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# Successful ageing and multi-dimensional poverty: the case of Peru

JAVIER OLIVERA\* and ISABELLE TOURNIER†

## **ABSTRACT**

This study investigated the determinants of Successful Ageing (SA) in a sample of 4,151 Peruvians aged between 65 and 80 years and living in poverty. A key contribution of this study is to combine the conceptual appeal of SA to measure wellbeing in old age with the multi-dimensional poverty counting approach developed in the economic literature. This setting allows for moving beyond the dichotomy of successful and usual ageing to take advantage of the full distribution of success along a set of dimensions of wellbeing. The data are drawn from the Encuesta de Salud y Bienestar del Adulto Mayor (ESBAM) survey, which is the baseline to evaluate the non-contributory public pension programme Pension 65. 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 male gender, younger old age, literate, employed, low food insecurity, good nutritional status, normal blood pressure, absence of disabilities, non-smoker, 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 influence by public intervention. These variables are food security, nutrition quality and self-esteem.

**KEY WORDS**—successful ageing, old age, poverty, wellbeing, non-contributory pensions, Peru.

## **Introduction**

Social protection policies for old age have undergone a significant shift in Latin America. During the last years, 12 countries of this region<sup>1</sup> have implemented non-contributory pension schemes which, in general, offer a small benefit to elderly individuals who are not entitled to receive any other

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pension and live in poverty. The amount of the benefit, coverage (targeted or universal) and access requisites vary widely in the region, but given the popularity and inherent long-term fiscal commitment of these programmes, 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 of the 1990s and 2000s 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 (such as the World Bank and the Inter-American Development Bank) with respect to these programmes, is the assessment of the impacts on different outcomes related to the wellbeing of the recipients. Particular attention has been paid to variables such as labour supply, retirement decisions, saving behaviour and health. Such empirical attention has yielded mixed results. For example, it has been found that non-contributory pensions do not reduce the labour supply of old individuals in Mexico, but the reduction is very large in Brazil (Olivera and Zuluaga 2014). However, there is a lack of studies that focus on a summary indicator of different dimensions of old age wellbeing. In this respect, a concept used widely in the ageing literature, Successful Ageing (SA), can help to understand more fully the effects of non-contributory pensions on multi-dimensional wellbeing. As the implementation of the concept of SA proved to be rather rigid (estimating the share of individuals with SA *versus* usual ageing), the present study will enrich this approach by incorporating the counting method for multi-dimensional poverty developed in the economic literature.

As some of the non-contributory pension programmes have started to produce information to measure the impact on the recipients, this study profits from its access to a unique data-set carried out for that specific purpose (Encuesta de Salud y Bienestar del Adulto Mayor (ESBAM)). This survey is the baseline of Peru's Pension 65 programme 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 per cent of the 65+ population.

Although research on ageing was long influenced by the view of a linear deterioration in age and focused on losses, the introduction of the SA concept in Rowe and Kahn's (1987) seminal article has contributed to a more positive view of this developmental period. Indeed, the age-related changes in physiological, physical and cognitive functions, though considered a part of normal ageing, showed a wide range of individual variation

and could be modified by some environmental factors. In this context, the idea behind the concept of SA is to distinguish why some individuals experience their course of ageing better than others and which factors should be improved to increase the number of people with SA. Moreover, as SA summarises 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 a topic of debate about what exactly the definitions of SA and usual ageing 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 (Rowe and Kahn 1997). Moreover, a proposal has been made to include indicators of subjective wellbeing 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 ten Latin American and European countries, health, independence, social relationships and life satisfaction are the components most frequently and consistently cited by elderly individuals on what is important for 'ageing well' (Fernandez-Ballesteros *et al.* 2010). On a similar note, Hung, Kempen and de Vries (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) revealed 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 focused on industrialised countries and mostly in specific populations of elderly individuals. Less is known about SA 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). Associated with SA in Brazil, Chaves *et al.*

(2009) and de Moraes and de Azevedo e Souza (2005) report family relations and friendship, health and perceived wellbeing, functional capacity and psycho-social support, and family income. Regarding the analysis of SA among the poor, there is a lack of studies that focus on this specific population. As an exception, Chung and Park (2008) 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: (a) a positive attitude towards life, (b) the success of adult children, and (c) relationships with others.

