.0559** | 0.0281 | -0.0729** | 0.0295 | -0.0443 | 0.0286 |
| Religion | 0.415*** | 0.0621 | 0.304*** | 0.0869 | 0.416*** | 0.0622 | 0.364*** | 0.0736 | 0.416*** | 0.0623 |
| Crime | -0.0167 | 0.0284 | 0.0405 | 0.0406 | -0.0148 | 0.0285 | 0.0128 | 0.0328 | -0.0112 | 0.0286 |
| Household size | 0.0364*** | 0.0135 | -0.0287 | 0.0389 | 0.0362*** | 0.0135 | 0.0460*** | 0.0146 | 0.0336** | 0.0137 |
| Time | -0.0276 | 0.0445 | - | - | - | - | - | - | - | - |
| Constant | 2.518*** | 0.313 | 2.242*** | 0.534 | 2.529*** | 0.304 | 2.322*** | 0.339 | 2.648*** | 0.328 |
| F stat (Prob>F) | 48.63*** | - | 9.27*** | - | 44.88*** | - | 43.65*** | - | 37.33*** | - |
| Observations | 2931 | - | 2931 | - | 2931 | - | 2931 | - | 2931 | - |
| *R*-squared | 0.194 | - | 0.061 | - | 0.192 | - | 0.178 | - | 0.191 | - |

DiD, difference-in-difference; FE, fixed effects; OAP, old age pension; OLS; PSM, propensity score matching.
*, $p < 0.10$; **, $p < 0.05$; ***, $p < 0.01$.

**TABLE 4:** Life satisfaction results-female sample.

| Variables | Model 1: OLS | | Model 2: FE | | Programme effects | | | | Anticipation effects: Model 4: DiD Treat A | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Model 3: DiD | | Model 3.1: PSM-DiD | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Old age pension (OAP) | 0.367*** | 0.119 | 0.195 | 0.142 | - | - | - | - | - | - |
| Post | - | - | - | - | -0.347 | 0.226 | -0.339 | 0.230 | 0.0991 | 0.259 |
| Treat (OAP) | - | - | - | - | -0.104 | 0.131 | -0.0701 | 0.142 | 0.156 | 0.223 |
| Treat*Post (DiD) | - | - | - | - | 0.651** | 0.256 | 0.679*** | 0.262 | -0.125 | 0.258 |
| African | -1.331*** | 0.128 | - | - | -1.330*** | 0.128 | -1.258*** | 0.144 | -1.435*** | 0.138 |
| Married | -0.0887 | 0.117 | -0.522*** | 0.175 | -0.103 | 0.113 | -0.108 | 0.123 | -0.164 | 0.118 |
| Years of schooling | 0.0328*** | 0.0120 | 0.106 | 0.0647 | 0.0320*** | 0.0120 | 0.0401*** | 0.0134 | 0.0245* | 0.0128 |
| Health status | 0.0725 | 0.0446 | 0.0297 | 0.0620 | 0.0699 | 0.0446 | 0.0707 | 0.0523 | 0.0398 | 0.0470 |
| Medical aid | 0.222 | 0.211 | -0.0307 | 0.387 | 0.198 | 0.211 | 0.222 | 0.243 | 0.228 | 0.222 |
| Relative income | 0.602*** | 0.0565 | 0.507*** | 0.0779 | 0.606*** | 0.0566 | 0.649*** | 0.0604 | 0.595*** | 0.0601 |
| Income per capita | 0.00820 | 0.0223 | 0.0255 | 0.0396 | 0.00940 | 0.0223 | 0.0157 | 0.0251 | 0.0100 | 0.0244 |
| Income per capita squared | -0.0267 | 0.0440 | -0.0605 | 0.0774 | -0.0301 | 0.0441 | -0.0425 | 0.0486 | -0.0304 | 0.0480 |
| Religion | 0.485*** | 0.0808 | 0.392*** | 0.111 | 0.485*** | 0.0810 | 0.425*** | 0.0898 | 0.501*** | 0.0852 |
| Crime | -0.0274 | 0.0341 | -0.00633 | 0.0481 | -0.0245 | 0.0342 | -0.00676 | 0.0392 | -0.0160 | 0.0363 |
| Household size | 0.0324** | 0.0162 | -0.0561 | 0.0461 | 0.0331** | 0.0162 | 0.0457*** | 0.0176 | 0.0438** | 0.0180 |
| Time | 0.0124 | 0.0537 | - | - | - | - | - | - | - | - |
| Constant | 2.403*** | 0.393 | 2.211*** | 0.656 | 2.522*** | 0.384 | 2.351*** | 0.417 | 39.33*** | 25.75 |
| F stat (Prob>F) | 35.15*** | - | 7.25*** | - | 32.39*** | - | 32.53*** | - | 24.43*** | - |
| Observations | 1958 | - | 1958 | - | 1958 | - | 1958 | - | 1958 | - |
| *R*-squared | 0.190 | - | 0.069 | - | 0.189 | - | 0.179 | - | 0.193 | - |

