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Ageing Unequally in Latin America

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Abstract

This paper studies active ageing and its distribution among older adults in a sample of 18 Latin American countries. For this purpose, a multidimensional index of active ageing is estimated for each individual, as well as its distribution in each country. This strategy makes it possible to measure inequalities in the ageing process, and also to consider different value judgements in the overall assessment of quality of life during ageing. Thus, the study sheds light on discrepancies in the quality of ageing within and between countries. Furthermore, individual factors associated with the degree of inequality in active ageing are analysed by means of regressions using Gini re-centred influence functions. A higher proportion of people with secondary education and better access to water and sewerage services is found to be associated with reduced inequality in active ageing. Country-level variables — such as health expenditure, pension coverage, access to health care and the poverty rate among older people — are key in explaining between-country differences in active ageing.

Key words: Active ageing, Old age, Inequality, Well-being, Latin America

JEL-classification: H55, I14, I31, J14

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1 Introduction

While population ageing is a global success story, reflecting important achievements in terms of reduced mortality and a steady increase in life expectancy, it is also important to consider under what conditions ageing occurs. For governments and society, this success also implies the challenges of implementing the necessary policies and institutions so that older adults can have an adequate quality of life with a healthy and active lifestyle. Population ageing is one of the most important challenges in the world, and although in Latin America the population is still relatively young, demographic projections point to a significant increase in the population of older adults by 2050 (Bosch et al. 2013). While 13 per cent of the population in Latin America was aged 60 years or older in 2020, this figure is predicted to be 25 and 38 per cent in 2050 and 2100, respectively.[1]

Life expectancy is a variable that can capture the success of public policies (especially improvements in the health system) and the continued effects of favourable living conditions and the acquisition of human capital. However, this variable has its own limits in terms of adequately capturing other dimensions of well-being that are important for older adults, and for assessing well-being on an individual basis.

There are other tools that use the theoretical principles of successful, active and healthy ageing as a basis to study and monitor the quality of ageing across countries in a multidimensional approach. In general, these approaches count the proportion of elderly individuals who are ageing well, which is useful for comparing societies in a given year or across periods. This also allows the identification of areas where public policies can improve the well-being of individuals or where their focus should be.

This paper studies how well people age in 18 Latin American countries, by adapting one of these approaches (the *Active Ageing Index*, AAI) to Latin America and estimating the quality of ageing at the individual level. The AAI was jointly developed by the European Commission (EC) and the United Nations Economic Commission for Europe (UNECE) to measure active and healthy ageing in an aggregated way. Similarly to the well-known Human Development Index (HDI), the AAI is estimated by country and time period using a variety of data sources. Thanks to the methodological advances made by Olivera (2022), it is possible to estimate active ageing at the individual level and study its distributions across countries. Therefore, an important objective of this study is to shed light on discrepancies within countries in the quality of ageing, and to compare the quality of the ageing experience between countries.

The discussion initiated by the Organisation for Economic Co-operation and Development (OECD) with its report *Preventing Aging Unequally* (OECD 2017) focuses on inequalities experienced in old age, and how these relate to early life conditions and the institutional environment. The present paper contributes to this debate by studying the distribution of the quality of ageing. In fact, going beyond economic inequalities in old

[1] Data from the CEPALSTAT statistical system of the Economic Commission for Latin America and the Caribbean (ECLAC).

age, this study focuses on inequalities in active ageing, which captures differences in dimensions of well-being that are relevant and valuable to older adults.

Obtaining AAI distributions for each country allows for comparisons that go *beyond the mean*. These distributions are used in a flexible way in order to incorporate normative judgements on how to rank countries according to considerations of efficiency (a higher average level for the AAI) and equality (a more equal distribution of the AAI). Thus, another objective of this paper is to study the differences and ranking of countries according to their level of AAI, also taking into account different scenarios of normative judgements on the distribution of the index. It may be that one country has a higher AAI than another on average, but simultaneously has a more unequal distribution, which would make it difficult to have an unambiguous ranking of which country has a better overall performance for active ageing. The use of different normative assessments — that is, the importance given to the distribution of active ageing in the population — will help to improve the understanding of the level and distribution of the quality of ageing in Latin America.

