

Successful Ageing and Poverty: The case of Peru

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Abstract

This study investigated the determinants of Successful Ageing (SA) in a sample of 4,151 Peruvians aged between 65 and 80 and living in poverty. The data correspond to the ESBAM survey, which is the baseline to evaluate the non-contributory public pension program *Pension 65*. A key contribution of this study is to combine the conceptual appealing of Successful Ageing to measure well-being in old-age with the multidimensional poverty counting approach developed in the economic literature. This setting allows for moving beyond the dichotomy of the SA literature (success or usual ageing) and take advantage of the full distribution of success along the set of dimensions of well-being. Nine indicators of SA have been used to assess the dimensions of physical health, functioning, cognition, emotional health, and life satisfaction. The variables associated with a higher number of satisfied indicators were being a male, younger, literate, working, low food insecurity, good nutritional status, normal blood pressure, absence of disabilities, not smoking, empowerment, good self-esteem, absence of mental disability, and less frequent contact with a social network. From a policy perspective, the results of this study report a remarkably stable effect of three variables affecting SA that can be relatively easy to measure, monitor and affect by public intervention. These variables are food security, nutrition quality, and self-esteem.

Keywords: successful ageing, old-age, poverty, well-being, non-contributory pensions, Peru

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1. Introduction

Social protection policies for old-age have undergone a significant shift in Latin America. During the last years, 12 countries of this region¹ have implemented non-contributory pension schemes which, in general, offer a low amount transfer to elderly individuals who are not entitled to receive any other pension and live in poverty. Transfer generosity, coverage (targeted or universal) and access requisites vary widely in the region, but given the popularity and inherent long-term fiscal commitment of these programs, it can be said that this is a major change in the strategy to deal with social protection and poverty in old-age. Although the structural pension reform carried-out in the 1990's and 2000's helped to make contributory pension systems more financially sustainable across Latin America, pension coverage rates remained low, with acute differences between rural and urban areas and among income groups (Rofman and Oliveri, 2011). An important issue, raised by governments and international support institutions with respect to these programs, is the assessment of the impacts on different outcomes related to the well-being of the recipients. Particular attention has been paid to variables such as labour supply, retirement decision, saving behaviour, and health. Such attention has yielded mixed results. However, there is a lack of studies that focus on a summary indicator of old-age well-being which might include a more comprehensive set of variables. In this respect, the concept of Successful Ageing (SA), widely used in the ageing literature, can help to more fully understand the effects of non-contributory pensions on multi-dimensional well-being. As the implementation of this concept has proved to be rather rigid (estimating the share of individuals with successful ageing versus usual ageing), the present study will enrich this approach via the use of the counting method for multidimensional poverty developed in the economic literature.

¹ Bolivia (2008), Chile (2008), Colombia (2003), Ecuador (2003), El Salvador (2009), Guatemala (2005), Honduras (2011), Mexico (2007), Panama (2009), Peru (2011), Paraguay (2009), Venezuela (2011). See more details on non-contributory pension programs in Olivera and Zuluaga (2014)'s table A1.

As some of the non-contributory pension programs have started to produce information to measure the impact on the recipients, this study profits from being granted access to a unique dataset carried-out for that specific purpose (ESBAM). This survey is the baseline of Peru's *Pension 65* program collected by the National Institute of Statistics (INEI) in December 2012 and comprises 4,151 elderly individuals living in poverty in half of Peru's regions. At the time of the survey, about 250,000 individuals were already enrolled in *Pension 65*, representing 16% of the 65+ population.

Although research on ageing was long influenced by the view of a linear deterioration in age and focussed on losses, the appearance of the concept of SA in a seminal article by Rowe and Kahn (1987) has contributed to a more positive view of this developmental period. The idea behind the concept of SA is to distinguish individuals who experience a 'good' ageing from those who experience usual ageing. In this way, the concept aims at understanding why some individuals experience better ageing than others and which factors should be improved to increase the number of people with SA. Moreover, as SA summarizes different important dimensions for elderly individuals, this concept is also useful to account for the overall quality of life of the elderly population. This is particularly relevant because persons with SA have better capacities of adaptation and adjustment to age and daily life changes (de Moraes and de Azevedo e Souza, 2005).

It has long been debated what exactly successful and usual aging are and how they should be measured. This is not an easy task due to the multi-dimensionality of the concept and the heterogeneity in age and cultural background among elderly adults (Cosco *et al.* 2014). In the first place, SA refers to the avoidance of disease, maintenance of physical and cognitive functioning, and engagement in an active lifestyle. Moreover, a proposal has been made to include indicators of subjective well-being in the measure of SA and rely less on biomedical and physical functioning aspects (Ng *et al.*, 2009; Zelikova, 2013). Interestingly, in a sample of 10 Latin American and European countries, health, independence, social relationships and life

satisfaction are the components most frequently and consistently cited by the elderly individual themselves on what is important for “ageing well” (Fernandez-Ballesteros *et al.* 2010). On a similar note, Hung *et al.* (2010) performed a meta-analysis of the literature on healthy ageing and related concepts (including SA) and detected that, in general, lay definitions of SA include more domains (independence, family, adaptation, financial security, personal growth, and spirituality) and diversity than those provided and analysed by the academic researcher.

In general, socio-economic, physical, and psychological variables have been observed as regularly influencing SA. The review by Depp and Jeste (2006) reveals that the most significant variables, and the ones positively correlated with SA are younger age; non-smoking; absence of disability, arthritis and diabetes; greater physical activity; more social contacts; better self-rated health; absence of depression and cognitive impairments; and fewer medical conditions. The large majority of evidence on SA is focussed on industrialized countries and mostly in specific populations of elderly individuals. Less is known in developing countries and populations of elderly and poor individuals. In the case of Latin America, there is evidence that adults are reaching old-age with more chronic diseases and physical disabilities than adults in more developed countries (Alvarado *et al.*, 2008; Avila-Funes *et al.*; 2009; Runzer-Colmenares *et al.* 2014). Among the indicators associated with SA in Brazil, the studies by Chaves *et al.* (2009) and Moraes and de Azevedo e Souza (2005) report family relations and friendship, health and perceived well-being, functional capacity and psychosocial support, and family income. Regarding the analysis of SA among the poor, there is a lack of studies that focus on this specific population. An exception is the work by Chung and Park (2008) which report, for a sample of low-income South Koreans, that material or social success are less important in determining SA. The authors found that SA is positively associated with: i) positive attitude towards life, ii) success of adult children and iii) relationships with others.