The vast majority of studies assessing SA present the estimated share of individuals ageing with success in opposition to those individuals who experience usual ageing. Nonetheless, it is difficult to compare studies, 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 SA 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 SA or usual ageing. Hence, it is preferable to take a more flexible approach. Recent developments in economics in accounting for multi-dimensional poverty and wellbeing (*see e.g.* Alkire and Foster 2011) seem to provide an adequate base on which to build 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. As pointed out by Bourguignon and Chakravarty (2003), it has extended the use of a threshold of subsistence income or consumption (poverty line) to determine who is and who is not poor. An individual is considered poor if his or her income falls below the poverty line, and therefore, the poverty rate in the country is the share of individuals classified as poor. However, the problem with this approach is that poverty (or deprivation of wellbeing) also depends on attributes that are non-monetary and that cannot be purchased in the market (*e.g.* health, literacy, self-esteem, food security, *etc.*). This is why multi-dimensional measurement is needed. Some key developments in theoretical and methodological ways to deal with the estimation of multi-dimensional poverty in a counting approach are discussed in Atkinson (2003) and Alkire and Foster (2011). When following the counting approach, one first looks at each relevant dimension and assesses whether the individual is deprived of such dimensions according to specific deprivation cut-offs. A failure is assigned the value of one, otherwise a zero is assigned. Once

all dimensions are transformed into zero or one, they are summed up to detect the number of dimensions in which the individuals are deprived. The result is a continuum of values for each individual, where the minimum value is zero and the maximum is the total number of dimensions considered in the analysis. According to the *union* approach of the poverty counting method, individuals are considered to be poor if they are deprived in at least one dimension. But according to the *intersection* approach, individuals are considered poor if they are 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* approaches.

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, or assign a zero if otherwise. Third, in the current state of the SA empirical literature, an individual is considered to be ageing successfully if he or she rates successfully in each dimension under analysis, which is equivalent to the above-mentioned *intersection* approach.

The objective of this study is to account for the number of relevant dimensions in which the individual is successful. To do this, we report and use the complete distribution of successful indicators to assess the determinants in the numbers of achievements. This way of analysing SA allows us to move beyond the dichotomy of SA—usual ageing entrenched in the SA literature, and take full advantage of the observed variation in success.

## Data and methodology

### Data

The data were drawn from ESBAM, which is a unique survey conducted by Peru's INEI in December 2012 in 12 administrative regions<sup>2</sup> (half of the total number in Peru). This survey includes a detailed questionnaire for persons aged 65–80 years on socio-economic conditions, subjective well-being, expectations, beliefs, and several self-reported subjective and objective health measures, anthropometrical measures (circumference of the waist, calf and arm, as well as armspan and weight), blood sampling and arterial blood pressure. 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.

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 blood pressure and blood samples were collected by medical technicians. The goal of this data-set is to establish the baseline for the evaluation of Pension 65, which is a recently implemented non-contributory pension programme administrated by the Ministry of Development and Social Inclusion of Peru (MIDIS). The cash transfers of this programme are targeted to individuals aged 65+ who do not receive a contributory pension and live in extreme poverty.

The population in ESBAM comprised individuals aged between 65 and 80 years who lived in particular households classified as poor by the national targeting score system SISFOH. Under this system, each household receives a score computed with variables such as material conditions, assets, incomes, education level, household size and occupation. Then, according to some thresholds in the score, the government classifies each household as extreme poor, non-extreme poor or non-poor, with the goal of targeting the recipients of social assistance. The sampling selection was probabilistic, independent in each region, stratified in rural/urban areas and carried out in two steps (first selecting census units or villages and then households). After excluding 65 individuals who were assisted by a *proxy* in answering the questionnaire (mostly persons with severe impairments such as blindness and deafness), the sample comprised 4,151 individuals. This number slightly decreases because of missing values in some variables of interest. No major limitations were found while collecting the data. Indeed, 3,083 out of 3,200 targeted households were successfully interviewed, which represented a success rate of 96.4 per cent.

### *Distinguishing SA 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 their corresponding indicators were: (a) good health (low number of illnesses, good self-rated health), (b) efficient daily living functioning (good activities of daily living and instrumental activities of daily living measures), (c) efficient cognitive functioning (high scores on the cognitive measure adapted from the Mini Mental State Examination<sup>3</sup>), (d) good emotional health (lower depressive symptoms), and (e) high life satisfaction (in eight different domains). These dimensions were chosen because they include the aspects mentioned by Rowe and Kahn (1997) as

well as indicators of subjective wellbeing (*i.e.* good emotional health and life satisfaction) as has been recommended by several authors (*e.g.* Cosco *et al.* 2014). More details of each indicator and their specific thresholds are reported in Table 1.