DiD, difference-in-difference; FE, fixed effects; OAP, old age pension; OLS; PSM, propensity score matching.
*, $p < 0.10$; **, $p < 0.05$; ***, $p < 0.01$.

children's unemployment, AIDS-related illness and death (Munthree & Maharaj 2010; Ogunmefun, Gilbert & Schatz 2011; Schatz & Ogunmefun 2007).

Other critical differences emanating from the gender specific analysis is that education is a significant contributor to the well-being of women but not men. Religion and relative income, on the other hand, are seen to be important for both sexes contributing positively to life satisfaction. While the impact of relative income is exactly the same for both sexes at 0.649 points, the positive effect of religion is strong for women at 0.425 points compared to 0.25 points for men. Being black African, however, is found to contribute negatively to life satisfaction for both sexes, with the effect being more negative for women than men.

**TABLE 5:** Life satisfaction results-male sample.

| Variables | Model 1: OLS | | Model 2: FE | | Model 3: DiD | | Programme effects Model 3.1: PSM-DiD | | Anticipation effects: Model 4: DiD Treat A | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Old age pension (OAP) | 0.370* | 0.204 | 0.483** | 0.243 | - | - | - | - | - | - |
| Post | - | - | - | - | 0.188 | 0.294 | 0.248 | 0.359 | -0.0568 | 0.306 |
| Treat (OAP) | - | - | - | - | -0.0530 | 0.192 | -0.0703 | 0.197 | 0.233 | 0.245 |
| Treat*Post (DiD) | - | - | - | - | 0.0298 | 0.353 | 0.0730 | 0.419 | -0.427 | 0.317 |
| African | -1.095*** | 0.191 | - | - | -1.098*** | 0.191 | -1.001*** | 0.222 | -1.225*** | 0.199 |
| Married | 0.152 | 0.177 | 0.184 | 0.242 | 0.221 | 0.164 | 0.330* | 0.187 | 0.239 | 0.170 |
| Years of schooling | 0.0132 | 0.0161 | 0.0612 | 0.0795 | 0.0119 | 0.0162 | 0.0162 | 0.0182 | 0.0149 | 0.0169 |
| Health status | 0.109 | 0.0666 | 0.0858 | 0.0968 | 0.0989 | 0.0667 | 0.136* | 0.0740 | 0.102 | 0.0688 |
| Medical aid | 0.446* | 0.250 | -0.674 | 0.493 | 0.407 | 0.249 | 0.233 | 0.282 | 0.359 | 0.255 |
| Relative income | 0.668*** | 0.0836 | 0.558*** | 0.116 | 0.667*** | 0.0838 | 0.649*** | 0.0932 | 0.677*** | 0.0858 |
| Income per capita | 0.0379 | 0.0357 | -0.0657 | 0.0601 | 0.0345 | 0.0359 | 0.0653* | 0.0388 | 0.00225 | 0.0376 |
| Income per capita squared | -0.157 | 0.639 | 1.686* | 0.931 | -0.0992 | 0.641 | -0.633 | 0.679 | 0.365 | 0.662 |
| Religion | 0.303*** | 0.0988 | 0.174 | 0.140 | 0.299*** | 0.0989 | 0.250** | 0.126 | 0.275*** | 0.104 |
| Crime | -0.00680 | 0.0520 | 0.173** | 0.0756 | -0.00608 | 0.0522 | 0.0498 | 0.0591 | -0.0116 | 0.0544 |
| Household size | 0.0429* | 0.0254 | 0.0394 | 0.0729 | 0.0375 | 0.0254 | 0.0440 | 0.0277 | 0.0256 | 0.0271 |
| Time | -0.0942 | 0.0819 | - | - | - | - | - | - | - | - |
| Constant | 2.744*** | 0.517 | 1.901** | 0.950 | 2.583*** | 0.498 | 2.314*** | 0.552 | -27.72 | 39.09 |
| Observations | 973 | - | 973 | - | 973 | - | 973 | - | 973 | - |
| F stat (Prob>F) | 18.01*** | - | 3.69*** | - | 16.52*** | - | 15.72*** | - | 13.77*** | - |
| *R*-squared | 0.210 | - | 0.078 | - | 0.209 | - | 0.189 | - | 0.22 | - |