The vast majority of studies assessing SA present the estimated share of individuals ageing with success in opposition to those individuals with usual ageing. It is difficult to compare one study to another one, not only because of different sample selections and designs, but also because of the use of different indicators of SA and thresholds indicating the dichotomy between successful and usual ageing. According to the review by Depp and Jeste (2006), the average share of individuals belonging to the SA group is approximately one-third. Given the multi-dimensionality of SA, it is rather arbitrary to select a particular threshold to determine who is experiencing successful or usual ageing. Hence, it can be preferable to take a more flexible approach. Recent developments in economics in accounting for multi-dimensional poverty and well-being seem to provide an adequate base to build on a more flexible measure of multi-dimensional SA, without losing the variability in the different degrees of ageing quality experienced by the individuals.

Dating back to the works by Sen (1985, 1993), the concept of poverty, as inherently multi-dimensional and encompassing dimensions beyond income, has gained prominence in social research. Some key developments in theoretical and methodological ways to deal with the estimation of multi-dimensional poverty in a counting approach is available in Atkinson (2003) and Alkire and Foster (2011). According to the counting approach, one first looks at each relevant dimension and assesses whether the individual is deprived of such dimensions according to a specific deprivation cut-offs. A failure is assigned the value of one, and zero otherwise. Once all dimensions are transformed into zero and one, they must be summed up to detect the number of dimensions in which the individual is deprived. The result is a continuum of values for each individual, where the minimum value is zero and the maximum is the number of total dimensions considered in the analysis. According to the *union* approach of the poverty counting method, an individual is poor if she is deprived in at least one dimension. But according to the *intersection* approach, an individual is considered poor if she is deprived in every dimension. A third approach indicates that a person is poor if the number of

experienced deprivations exceeds a second and overall cut-off located between the *union* and *intersection* approach.

The comparability between the multi-dimensional poverty counting approach and SA is evident. First, both concepts are fundamentally multi-dimensional. Second, SA rates success instead of deprivation, so that one might consider achievements (success) in each dimension instead of deprivations, and consequently assign a value of one if the value in the dimension exceeds the achievement cut-off, and zero otherwise. Third, in the current state of the SA empirical literature, an individual is considered as ageing successfully if she rates successfully in each dimension under analysis, which is equivalent to the above-mentioned *intersection* approach. So, in this study it is proposed to account for the number of relevant dimensions (or indicators) in which the individual is successful according to dimension specific cut-offs. Then, instead of considering that an individual experiences SA if she rates successfully in each indicator (like in the intersection approach), the complete distribution of successful indicators is reported and further accounted in assessing the determinants in the numbers of achievements.

2. Data and Methodology

2.1. Data

The data were drawn from the Survey of Health and Well-being of the Older Adults (ESBAM) which is a unique survey collected by the National Institute of Statistics of Peru in December 2012 in 12 departments (half of the total in Peru). This survey includes a detailed questionnaire for the 65-80 year old persons on socio-economic conditions, subjective well-being, expectations, beliefs and several self-reported subjective and objective health measures; even anthropometrical measures, blood sampling and arterial pressure. Furthermore, ESBAM contains socio-economic questions at the household level and for each household member.

Detailed questions on expenses and income were also recorded. General information was collected in face-to-face interviews, while data on anthropological measures, arterial pressure and blood samples were collected by medical technicians. The goal of this dataset is to be the baseline for the evaluation of *Pension 65*, which is a recently implemented non-contributory pension program administrated by the Ministry of Development and Social Inclusion of Peru (MIDIS). The cash transfers of this program are targeted to individuals aged 65+ who do not receive a contributory pension and live in extreme poverty.

The population in ESBAM comprised the individuals aged between 65 and 80 who lived in particular households classified as poor by the national targeting score system SISFOH. The sampling selection was probabilistic, independent in each department, stratified in rural/urban areas and carried out in two steps (first selecting census units or villages and then households). After dropping 65 individuals who were assisted by a *proxy* in answering the questionnaire (mostly persons with severe impairments like blindness and deafness) the sample comprised 4,151 individuals. This number will slightly decrease because of missing values in some variables of interest.

2.2. Distinguishing successful and usual ageing

Similar to other empirical studies on SA (Chaves *et al.* 2009; Hodge *et al.* 2013; Ng *et al.* 2009) several indicators – grouped in five dimensions – were used to assess SA among the poor and elderly Peruvians. The dimensions and its corresponding indicators were: i) good health (low number of illnesses, good self-rated health), ii) efficient daily living functioning (good ADL and IADL measures), iii) efficient cognitive functioning (high scores at the cognitive measure adapted from the MMSE²), iv) good emotional health (lower depressive

² The score of cognitive functioning is computed with four questions. The first question is about orientation and asks about the day of the month, month, year and day of week. Each correct answer receives one point. The second question is about memory; three words are mentioned and the respondent has to repeat these immediately after in any order. These words are asked later again (forth question) in order to measure delayed recall. A point is given for each word correctly answered. The third question is a command of the following three actions that the respondent has to follow orderly: “I will give a piece of paper. Take this with your right hand, bend in half with

symptoms) and v) high life satisfaction (in eight different domains). More details of each indicator and their specific thresholds are reported in Table 1.

(Table 1 here)

2.3. Determinants of successful ageing

The variables used in the present study as potential mediators of SA are also commonly employed in other related studies, although the richness of variables investigated in ESBAM allowed ageing quality to be studied more comprehensively than other studies. These variables were classified in three categories: socio-demographic, physical, and psychological variables. The socio-demographic category included 12 variables: gender (*1=male, 0=female*), age, marital status (*1=married or living with partner, 0=other*), education (*1=illiterate, 0=literate*), working status (*1=working, 0=retired or unemployed*), pensioner condition (*1=receiving a pension, 0=no receiving pension*), health insurance (*1=have health insurance, 0=no health insurance*), total annual household income (*expressed in monthly Soles*), household size, ethnic (*1=indigenous mother tongue, 0=other*), area of living (*1=urban, 0=rural*), and food insecurity index. Measured at the household level, it must be noted that food insecurity can lead to starvation and be an important source of stress for the household. In this respect, ESBAM closely follows the Household Food Insecurity Access Scale (HFIAS) developed by Coates *et al.* (2007). The index was computed with nine items referring to different difficulties in accessing food, which had to be responded to with an intensity scale of four points (*4=always, 3=often, 2=sometimes, 1=rarely, 0=none*). Hence, the best (no food insecurity) and worst (maximum food insecurity) possible outcomes of food insecurity are 0 and 36, respectively.

both hands and place on your legs". Each correct action will receive one point. The cognitive score is the result of summing up the all the points recorded in each question (from 0 to 13 points).