### *Determinants of SA*

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 in 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 = not receiving a pension), health insurance (1 = has health insurance, 0 = no health insurance), total annual household income (expressed in monthly Nuevos Soles, the monetary unit of Peru), household size, ethnicity (1 = indigenous mother tongue, 0 = other), area of living (1 = urban, 0 = rural) and food insecurity index. It must be noted that food insecurity, measured at the household level, can be an important source of stress for the household and can ultimately lead to starvation. In this respect, ESBAM closely follows the Household Food Insecurity Access Scale developed by Coates, Swindale and Bilinsky (2007). The index consists of nine items referring to various difficulties encountered in accessing food, and each item is rated on a four-point intensity scale (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.

The physical variables category included ten items. A dummy variable was used to indicate the presence of anaemia in the individual according to the haemoglobin level of the blood sample that was extracted during the interview and compared to the World Health Organization's thresholds by gender. The Mini Nutritional Assessment (MNA) score was also used to assess the conditions of malnutrition. This instrument is commonly used in samples of older individuals and reveals a good ability to identify frail and elderly individuals at risk of undernutrition and malnutrition (Harris and Haboubi 2005). It is composed of items related to diet quality, mobility, disease history and anthropometrical measures. Importantly, the MNA has also been used in the Survey on Health and Well-being of Elders, a large-scale study implemented during the early 2000s in seven capital



TABLE 1. *Dimensions and indicators of Successful Ageing*

Dimension	Indicator	Value	Success value	Individuals (%)
I. Physical health	Number of medically 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, would 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	From 0 to 6	0-2	71.7
	Limitations with instrumental activities of daily living	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?;	1. 5. 1. Never	3-7	57.2
	(2) Do you feel happy, in a good mood most of the time?;	2. 4. 2. Very few times		
	(3) Do you often feel helpless?	3. 3. 3. Sometimes 4. 2. 4. Yes, most of the time 5. 1. 5. Always		
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	Total: from 3 to 15 1. Not satisfied at all 2. Dissatisfied 3. Satisfied 4. Very satisfied Total: from 8 to 32	24-32	43.4

Source: Encuesta de Salud y Bienestar del Adulto Mayor database, authors' elaboration.

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 categorisation of individuals who are malnourished (<17), at risk of malnutrition (17–23.5) or enjoy normal nutritional status (>24). For comparability reasons with the original version, it was only possible to compute a MNA score 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 World Health Organization norms. Blood pressure was measured for each participant by medical technicians. Five dummy variables indicating whether the individual reported any type of physical disability (sight, hearing, speech, body extremities and others) were also assessed. Finally, two dummy variables were computed to indicate either past or present smoking behaviour and present habitual alcohol consumption.

The psychological variables category included items to assess: empowerment, self-esteem, 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 contribute positively to the wellbeing of elderly people. The reason is that empowerment implies more bargaining power in pursuing one's own desires in regard to 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?' Answers were provided on scales with the options: 5 = Yes, always, 4 = Yes, most of the time, 3 = Sometimes, 2 = Seldom, 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, 1 = Never). As demonstrated in Robins, Hendin and Trzesniewski (2001), this single item has a strong correlation with the ten-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 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, companionship, 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, with the response options: 1 = much, 2 = fair, 3 = little, 4 = nothing. The variable for network size was computed as the number of reported persons with whom the individual feels much trust, *i.e.* their intimate, inner and trustworthy network. This measure of inner social support network is relevant for elderly people because of their

greater frailty and dependence on other persons. Finally, the frequency of contact with the support network was measured in days per year.