DiD, difference-in-difference; FE, fixed effects; OAP, old age pension; OLS; PSM, propensity score matching.
*, $p < 0.10$; **, $p < 0.05$; ***, $p < 0.01$.

**TABLE 6:** Ordinal difference-in-difference regression.

| Variables | Whole sample | | Female | | Male | |
|---|---|---|---|---|---|---|
| | *n* | Standard error | *n* | Standard error | *n* | Standard error |
| Post | -0.0652 | 0.0964 | -0.199 | 0.125 | 0.133 | 0.155 |
| Treat (OAP) | -0.0657 | 0.0580 | -0.0766 | 0.0710 | -0.0257 | 0.102 |
| Treat*Post (DiD) | 0.211* | 0.111 | 0.382*** | 0.141 | -0.0909 | 0.186 |
| African | -0.596*** | 0.0563 | -0.640*** | 0.0686 | -0.533*** | 0.101 |
| Married | 0.0478 | 0.0493 | -0.0270 | 0.0608 | 0.174** | 0.0865 |
| Years of schooling | 0.00882* | 0.00506 | 0.0114* | 0.00643 | 0.00772 | 0.00853 |
| Health status | 0.0468** | 0.0198 | 0.0371 | 0.0240 | 0.0529 | 0.0354 |
| Male | 0.0230 | 0.0487 | - | - | - | - |
| Medical aid | 0.223*** | 0.0827 | 0.175 | 0.112 | 0.281** | 0.129 |
| Relative income | 0.282*** | 0.0254 | 0.272*** | 0.0308 | 0.299*** | 0.0453 |
| Income per capita | 0.0199** | 0.00819 | 0.0135 | 0.0122 | 0.0273 | 0.0202 |
| Income per capita squared | -0.0426*** | 0.0165 | -0.0304 | 0.0241 | -0.112 | 0.433 |
| Religion | 0.211*** | 0.0340 | 0.239*** | 0.0443 | 0.162*** | 0.0537 |
| Crime | 0.00484 | 0.0153 | -0.000834 | 0.0185 | 0.0152 | 0.0277 |
| Household size | 0.0210*** | 0.00724 | 0.0194** | 0.00874 | 0.0226* | 0.0135 |
| /cut1 | 1.088*** | 0.166 | 1.039*** | 0.210 | 1.170*** | 0.270 |
| /cut2 | 2.365*** | 0.169 | 2.350*** | 0.214 | 2.385*** | 0.276 |
| LR $Chi^2$ | 525.33*** | - | 342.19*** | - | 197.21*** | - |
| Pseudo $R^2$ | 0.089 | - | 0.085 | - | 0.105 | - |
| Log likelihood | -2706.28 | - | -1854.13 | - | -843.15 | - |
| Observations | 2931 | - | 1958 | - | 973 | - |

DiD, difference-in-difference; OAP, old age pension.
*, $p < 0.10$; **, $p < 0.05$; ***, $p < 0.01$.