The physical variables category included 10 items. A dummy variable was used to indicate the presence of anaemia in the individual according to the haemoglobin level measured with a sample of blood extracted during the interview³. The Mini Nutritional Assessment Score (MNA) was also used to assess the conditions of malnutrition. This instrument is commonly used in old individuals and reveals a good ability to identify frail and elderly individuals at risk of under-nutrition and malnutrition (Harris and Haboubi, 2005). It is composed by items related to diet quality, mobility, diseases history and anthropometrical measures. Importantly, the MNA has also been used in the Survey on Health and Well-being of Elders (SABE) implemented during the early 2000's in seven capital cities of Latin America and the Caribbean (Albala *et al.* 2005). The original MNA reports a score from 0 to 30 and allows for the categorization of individuals who are malnourished (<17), at risk of malnutrition (17-23.5) and enjoy normal nutritional status (>24). For comparability reasons with the original version, it was only possible to compute a MNA ranging from 0 to 22, thus it is preferable to use the MNA in a continuous form. A dummy variable indicating abnormal blood pressure was also computed according to WHO norms. Blood pressure was taken from each individual by medical technicians. Five dummy variables indicating whether the individual suffers any type of physical disability (sight, hearing, talking, body extremities, and others) were also assessed⁴. Finally, two separate dummy variables were computed to indicate if the individual smokes at present or smoked in the past, and if she drinks alcohol regularly.

The psychological variables category included the following four items: empowerment score, self-esteem score, cognitive related disabilities, and social support network size. As old-age reduces individual autonomy and increases dependence on other household members or relatives, empowerment can count positively for the well-being of elderly people. The reason is that empowerment implies more bargaining power in pursuing their own desires in regard to

³ The variable for anaemia was computed according to the WHO thresholds by gender.

⁴ The individuals are directly asked about these disabilities.

resources and decisions. The questions related to empowerment in ESBAM are “Do you consider that your relatives treat you with respect?” and “Do you consider that your relatives respect your opinions and interests?” The answer scales are: 5=*Yes, always*, 4=*Yes, most of the time*, 3=*Sometimes*, 2=*Seldom*, and 1=*Never*. The score of empowerment was computed by summing up the answered scales, so that the lowest and highest scores were 1 and 10. Self-esteem was measured with the question “Do you see yourself as a valuable person?” (5=*Yes, always*, 4=*Yes, most of the time*, 3=*Sometimes*, 2=*Seldom*, and 1=*Never*). As explained in Robins *et al.* (2001) this single item has a strong correlation with the 10-item Rosenberg self-esteem scale. For cognitive disabilities, a dummy variable was employed to indicate the presence of any cognitive related disability. As in the case of having physical disabilities, this variable was also self-reported. Regarding the size of the social support network, the respondents had to list the names of the main persons with whom they give or receive advice, companion, care, information, food, money, etc. These persons can be relatives, friends, neighbours, religious groups, etc. Moreover, the respondents were also asked how much trust they feel with each of the listed persons, the scale being: 1=*much*, 2=*fair*, 3=*little* and 4=*nothing*. The variable for network size was computed with the number of reported persons with whom the individual feels much trust; i.e. this is a sort of intimate, inner and trustable network. This measure of inner social network is relevant for elderly people because of their higher frailty and dependence on other persons. Finally, the frequency of contact with the social network was measured in days per year.

2.4. Empirical strategy

Unlike previous approaches aimed at distinguishing the group of individuals successfully ageing from the group of individuals with usual ageing, this study investigated what factors were associated to perform better in a larger number of successful indicators, without imposing any threshold in determining who presents successful or usual ageing. The

goal was to move beyond the common dichotomy of successful and usual ageing and take advantage of the full distribution of success along the set of available indicators. The reduced form equation estimated with linear regression models (OLS) was the following:

$$y_i = \text{count}(I_{ji} \geq \bar{I}_j) \quad \text{for } j = 1, \dots, 9 \quad (1)$$

$$y_i = \alpha + \beta_k X_{ki} + \mu_i \quad (2)$$

The subscript j represents a given indicator ($j=1, \dots, 9$) of SA, the subscript i indicates a particular individual from the sample, and the subscript k stands for the determinants of SA. The variable \bar{I}_j represents thresholds of success for each indicator j (values defined in Table 1). In this setting, the dependent variable y_i is equivalent to the total number of indicators in which an individual was successful (equation 1)⁵. Equation 2 is the reduced form to estimate, which includes a vector of X_k different determinants of SA and an error term μ_i normally distributed. This empirical strategy allowed to overcome the arbitrariness of conforming two exclusive groups, it says successful and usual ageing individuals. Recall that other studies on SA have routinely employed that strategy and hence have removed almost all variation contained in the SA indicators. It could be the case that within each group of successful and usual ageing, there are individuals with very dissimilar patterns of ageing. Furthermore, some indicators could be strongly correlated, so that the approach employed in this study seems more flexible to reduce measurement errors in the computation of the quality of ageing.