### *Method*

Unlike previous approaches aimed at distinguishing the group of individuals ageing successfully from the group of individuals with usual ageing, this study investigated specifically what factors were associated with performing better in a larger number of successful indicators, without imposing any threshold for determining who presents SA *versus* usual ageing. The goal was to move beyond the common dichotomy of SA 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 (ordinary least squares (OLS)), was the following:

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

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

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).<sup>4</sup> Equation 2 is the model to estimate, which includes a vector of  $X_k$  different determinants of SA and an normally distributed error term  $\mu_i$ . This strategy allowed the arbitrariness of conforming two exclusive groups (SA and usual ageing individuals) to be overcome. Other studies on SA have routinely employed that strategy and hence have removed almost all variation contained in the SA indicators. It could very well be the case that within the groups of SA and usual ageing adults, 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 the favouring or limiting of SA in a number of indicators. As discussed above, these indicators are part of dimensions considered to be important in measuring the quality of ageing of elderly individuals. However, it is also important to look at each indicator and its determinants to understand better the conditions enhancing a good performance on the indicator. In this way, public policies oriented towards improving the living

conditions of the old-age population can be focused 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 (LPM) regressions. In this case, the interest is in the average effects of the determinants on each indicator. The reduced equation used 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 standardised values (mean = 0 and standard deviation = 1) with the exception of the dummy variables. Furthermore, the regressions use robust standard errors.

## Results

### *Distribution of SA*

The distribution of population by successful indicators, shown in [Table 2](#), revealed that 14.6 per cent of the individuals analysed in the sample are successful in all nine indicators. In the standard approach employed in the SA literature, the researcher would interpret this figure as the proportion of individuals with SA while the proportion with usual ageing would be 85.4 per cent. However, in our counting approach we do not simply intend to establish these two groups. Instead, we look at the variance in the contribution of each indicator (*see Table 2*). For example, 18 per cent of the sample satisfied a maximum of three indicators with success, and 29.2 per cent satisfied eight or nine indicators.

### *Determinants of multi-dimensional SA*

First, the standardised 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 4](#).

The groups of variables were introduced one by one in the first three columns of [Table 4](#), with Model 1 composed of only 12 socio-demographic variables. Model 2 included ten additional variables related to physical health and Model 3 added a further five psychological health-related variables. The final model (Model 4) included dummies for each district of the respondent (fixed effects). The goal of this last specification was to

TABLE 2. *Distribution of population by successful dimensions*

Number of successful indicators	Frequency	%	Cumulative %
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	4,053	100.0	

*Source:* Encuesta de Salud y Bienestar del Adulto Mayor database, authors' elaboration.

capture unobservable characteristics at the local level, such as labour market conditions, community deprivation of health and basic services, healthy environments, *etc.*

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, speaking the Spanish mother tongue, working and receiving pensions. Surprisingly, having any type of health insurance was negatively associated with 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 their SA was.

Regarding the physical health-related variables added into Model 2, anaemia was not significant but the MNA score was 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 score and anaemia are highly correlated. Regarding the effects of permanent disabilities, all physical disabilities were statistically significant and negatively associated with SA. Finally, of 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. Neither of the two variables related to

TABLE 3. Standardised means by successful indicators

Variables	Number of successful indicators								
	1	2	3	4	5	6	7	8	9
Male <sup>1</sup>	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 <sup>1</sup>	0.678	0.668	0.650	0.668	0.721	0.711	0.735	0.740	0.766
Illiterate <sup>1</sup>	0.557	0.443	0.376	0.328	0.303	0.278	0.237	0.221	0.184
Working <sup>1</sup>	0.478	0.512	0.595	0.664	0.693	0.746	0.747	0.745	0.775
Pensioner <sup>1</sup>	0.000	0.012	0.033	0.018	0.039	0.038	0.035	0.052	0.052
Health insurance <sup>1</sup>	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 <sup>1</sup>	0.565	0.418	0.408	0.376	0.357	0.321	0.269	0.197	0.168
Urban <sup>1</sup>	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 <sup>1</sup>	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 <sup>1</sup>	0.123	0.222	0.170	0.211	0.209	0.175	0.163	0.209	0.190
Disability: vision <sup>1</sup>	0.104	0.131	0.149	0.120	0.085	0.080	0.061	0.078	0.051
Disability: hearing <sup>1</sup>	0.122	0.111	0.080	0.058	0.058	0.064	0.039	0.037	0.025
Disability: talk <sup>1</sup>	0.035	0.020	0.022	0.009	0.010	0.004	0.003	0.002	0.002
Disability: limbs <sup>1</sup>	0.191	0.221	0.138	0.109	0.095	0.080	0.076	0.051	0.042
Disability: other <sup>1</sup>	0.009	0.020	0.011	0.004	0.002	0.004	0.002	0.002	0.002
Smoking <sup>1</sup>	0.157	0.164	0.204	0.216	0.193	0.187	0.213	0.211	0.210
Alcohol consumption <sup>1</sup>	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 <sup>1</sup>	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
Frequency of contact with network	0.306	-0.073	0.002	0.010	-0.072	-0.020	-0.079	0.045	0.086

Note: 1. Dummy variables are not standardised.