**TABLE 7:** Non-linear difference-in-difference regression margins-robustness checks.

| Variable | Ordinal model | | | | | |
|---|---|---|---|---|---|---|
| | Life satisfaction < 5 | | Life satisfaction > 4 & < 8 | | Life satisfaction > 7 | |
| | *n* | Robust standard errors | *n* | Robust standard errors | *n* | Robust standard errors |
| Whole sample | -0.07037* | 0.0391 | 0.0245* | 0.0155 | 0.0458** | 0.0237 |
| Females | -0.1337*** | 0.0501 | 0.05435** | 0.02489 | 0.0794*** | 0.02569 |
| Males | 0.0312 | 0.0626 | -0.00828 | 0.0154 | -0.02297 | 0.0473 |

*, $p < 0.10$; **, $p < 0.05$; ***, $p < 0.01$.

There is a significant amount of literature (Salinas-Rodríguez et al. 2014) which suggests that elderly persons who are close in age to meeting the criteria for receiving OAP might modify their behaviour in anticipation of the income. This extra source of bias could influence the magnitude of the estimates. To test for anticipatory effects, Model 4 estimates the DiD regression with treatment group (*Treat A*) consisting of individuals who are between the ages of 55 and 59 years who qualify for OAP based on the income criteria. If anticipation effects are present in the model, we would expect to have positive and statistically significant coefficient for *Treat*Post* in Model 4. Results are shown in the last column of Tables 3–5. The statistically insignificant coefficient for all our samples indicates that there are no changes in behaviour due to an expectation of receiving the gran.

### Robustness checks

We further present non-linear ordinal regression DiD results as robustness check (Table 6). In order to undertake the ordinal regression model, the dependent variable is life satisfaction with categories ranging from 1 to 10 which we collapse into three categories. The variable equals 1 (not satisfied) for all life satisfaction responses less than 5, equals 2 (satisfied) for responses 5–7 and equals 3 if the life satisfaction rating is greater than 7. The magnitude of the interaction effect (*Treat*Post*) in non-linear models does not equal the marginal effect of the interaction term in linear models (Ai & Norton 2003). Therefore, in order to assess the impact of OAP we estimate the contrasting predictive margins following Puhani (2008). Table 7 represents estimates derived from the ordinal DiD models. The results are consistent with the linear DiD estimates in Tables 3–5, that while OAP is seen to impact positively on the subjective well-being of elderly people as a whole, the impact is seen to be higher and significant for women while it is insignificant for men.

The results confirm that receiving OAP increases subjective well-being for women and not for men. These results support the findings by Grogan and Summerfield (2019) in the Russian context where OAP was found to increase the well-being of women, but not men. The gendered results reflect the societal gender stereotypes where the men derive their worth through their workplace related identity. Women, on the other hand, are able to derive increased life satisfaction through the OAP which gives them an opportunity to increase engagement in household roles of caring for the other family members, especially grandchildren (Case & Menendez 2007; Duflo 2003; Moller 1996).

## Conclusion

Although the desired policy outcome of social grants in South Africa – including the OAP – has been to redistribute income to the elderly poor and reduce income inequality, its role in life satisfaction has either been equated to or neglected in favour of economic well-being. This article, therefore, investigated the relationship and measured the magnitude of the impact that the OAP grant has on subjective well-being of the elderly in South Africa. This study employed various models in increasing degrees of sophistication to ascertain the impact of OAP. Results from these models established that receiving the grant positively and significantly contributes to an individual's happiness and is critical for these vulnerable groups without which they might not be able to survive. A minimum amount of income contributes significantly to happiness, irrespective of its source. There is no anticipation effect observed and OAP does not contribute more to well-being as compared to other sources of income. Therefore, for those without other means of income OAP is critical in uplifting their well-being. Old age pension can therefore be said to be an equaliser of well-being among the elderly. The increased well-being can be attributed to improved consumption and also to empowerment through increased participation of the OAP recipient in daily household decision-making and contributing to community development (Burns, Keswell & Leibbrandt 2008; Case & Menendez 2007). These implied empowerment effects translate into a feeling of worthiness especially relating to children and grandchildren who may still be heavily reliant on them (Duflo 2000).