The main interest of the present study was to uncover the effects of relevant variables in favouring or limiting SA in a number of indicators. As discussed before, these indicators are part of dimensions considered to be important in measuring the quality of ageing of elderly

⁵ The counting approach of multi-dimensional poverty involves other technical features, but they are beyond the scope of the present study. For example, it is hotly debated how to set relative weights for each dimension in order to estimate the overall poverty measure, and what is the degree of substitution between each dimension. It is common to assume, as done in this study, equal weights and perfect substitution.

individuals. However, it is also important to look at each indicator and its determinants to better understand the conditions enhancing a good performance in the indicator. In this way, public policies oriented to improving the living conditions of the old-age population can be focussed on certain indicators that are more likely to be affected by these policies. Therefore, a further section of analysis will investigate the main determinants for each indicator of SA. As each indicator I_{ji} is a dummy variable taking the value of one if the indicator value reaches at least the threshold ($I_{ji} \geq \bar{I}_j$), or zero otherwise, each indicator can be analysed with linear probability model regressions (LPM). In this case, the interest is in the average effects of the determinants on each indicator. The reduced equation to estimate for each indicator j is the following:

$$I_{ji} = \delta + \beta_k X_{ki} + \varepsilon_i \quad (3)$$

The independent variables entering into the regressions are in standardized values (mean 0 and standard deviation 1) with the exception of the dummy variables. Furthermore, the regressions use robust standard errors,

3. Results

3.1 Distribution of successful ageing

The distribution of population by successful indicators is shown in Table 2 and revealed that 14.6% of the individuals analysed in the sample are successful in all 9 indicators. This figure, together with 85.4% of individuals showing usual ageing would be the outcomes if a more standard approach in measuring SA had been applied. However, Table 2 shows large

variance in the contribution of each indicator. For example, 18% of the sample satisfied a maximum of 3 indicators with success, and 29.2% satisfied 8 or 9 indicators.

(Table 2 here)

3.2 Determinants of multi-dimensional successful ageing

First, the unconditional means of the variables employed in the analysis are shown in Table 3, while the results of the determinants of SA (equation 2) are reported in Table 3.

(Table 3 here)

The groups of variables were introduced one by one in the first three columns of Table 4, with model 1 composed only by 12 socio-demographic variables. Model 2 included 10 additional variables related to physical health; and model 3 added 5 further psychological health related variables. The last model (model 4) included dummies for each district of the respondent (fixed effects). The goal of this last specification was to capture unobservable characteristics at the local level, such as labour market conditions, community deprivation of health and basic services, healthy environments, etc.

(Table 4 here)

Looking first at models 1-3 (see Table 4) it is clear that being male and younger was associated with more successful indicators. Having any of the variables signalling better socio-economic position contributed to having more successful indicators. In particular, this was the case for being literate, Spanish mother tongue, working and receiving pensions. Surprisingly, having any type of health insurance was negatively associated to the number of successful

indicators. In contrast, the food insecurity index was negatively and significantly associated with the number of successful indicators, meaning that the more starved and stressed for food provision the individuals were, the lower successful ageing was.

Regarding physical related variables added into model 2, anaemia was not significant but the MNA was remarkably strong and significant in explaining a larger number of successful indicators. Interestingly, once MNA was removed from each model specification, anaemia was significant and positive in every model, meaning that MNA subtracted the explanatory power to anaemia. Regarding the effects of permanent disabilities, all physical disabilities were statistically significant and negatively associated with SA. Finally, from the two risk behaviours considered, only smoking was statistically significant and negatively related to SA whereas no effect was observed for alcohol consumption.

Concerning the psychological variables introduced in model 3, empowerment and self-esteem were positively and significantly associated with a larger number of successful indicators. Moreover, having a mental disability was negatively associated with SA. None of the two variables related to social support was statistically significant, although the frequency of contact with the social network became significant and, quite surprisingly, negative once the size of the social network was removed.

Model 4 was more demanding because it included district fixed effects as a way to control for unobservable characteristics at the community level. Therefore, some estimators previously found to be statistically significant lose their significance. This was the case for being a pensioner, income, indigenous mother tongue and living in urban areas. This time, having abnormal blood pressure and frequent contact with the social support network are statistically significant and negatively associated to SA indicators.

In sum, the socio-economic determinants passing the most demanding model specification (model 4) and being positively associated with the number of successful indicators were: being male, younger, more educated, working, having no health insurance

registration, and reporting less food insecurity. The physical health related variables positively affecting SA were good nutritional status (high MNA), normal blood pressure values, lack of physical disabilities, and not smoking. Finally, SA was positively associated with high empowerment, self-esteem, being free of any mental disability and having less frequent contacts with the social support network.

3.3 Determinants of individual dimensions of successful ageing

The LPM regressions corresponding to each indicator of SA (equation 3) are reported in Table 5. The model specification for each regression includes all determinants previously considered and district fixed effects. It is remarkable that the MNA is statistically significant and positively associated with every indicator. A similar performance was observed for the food insecurity index and self-esteem, both being statistically significant in each indicator with the exception of chronic illnesses. Food insecurity was negatively related with each indicator, which is a very important result for public policy because it reveals the key role of nutrition and food intake security in the well-being of the poor and elderly population. Furthermore, self-esteem is positively related with each indicator and could account for guiding some public interventions towards the improvement of the quality of ageing. Other important variables with a large number of statistically significant results on the studied indicators are working (with 7), empowerment and other disability (both with 6), and male, sight disability, social network size and mental disability (each with 5).

(Table 5 here)

4. Discussion

The main goals of the present study were to offer an overview of the patterns of ageing in a large sample of elderly Peruvian individuals living in poverty, and give insights about

which variables influence the quality of ageing of this population. The analysed data corresponds to the ESBAM survey implemented in December 2012 by the National Institute of Statistics of Peru and the Ministry of Development and Social Inclusion, which is the baseline of the Governmental non-contributory pension program *Pension 65*. This is an extraordinary opportunity to enhance our knowledge on the quality of ageing in a population of poor and elderly adults. Consequentially, these data and the implemented analysis can shed light on how to help the poor and elderly to age even better. Accordingly, the provided results can guide policy-makers in evaluating the impact of *Pension 65* in the quality of ageing and making positive adjustments to the program.

The quality of ageing was rated here according to 9 indicators associated with the dimensions of physical health, daily life functioning, cognition, emotional health, and life satisfaction. Although the proportion of older Peruvian adults who were reported as satisfying all these indicators was only 14.6%, there is a sizeable heterogeneity along the distribution of success for each indicator. Consequently, this study takes advantage of the complete distribution of success along the set of available indicators without imposing any threshold to distinguish successful from usual ageing. In this way it differs from previous research that mostly focussed on the dichotomy of successful versus usual ageing. The interest was on assessing what factors were associated to perform better in a larger number of successful indicators. In particular, the empirical strategy consisted in regressing a comprehensive set of determinants of SA on the total number of indicators that an individual achieves with success.