TABLE 4. Ordinary least squares estimates for Successful Ageing

Variables	Model 1		Model 2		Model 3		Model 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

Frequency 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	4,039		4,016		3,921		3,921	
R <sup>2</sup>	0.156		0.310		0.351		0.461	

*Notes:* Coeff: coefficient. SE: robust standard error. The dependent variable is the number of successful indicators (from 0 to 9). The regressors are in standardised values, with the exception of dummy variables.

*Significance levels:* \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .



TABLE 5. *Linear probability model 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
Frequency 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	3,921	3,921	3,921	3,921	3,921	3,921	3,921	3,921	3,921	3,921	3,921	3,921	3,921	3,921	3,921	3,921	3,921	3,921
R <sup>2</sup>	0.166	0.254	0.206	0.296	0.328	0.348	0.282	0.312	0.301									

*Notes:* Coeff: coefficient. SE: robust standard error. ADL: activities of daily living, IADL: instrumental activities of daily living. Includes district fixed effects. The dependent variable is a dummy indicating success in the indicator. The regressors are in standardised values, with the exception of dummy variables. *Significance levels:* \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

social support were 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 fixed effects for districts as a way to control for unobservable characteristics at the community level. Therefore, some estimators previously found to be statistically significant lost their significance. This was the case for being a pensioner, income, indigenous mother tongue and living in urban areas. In this model, 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 scores), normal blood pressure, lack of physical disabilities and non-smoker. Finally, SA was positively associated with high empowerment, self-esteem, being free of any mental disability and having less frequent contact with the social support network.

### *Determinants of individual dimensions of SA*

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. Recall that in the LPM, the dependent variable takes the value of 0 or 1, while in the OLS estimates, the dependent variable is the number of successful indicators and ranges from 0 to 9; therefore, the magnitude of the OLS coefficients will be larger than the LPM coefficients. It is notable that the MNA score is statistically significant and positively associated with every indicator. A similar performance was observed for the food insecurity index and self-esteem: both were statistically significant in all indicators with the exception of chronic illnesses. Food insecurity was negatively related to each indicator, which is a very important finding for public policy because it reveals the key role of nutrition and food intake security in the wellbeing of the poor and elderly population. Furthermore, self-esteem is positively related to all indicators, a finding which should be taken into consideration by public interventions geared towards the improvement of the quality of ageing. Other important variables with a large number of statistically significant results are working (with seven), empowerment and other disability

(both with six), and male, sight disability, social network size and mental disability (each with five).

## **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 to provide insights about which variables influence the quality of ageing in this population. The analysed data are drawn from the ESBAM survey implemented in December 2012 by Peru's INEI and MIDIS, which is the baseline of the governmental non-contributory pension programme Pension 65.

The quality of ageing was rated according to nine 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 per cent, there is a sizeable heterogeneity along the distribution of success for each indicator. Consequently, the present analyses take advantage of the complete distribution of success along the set of available indicators without imposing any specific threshold to distinguish SA from usual ageing. In this way it differs from previous research that mostly focused on the dichotomy of SA *versus* usual ageing. The interest was on assessing what factors were associated with performing better in a larger number of successful indicators. In particular, the empirical strategy consisted of 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 to the number of successful indicators. Some associations, such as gender or age, have been reported in other studies (*see e.g.* Depp and Jeste 2006; Hsu 2005), whereas others are rather 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. All these variables are highly correlated to distinct socio-economic differences among districts. For example, given that pensioners tend to live in urban localities and the indigenous

population is 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 specific, 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 finding is the positive and strong association between working and quality of ageing. The status of being employed can help old-age individuals to maintain good levels of cognitive functioning and mobility, although one must be cautious in interpreting this finding given the endogeneity between retirement and health. Rohwedder and Willis (2010) argue that individuals can self-select into retirement if the cognitive demands associated with the job are intolerable, so that the decision of retirement can be endogenous with the state of the cognitive functioning.<sup>5</sup> 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 with health insurance is 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 subsidised health scheme for persons living in poverty, and at the same time, evidence suggest that SIS affiliates do not use it.<sup>6</sup>