A gender specific analysis brings out the differences in impact of OAP between men and women. Women are seen to improve their well-being substantially as a result of pensions compared to men. Our findings support the similar results achieved by Grogan and Summerfield (2019) in the Russian context. The gender difference in the impact of OAP is as anticipated as the use and meaning of pensions, as with access to and control over other economic resources, is likely to be gendered (Maitra & Ray 2003; Posel et al. 2006). Since men are more likely to have income prior to pension receipt, and their pensions do less for household members' health and well-being (Case & Deaton 1998; Duflo 2003), the well-being impact of pension to men is not as high as for women. Our study shows that both men and women did not record any significant improvement in their well-being due to the anticipatory effect of OAP. Our findings, together with Ranchhod (2006), show that OAP significantly reduces labour supply, raises the question whether equalising the qualifying age for OAP across genders finalised in 2010 is yielding benefit in terms of improving subjective well-being in South Africa.

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### Competing interests

The authors have declared that no competing interest exist.

### Author's contributions

This study was initiated as the master's research report of M.N.E. under the supervision of U.K. Subsequently for the purpose of journal submission U.K. undertook an

extension of analysis and brought in the gender perspective of the study. Hence while both authors have contributed in equal measure towards this manuscript, it can be summarised that U.K. gave guidance and direction to M.N.E.

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## Data availability statement

Data sharing is not applicable to this article as no new data were created or analysed in this study.

## Disclaimer

Both authors would like to be clear that the views expressed in the submitted article our own and not an official position of any institution.

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# Appendix 1

**TABLE 1-A1:** Description of explanatory variables.

| Variable | Source | Description | Type |
|---|---|---|---|
| Life satisfaction | NIDS | • The measure of subjective well-being rated on a scale of 1–10 where 1 is very dissatisfied and 10 is very satisfied.<br>• For ordinal model:<br>▪ Y = 1 if life satisfaction < 5<br>▪ Y = 2 if life satisfaction > 4 and life satisfaction < 8<br>▪ Y = 3 if life satisfaction > 7<br>• For logit model:<br>▪ Y = 1 if life satisfaction > 5, and<br>▪ Y = 0 if life satisfaction < 6 | Continuous<br>Ordinal<br>Dummy |
| State old age pension (OAP) | NIDS | • Indicator variable for receiving OAP:<br>▪ X = 1 for receiving pension and 0 otherwise | Dummy |
| Marital status | NIDS | • Indicates of the respondent is married or single:<br>▪ X = 1 if married or living with partner,<br>▪ X = 0 if widowed, divorced/separated or never married | Dummy |
| African | NIDS | • Indicates race of individual:<br>▪ X = 1 if individual is black and 0 otherwise | Dummy |
| Health status | NIDS | • Measure of self-reported health:<br>▪ X = 1 if rated as poor,<br>▪ X = 2 if fair, X = 3 if good,<br>▪ X = 4 if very good, and<br>▪ X = 5 if excellent | Discrete |
| Medical aid | NIDS | • Indicator variable for having a medical aid:<br>▪ X = 1 if yes and 0 if no | Dummy |
| Relative income | NIDS | • Subjective measure of relative income standing on a scale of 1–6:<br>▪ X = 1 if rating = 1,<br>▪ X = 6 if rating = 6 | Discrete |
| Income per capita | NIDS | • Measure of income per person calculated as (total monthly household income divided by household size)/1000 | Continuous |
| Importance of religious activities | NIDS | • X = 0 if not important or unimportant,<br>• X = 1 for important or very important | Dummy |
| Crime | NIDS | • Measures the frequency of theft and burglary in the neighbourhood:<br>▪ X = 1 if it never happens,<br>▪ X = 2 if very rare,<br>▪ X = 3 if not common,<br>▪ X = 4 if fairly common, and<br>▪ X = 5 if very common | Discrete |
| Male | NIDS | • Shows the gender of the individual:<br>▪ X = 1 if male and 0 otherwise. | Dummy |
| Household size | NIDS | • Measure of the number of persons living with the OAP recipient | Discrete |

NIDS, National Income dynamics study; OAP, old age pension.