Among the socio-economic variables, it was found that working, education, lower food insecurity, male, younger, and lack of health insurance registration were positively linked with the number of successful indicators. Some associations such as gender or age have been reported in other studies whereas other are more novel or surprising. It should be noted that the preferred model specification is the one controlled by fixed effects of the districts where the respondents live. The reason is that this model is more demanding because it controls for

unobservable characteristics at the community level and hence removes part of the explanatory power of the variables. Therefore, some estimators previously found to be statistically significant lose their significance. This is the case for being a pensioner, income, indigenous mother tongue and living in urban areas, for all these variables are highly correlated to sharp socio-economic differences among districts. For example, given that pensioners tend to live in urban localities and the indigenous population are mainly agglomerated in rural or highland districts, it was expected that fixed district effects would reduce or even remove the statistical significance of such variables. All these results account for the concentration of some individuals in certain, more economically deprived, geographical areas and the importance of dealing with unobservable factors at the community level. Moreover, unlike models without fixed effects, the variables of abnormal blood pressure and contact frequency with the social support network were statistically significant and negatively associated with SA indicators. Another interesting result is the positive and strong association between working and quality of ageing. The status of working can help to keep old-age individuals with good levels of cognitive functioning and mobility, although one must be cautious in interpreting this result given the endogeneity between retirement and health. The surprising negative association between having any type of health insurance and the number of successful indicators could be explained by the fact that individuals with poor health are self-selected into health insurance. Another possible explanation is that being affiliated to any health insurance is little more of administrative information and does not mean that the individual is really using the insurance. In Peru, a large percentage of poor people are enrolled in the *Sistema Integral de Salud* (SIS), which is a largely subsidized health scheme for persons living in poverty, and at the same time, evidence suggest that SIS affiliates do not use it⁶.

⁶ In the sample of analysis, 64% of the population was enrolled in some type of health insurance (2/3 of this percentage being in SIS). Furthermore, 39% of health insured individuals who were sick during the previous 4 weeks to the survey interview did not seek medical attention.

The physical health related variables positively affecting SA, after the inclusion of district effects, were good nutritional status (high MNA), normal values of blood pressure, not smoking and low self-reported disabilities of sight, hearing, body extremities and “other” disabilities. The strong and statistically significant coefficient of MNA, probably explained by the importance of efficient nutrition and low sarcopenia on physical and cognitive functioning (see Choquette *et al.*, 2010; Shatenstein *et al.*, 2012), calls for giving more interest to nutritional aspects that are not studied enough in the successful ageing literature (an exception is Ng *et al.* 2009). Furthermore, in the regressions it was detected that the MNA score subtracts the explanatory power of the anaemia measured with blood samples, so that this instrument could somehow replace the costly activity of extracting and analysing blood samples in further evaluations. On a similar note, the negative influence of abnormal blood pressure and smoking on SA can be related to the negative effects of these variables on health and cognitive functioning (Brady *et al.*, 2005; Meisler, 2002). Regarding self-reported physical disabilities, these limitations can strongly impact the performance of daily life activities (e.g., Wahl and Heyl, 2003) and in consequence affect the quality of ageing. For example, poor sight may restrict medication intake (Windham *et al.* 2005).

Finally, four out of five investigated psychological variables were significant determinants of SA. Having high self-esteem, high empowerment, being free of any mental disability and having less frequent contacts with the social support network were associated with a better quality of ageing. This last result could appear counterintuitive, though empirical research on the links between ageing and psychosocial network are still scarce. The available evidence shows mixed results as some studies have suggested the existence of a positive association (de Moraes and de Azevedo e Souza, 2005), a negative association (Chaves *et al.* 2009) or no association at all (Hodge *et al.*, 2013). A possible explanation for this discrepancy is the absence of a clear and unique definition of psychosocial network (Hodge *et al.*, 2013). Moreover, no desired interactions with unloved acquaintances might represent a psychological

burden (see Chaves *et al.*, 2009). Hence, it seems that instead of frequency or quantity of contacts, the component of social network positively related to SA is the quality and psychological relevance of the social support network. The result about empowerment gives support to the idea that old individuals with more bargaining power in pursuing their own desires concerning resources and decisions can also increase their well-being (Giles *et al.*, 2013). Good self-esteem is more strongly associated with the indicators of emotional health and life satisfaction than with the indicators of the other dimensions (Table 5). This observation is congruent with other studies that point out that self-esteem is an important component of mental health and efficient coping strategies for stressful life events (Ben-Zur, 2002). Furthermore, Cha *et al.* (2012) have shown that self-esteem is a strong determinant of SA.

From a policy perspective, the results of this study report a remarkably stable effect of three variables on SA that can be relatively easy to measure, monitor and affected by public intervention. These are the food insecurity index, MNA and self-esteem. The food insecurity index was measured at the household level with questions referring to different difficulties in accessing food, whereas the MNA is aimed at identifying the risks of under-nutrition and malnutrition with items related to diet composition, mobility and anthropometrical measures. Food insecurity can lead to starvation and represent an important source of stress for the household and its members living in poverty, and a low MNA relates to a poor quality of nutrition. Self-esteem was measured with a single item which is highly correlated with the 10-item Rosenberg self-esteem index. Although the evaluation of the program *Pension 65* has not been carried out yet, an important impact of this program on the recipients might be an increase in the nutritional state, food security and self-esteem. Nevertheless, the economic transfer provided by the program could be insufficient to impact on these variables given the needs of other (and younger) household members who could demand part of these transfers. This question and similar ones can only be answered empirically with another wave of ESBAM.

In conclusion, the present research offers new insights about successful ageing in a population of elderly adults living in poverty. The method of multidimensional poverty accounting developed in the economic literature was implemented in order to detect the number of indicators the individual performs with success. Several indicators were associated with better quality of ageing: being a male, younger, literate, working, not having any health insurance, low food insecurity index, good MNA, normal blood pressure, absence of disabilities (sight, hearing, body extremities, and others), not smoking, empowerment, good self-esteem, absence of mental disability, and less frequent contact with social network.