The physical health-related variables positively affecting SA, after the inclusion of district effects, were good nutritional status (high MNA scores), normal blood pressure, not smoking, and low self-reported disabilities of vision, hearing, body extremities and 'other' areas. The relatively strong and statistically significant coefficient of MNA, probably explained by the importance of efficient nutrition and low sarcopenia for physical and cognitive functioning (*see* Choquette *et al.* 2010; Shatenstein *et al.* 2012), calls for more empirical attention on nutritional aspects, which have not been studied in depth in the SA literature (an exception is Ng *et al.* 2009). Furthermore, results of the regressions revealed that the MNA score is highly correlated with anaemia, so that this instrument could perhaps replace the costly and time-consuming 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, Spiro and Gaziano 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, having poor sight may restrict the individual in his or her ability to read medical instructions and correctly take the adequate doses of medications (Windham *et al.* 2005).

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 psycho-social 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 apparent association (Hodge *et al.* 2013). This discrepancy can be explained by variations in SA assessment (*i.e.* more or less measurement of psycho-social aspects) and the absence of a clear and unique definition of psycho-social network (Hodge *et al.* 2013). Perhaps it is the quality of the social support network, instead of frequency or quantity of contacts, that likely matters in SA. An example of this is given in Chaves *et al.* (2009), who note that interactions with unloved acquaintances might represent a psychological burden.

Our finding on empowerment lends support to the idea that older individuals with more bargaining power in pursuing their own desires with respect to resources and decisions can also increase their wellbeing (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, Seo and Sok (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 be 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 various 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 represents an important source of stress for the household and its members living in poverty, and a low MNA score relates to a poor quality of nutrition. Self-esteem was measured with a single item which is highly

correlated with the ten-item Rosenberg Self-esteem Index. Although the evaluation of the programme Pension 65 has not been carried out yet, an important impact of this programme on the recipients might be an increase in their nutritional state, food security and self-esteem. Nevertheless, the economic transfer provided by the programme could be insufficient to have an 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.

Although the literature on SA is extensive, our paper has shown that the use of the multi-dimensional poverty counting approach developed in the economic literature is promising to improve our understanding of wellbeing in old age. Indeed, in public policy circles, the use of multi-dimensional synthetic indicators is gaining prominence, and hence, we believe that the concept of SA can be well taken and applied by policy makers if this is assessed with a multi-dimensional counting approach. Another contribution of our paper is that the focus is on a unique sample of individuals who face different age-related challenges than typical samples used to assess SA. This last aspect is particularly relevant for countries with significant proportions of their elderly living in poverty. Although the situation of elderly people in Peru is not strictly equal to that of other middle-income countries, it may be the case that our results can be used as evidence of how wellbeing is determined in old age.

## NOTES

- 1 Bolivia (2008), Chile (2008), Colombia (2003), Ecuador (2003), El Salvador (2009), Guatemala (2005), Honduras (2011), Mexico (2007), Panama (2009), Peru (2011), Paraguay (2009) and Venezuela (2011). For more details on non-contributory pension programmes, see table A1 in Olivera and Zuluaga (2014).
- 2 The administrative region is the first political and territorial division, the second one is the province and the third one is the district. Some districts, particularly in rural areas, are further divided into *centros poblados* (villages).
- 3 The score of cognitive functioning is computed based on four questions. The first question is about orientation and asks about the day of the month, the month, the year and the 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 again later (fourth question) in order to measure delayed recall. A point is given for each word correctly remembered. The third question is a command of three actions that the respondent has to follow in the correct order: 'I will give you a piece of paper. Take this with your right hand, bend in half with both hands, and place it on your legs'. Each correct action receives one point. The cognitive score is the sum of all the points recorded for each question (with a total score ranging from 0 to 13 points).

- 4 The counting approach of multi-dimensional poverty involves other technical features, but they are beyond the scope of the present study. For example, topics of hot debate include 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.
- 5 In a recent paper with the same Peruvian data-set used in this paper, Novella and Olivera (2014) explore the relationship between retirement induced by the non-contributory pension programme and cognitive functioning.
- 6 In the sample of analysis, 64 per cent of the population was enrolled in some type of health insurance (two-thirds of this percentage were enrolled in SIS). Furthermore, 39 per cent of health-insured individuals who were sick during the four weeks prior to the survey interview did not seek medical attention.

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