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Tables and Figures

Table 1. Dimensions and indicators of successful ageing

Dimension	Indicator	Value	Success value	% individuals
I. Physical health	Number of medical-diagnosed chronic illnesses	From 0 to 8	0-3	94.3
	Self-reported health: In General, how do you rate your health today?	1. Very bad 2. Bad 3. Good 4. Very good	3,4	57.8
	Comparative self-reported health: Compared to 12 months ago, how would you rate your health now?	1. Much worse 2. Somewhat worse 3. About the same 4. Somewhat better 5. Much better	3-5	61.0
	Comparative self-reported health: In relation to other persons of your age, will you say that your health is?	1. Very bad 2. Bad 3. Good 4. Very good	3,4	60.6
II. Functioning	Limitations with activities of daily living (ADL)	From 0 to 6	0-2	71.7
	Limitations with instrumental activities of daily living (IADL)	From 0 to 6	0-2	63.5
III. Cognition	Orientation + immediate recall + delayed recall + command	From 0 to 13	10-13	77.7
IV. Emotional health	Depressive symptoms: 1) Do you often get bored?; 2) Do you feel happy, with good mood most of the time?; 3) Do you often feel helpless?	(1.)(5.)(1.) Never (2.)(4.)(2.) Very few times (3.)(3.)(3.) Sometimes (4.)(2.)(4.) Yes, most of the time (5.)(1.)(5.) Always Total: from 3 to 15	3-7	57.2
V. Life satisfaction	How satisfied are you with: 1) your health, 2) yourself; 3) your capacity to perform your daily life activities; 4) your personal relationships (friends, neighbours); 5) the place where you live; 6) your relationship with your children; 7) your relationship with other relatives; 8) your life as a whole	1. Not satisfied at all 2. Dissatisfied 3. Satisfied 4. Very satisfied Total: from 8 to 32	24-32	43.4

Source: Database ESBAM. Authors' elaboration.

Table 2. Distribution of population by successful dimensions

Number of successful indicators	Freq.	%	Cum. %
0	8	0.2	0.2
1	115	2.8	3.0
2	244	6.0	9.1
3	363	9.0	18.0
4	449	11.1	29.1
5	518	12.8	41.9
6	551	13.6	55.5
7	621	15.3	70.8
8	593	14.6	85.4
9	591	14.6	100.0
Total	4053	100.0	

Source: Database ESBAM. Authors' elaboration.

Table 3. Standardized means by successful indicators

Variables	Number of successful indicators								
	1	2	3	4	5	6	7	8	9
male ^a	0.391	0.414	0.499	0.497	0.523	0.523	0.599	0.604	0.626
age	0.281	0.200	0.204	0.045	0.100	-0.071	-0.063	-0.109	-0.147
married ^a	0.678	0.668	0.650	0.668	0.721	0.711	0.735	0.740	0.766
illiterate ^a	0.557	0.443	0.376	0.328	0.303	0.278	0.237	0.221	0.184
working ^a	0.478	0.512	0.595	0.664	0.693	0.746	0.747	0.745	0.775
pensioner ^a	0.000	0.012	0.033	0.018	0.039	0.038	0.035	0.052	0.052
health insurance ^a	0.757	0.652	0.639	0.673	0.651	0.670	0.660	0.600	0.602
income	-0.253	-0.130	-0.076	-0.025	-0.141	-0.039	-0.040	0.029	0.126
household size	0.020	-0.121	-0.110	-0.086	-0.062	-0.032	0.015	0.153	0.092
mother tongue indigenous ^a	0.565	0.418	0.408	0.376	0.357	0.321	0.269	0.197	0.168
urban ^a	0.304	0.336	0.372	0.305	0.409	0.363	0.382	0.438	0.440
food insecurity index	0.365	0.436	0.185	0.163	0.111	-0.046	-0.085	-0.184	-0.280
anaemia ^a	0.365	0.402	0.372	0.363	0.301	0.318	0.356	0.290	0.283
mini nutritional assessment	-0.907	-0.755	-0.559	-0.435	-0.224	-0.010	0.191	0.466	0.712
abnormal blood pressure ^a	0.123	0.222	0.170	0.211	0.209	0.175	0.163	0.209	0.190
disability: vision ^a	0.104	0.131	0.149	0.120	0.085	0.080	0.061	0.078	0.051
disability: hearing ^a	0.122	0.111	0.080	0.058	0.058	0.064	0.039	0.037	0.025
disability: talk ^a	0.035	0.020	0.022	0.009	0.010	0.004	0.003	0.002	0.002
disability: limbs ^a	0.191	0.221	0.138	0.109	0.095	0.080	0.076	0.051	0.042
disability: other ^a	0.009	0.020	0.011	0.004	0.002	0.004	0.002	0.002	0.002
smoking ^a	0.157	0.164	0.204	0.216	0.193	0.187	0.213	0.211	0.210
alcohol consumption ^a	0.113	0.143	0.188	0.167	0.172	0.191	0.219	0.228	0.239
empowerment	-0.578	-0.465	-0.224	-0.207	-0.044	-0.029	0.152	0.225	0.280
self-esteem	-0.513	-0.670	-0.404	-0.180	-0.085	0.105	0.113	0.256	0.369
mental disability ^a	0.571	0.235	0.072	0.034	-0.049	-0.083	0.003	-0.100	-0.086
social network size	-0.037	0.062	-0.092	-0.048	-0.022	0.074	-0.021	0.004	0.039
freq of contact with network	0.306	-0.073	0.002	0.010	-0.072	-0.020	-0.079	0.045	0.086

a/ dummy variables are not standardized.

Table 4. OLS estimates for successful ageing

Variables	(1)		(2)		(3)		(4)	
	coeff	se	coeff	se	coeff	se	coeff	se
male	0.0684**	(0.0347)	0.0786**	(0.0336)	0.0763**	(0.0333)	0.0668*	(0.0345)
age	-0.1035***	(0.0150)	-0.0595***	(0.0139)	-0.0554***	(0.0137)	-0.0557***	(0.0142)
married	0.0890***	(0.0335)	0.0484	(0.0306)	0.0327	(0.0304)	0.0377	(0.0322)
illiterate	-0.2242***	(0.0375)	-0.1451***	(0.0343)	-0.1406***	(0.0340)	-0.1658***	(0.0353)
working	0.3189***	(0.0365)	0.2042***	(0.0332)	0.1834***	(0.0327)	0.2197***	(0.0346)
pensioner	0.2659***	(0.0687)	0.1443**	(0.0648)	0.1316**	(0.0628)	0.0880	(0.0624)
health insurance	-0.0662**	(0.0307)	-0.0490*	(0.0278)	-0.0585**	(0.0273)	-0.0532*	(0.0300)
income	0.0185	(0.0166)	0.0099	(0.0138)	0.0171	(0.0131)	0.0057	(0.0140)
household size	0.0353**	(0.0164)	0.0401***	(0.0147)	0.0306**	(0.0146)	0.0218	(0.0159)
mother tongue indigenous	-0.4455***	(0.0317)	-0.3598***	(0.0295)	-0.3054***	(0.0296)	-0.0383	(0.0694)
urban	0.1428***	(0.0328)	-0.0398	(0.0306)	-0.0475	(0.0301)	-0.0238	(0.0658)
food insecurity index	-0.1888***	(0.0149)	-0.1092***	(0.0139)	-0.0960***	(0.0137)	-0.1215***	(0.0158)
anaemia			-0.0148	(0.0287)	-0.0243	(0.0281)	-0.0451	(0.0298)
mini nutritional assessment			0.3856***	(0.0138)	0.3462***	(0.0140)	0.3271***	(0.0149)
abnormal blood pressure			-0.0485	(0.0344)	-0.0315	(0.0340)	-0.0760**	(0.0367)
disability: sight			-0.1409***	(0.0496)	-0.1264***	(0.0489)	-0.2253***	(0.0533)
disability: hearing			-0.2337***	(0.0632)	-0.1793***	(0.0616)	-0.2637***	(0.0633)
disability: talking			-0.4213***	(0.1468)	-0.2571*	(0.1348)	-0.1949	(0.1384)
disability: body extremities			-0.2239***	(0.0482)	-0.2069***	(0.0485)	-0.2072***	(0.0529)
disability: other			-0.4667**	(0.1846)	-0.4133**	(0.1878)	-0.4748***	(0.1829)
smoking			-0.0830**	(0.0352)	-0.0787**	(0.0350)	-0.1034***	(0.0377)
alcohol consumption			0.0502	(0.0340)	0.0516	(0.0330)	0.0569	(0.0372)
empowerment					0.1059***	(0.0142)	0.0778***	(0.0158)
self-esteem					0.1613***	(0.0139)	0.1451***	(0.0153)
mental disability					-0.0433***	(0.0154)	-0.0646***	(0.0148)
social network size					-0.0150	(0.0130)	-0.0030	(0.0144)
freq of contact with network					-0.0197	(0.0136)	-0.0324**	(0.0146)
Constant	-0.1458***	(0.0515)	0.0486	(0.0494)	0.0600	(0.0481)	-0.0166	(0.0601)
District fixed effects	No		No		No		Yes	
Observations	4039		4016		3921		3921	
R-squared	0.156		0.310		0.351		0.461	

Robust Standard errors in parentheses. * p<0.10 ** p<0.05 *** p<0.01. The dependent variable is the number of successful indicators (from 0 to 9). The regressors are in standardized values, with the exception of dummy variables.

Table 5. LPM estimates for each indicator of successful ageing

Variables	I. Physical health						II. Functioning				III. Cognition		IV. Emotional health		V. Life satisfaction			
	Chronic illnesses		Self-reported health		Self-reported health (respect to last year)		self-reported health (respect to persons of similar age)		ADL		IADL		Cognitive functioning		Depressive symptoms		Life satisfaction	
	coeff	se	coeff	se	coeff	se	coeff	se	coeff	se	coeff	se	coeff	se	coeff	se	coeff	se
male	0.0328***	(0.0105)	-0.0103	(0.0197)	-0.0465**	(0.0200)	0.0018	(0.0194)	0.0107	(0.0174)	0.0801***	(0.0180)	0.0370**	(0.0159)	0.0694***	(0.0194)	-0.0233	(0.0190)
age	-0.0005	(0.0042)	-0.0105	(0.0084)	-0.0031	(0.0083)	-0.0010	(0.0081)	-0.0307***	(0.0073)	-0.0460***	(0.0076)	-0.0466***	(0.0070)	0.0018	(0.0079)	0.0102	(0.0079)
married	0.0072	(0.0096)	-0.0083	(0.0182)	0.0023	(0.0189)	-0.0034	(0.0177)	-0.0054	(0.0159)	0.0113	(0.0167)	-0.0209	(0.0156)	0.0747***	(0.0184)	0.0282	(0.0177)
illiterate	0.0340***	(0.0101)	-0.0328*	(0.0199)	-0.0076	(0.0205)	-0.0532***	(0.0198)	-0.0168	(0.0174)	-0.0414**	(0.0187)	-0.2184***	(0.0183)	-0.0345*	(0.0195)	-0.0059	(0.0191)
working	0.0209*	(0.0112)	0.0514***	(0.0196)	0.0218	(0.0202)	0.0868***	(0.0189)	0.0811***	(0.0174)	0.1347***	(0.0186)	0.0318*	(0.0167)	0.0148	(0.0190)	0.0557***	(0.0191)
pensioner	-0.0173	(0.0238)	0.0956**	(0.0378)	-0.0431	(0.0411)	0.0423	(0.0354)	0.0044	(0.0335)	-0.0069	(0.0396)	0.0245	(0.0315)	0.0770**	(0.0375)	0.0232	(0.0415)
health insurance	-0.0034	(0.0087)	-0.0390**	(0.0170)	-0.0009	(0.0172)	-0.0406**	(0.0164)	-0.0129	(0.0150)	-0.0038	(0.0158)	-0.0021	(0.0138)	-0.0196	(0.0165)	0.0014	(0.0167)
income	-0.0067	(0.0049)	-0.0031	(0.0084)	0.0152*	(0.0091)	-0.0006	(0.0074)	0.0081	(0.0076)	0.0084	(0.0084)	-0.0078	(0.0085)	0.0051	(0.0087)	-0.0055	(0.0093)
household size	0.0034	(0.0050)	0.0137	(0.0092)	-0.0028	(0.0095)	0.0119	(0.0089)	-0.0013	(0.0073)	-0.0007	(0.0081)	-0.0023	(0.0073)	0.0197**	(0.0082)	0.0078	(0.0088)
mother tongue indigenous	0.0228	(0.0206)	-0.0422	(0.0394)	-0.0234	(0.0406)	-0.0067	(0.0364)	-0.0134	(0.0346)	0.0125	(0.0377)	-0.0085	(0.0322)	0.0333	(0.0388)	-0.0615	(0.0379)
urban	-0.0418**	(0.0185)	0.0101	(0.0360)	-0.0481	(0.0362)	0.0006	(0.0347)	-0.0242	(0.0324)	0.0056	(0.0329)	0.0818***	(0.0292)	-0.0546	(0.0353)	0.0165	(0.0358)
food insecurity index	0.0006	(0.0045)	-0.0338***	(0.0091)	-0.0280***	(0.0093)	-0.0217**	(0.0087)	-0.0308***	(0.0080)	-0.0393***	(0.0083)	-0.0226***	(0.0074)	-0.0625***	(0.0087)	-0.0379***	(0.0089)
anaemia	0.0039	(0.0078)	0.0129	(0.0173)	-0.0041	(0.0173)	-0.0258	(0.0166)	-0.0106	(0.0150)	-0.0210	(0.0157)	-0.0147	(0.0142)	-0.0308*	(0.0169)	-0.0121	(0.0166)
mini nutritional assessment	0.0149***	(0.0042)	0.1215***	(0.0087)	0.0853***	(0.0089)	0.1458***	(0.0083)	0.0975***	(0.0074)	0.1033***	(0.0079)	0.0224***	(0.0071)	0.0583***	(0.0086)	0.0938***	(0.0087)
abnormal blood pressure	-0.0235**	(0.0114)	-0.0196	(0.0205)	-0.0121	(0.0210)	-0.0305	(0.0199)	-0.0068	(0.0178)	-0.0320*	(0.0191)	-0.0050	(0.0172)	-0.0343*	(0.0202)	-0.0086	(0.0207)
disability: sight	-0.0173	(0.0148)	-0.0645**	(0.0302)	-0.0463	(0.0310)	-0.0873***	(0.0296)	-0.1080***	(0.0270)	-0.1036***	(0.0280)	-0.0014	(0.0257)	-0.0287	(0.0306)	-0.0545*	(0.0290)
disability: hearing	-0.0063	(0.0156)	-0.0531	(0.0366)	-0.0324	(0.0388)	-0.1150***	(0.0372)	-0.1103***	(0.0344)	-0.1255***	(0.0351)	-0.1127***	(0.0317)	-0.0330	(0.0356)	-0.0104	(0.0360)
disability: talking	0.0208	(0.0448)	-0.1276	(0.0854)	-0.0259	(0.0876)	-0.1671**	(0.0784)	-0.0067	(0.0814)	0.1201	(0.0853)	-0.1699**	(0.0826)	-0.0173	(0.0862)	-0.0690	(0.0861)
disability: body extremities	-0.0209	(0.0153)	-0.0953***	(0.0296)	-0.0256	(0.0306)	-0.0755**	(0.0295)	-0.1102***	(0.0288)	-0.0211	(0.0282)	-0.0223	(0.0256)	-0.0185	(0.0279)	-0.0810***	(0.0273)
disability: other	0.1066***	(0.0311)	-0.2920***	(0.0839)	-0.1675*	(0.0926)	-0.2256**	(0.0913)	-0.1845*	(0.1060)	-0.1841*	(0.0992)	0.0781	(0.0930)	-0.1164	(0.0988)	-0.0926	(0.1172)
smoking	-0.0024	(0.0102)	-0.0318	(0.0221)	-0.0362	(0.0227)	-0.0392*	(0.0212)	-0.0298	(0.0189)	-0.0122	(0.0195)	-0.0471***	(0.0180)	-0.0101	(0.0216)	-0.0261	(0.0222)
alcohol consumption	0.0145	(0.0090)	0.0275	(0.0215)	0.0076	(0.0222)	0.0552***	(0.0208)	-0.0146	(0.0187)	0.0047	(0.0191)	0.0036	(0.0175)	-0.0142	(0.0206)	0.0449**	(0.0215)
empowerment	0.0008	(0.0044)	0.0285***	(0.0086)	-0.0002	(0.0093)	0.0251***	(0.0087)	0.0214**	(0.0086)	0.0038	(0.0086)	0.0165**	(0.0077)	0.0486***	(0.0087)	0.0321***	(0.0079)
self-esteem	-0.0001	(0.0044)	0.0343***	(0.0087)	0.0184**	(0.0090)	0.0399***	(0.0084)	0.0423***	(0.0081)	0.0489***	(0.0083)	0.0199***	(0.0076)	0.0687***	(0.0086)	0.0571***	(0.0082)
mental disability	-0.0077	(0.0055)	-0.0103	(0.0075)	-0.0239***	(0.0085)	-0.0147**	(0.0071)	-0.0221***	(0.0072)	-0.0168**	(0.0074)	-0.0367***	(0.0071)	-0.0089	(0.0080)	-0.0056	(0.0079)
social network size	-0.0096**	(0.0048)	-0.0040	(0.0082)	-0.0179**	(0.0088)	0.0063	(0.0081)	-0.0171**	(0.0077)	-0.0020	(0.0077)	0.0129*	(0.0070)	0.0205**	(0.0084)	0.0041	(0.0083)
freq of contact with network	-0.0023	(0.0042)	-0.0142*	(0.0083)	-0.0054	(0.0084)	-0.0205**	(0.0081)	0.0034	(0.0073)	-0.0278***	(0.0076)	-0.0041	(0.0069)	-0.0031	(0.0081)	0.0003	(0.0082)
Constant	0.9102***	(0.0171)	0.6148***	(0.0330)	0.6686***	(0.0340)	0.6241***	(0.0320)	0.7259***	(0.0294)	0.5307***	(0.0305)	0.8091***	(0.0266)	0.5314***	(0.0325)	0.4182***	(0.0318)
Observations	3921		3921		3921		3921		3921		3921		3921		3921		3921	
R-squared	0.166		0.254		0.206		0.296		0.328		0.348		0.282		0.312		0.301	

Robust Standard errors in parentheses. * p<0.10 ** p<0.05 *** p<0.01. Includes district fixed effects. The dependent variable is a dummy indicating success in the indicator. The regressors are in standardized values, with the exception of dummy variables.