This study exploits the most recent round of the *Latinobarometro* surveys, held in late 2020 in 18 Latin American countries and estimating individuals' values of AAI for the elderly population. Uruguay and Argentina are the countries that show the best performance in active ageing, even under different normative considerations. After these countries, Chile and the Dominican Republic also tend to perform well for various equality concerns. Guatemala is the country with the lowest average value for the AAI, but once strong equality concerns are included, the worst performer is Bolivia. This means that active ageing is both low and unequally distributed in Bolivia. Substantial heterogeneity in the quality of ageing is found both within and between countries in Latin America. For example, the average AAI value in Uruguay is 50 per cent higher than in Guatemala. Or to put it another way, 40 per cent of the population in Guatemala has lower result for active ageing than the bottom 10 per cent of the AAI distribution in Uruguay.

The study also examines the predictors of the level of AAI inequality by means of Gini re-centred influence function (RIF-Gini) regressions and finds that an increase in the proportion of people with tertiary education or greater access to water and sewerage services could reduce inequality in the index. An increase in the proportion of the oldest group may increase active ageing inequality.

Lastly, the study also explores potential country-level determinants of individual active ageing in the pooled sample of countries. As expected, active ageing is greater when pension systems are more mature (in terms of expenditure, coverage and generosity of benefits) and public health expenditure is higher, as well as when there is better access to and quality of health care.

The rest of the paper is organised as follows. Section 2 reviews the literature about approaches to measuring the quality of ageing. Section 3 describes the data and methods used. Section 4 presents and discusses the empirical results. Lastly, Section 5 concludes.

2 Literature review

2.1 Approaches about ageing

Ageing is a process of complex changes that pose significant health, economic and occupational challenges to ensure people's longevity in good health and with a good quality of life. There is a decline in physical and mental capacities and/or onset of chronic conditions, differing from person to person and over age groups. These losses in functional capacities are also related to an individual's social environment.

The progressive ageing of the population worldwide has brought to the discussion models of *successful ageing*, *healthy ageing* and *active ageing*, all of which share in some way the concern about how well people age. Therefore, many researchers have focused on the study of these models in order to propose public policies that guarantee a healthy and contented ageing process. Effective healthy ageing policies intend to improve opportunities throughout the life course and to modify lifestyle risk factors. Many of these policies seek to promote autonomy, participation and the right of older adults to active ageing.

Theories or models of 'successful ageing' can be traced back to Havighurst (1963) and Rowe and Kahn (1997). The former defines successful ageing through the activity theory, which promotes the maximum level of satisfaction and happiness. Activity theory considers that a successful ageing process consists of staying active during old age and maintaining social interactions. Although research on ageing has long been influenced by the view of a linear decline in age and has focused on deterioration, the development of the concept of successful ageing by Rowe and Kahn (1997) has contributed to a more positive view of old age.

Age-related changes in physiological, physical and cognitive functions, although considered part of normal ageing, show important variations among individuals and can be affected by some environmental factors. The concept of successful ageing helps us to distinguish why some people experience ageing better than others, and to determine the (modifiable) factors contributing to this. Some criticisms of this concept are related to the lack of dimensions not considered in early versions of the theory. For example, the absence of active spirituality, as this is a component fostering engagement in life and community activities that promote active participation in society (Crowther et al. 2002). Other missing indicators include the quality of social relationships and life satisfaction, which are important aspects reported by older adults themselves when asked about which dimensions are most important for their well-being (Fernandez-Ballesteros et al. 2010).

The World Health Organization (WHO) defines healthy ageing as the process of promoting and maintaining functional capacity that enables well-being in old age. That is, maintaining the attributes of intrinsic capacities such as physical and mental health within an environment that is shaped by the context of life (home, community and society at large) with well-being, defined as a sense of fulfilment and satisfaction (WHO 2015). Therefore, healthy old age should not only be seen as a disease-free stage or with disease

control, but should be understood from a multidimensional point of view.

With regard to the dimensions encompassed by healthy ageing, Lu et al. (2019) developed the following domains from a comprehensive literature review of health studies in older adults. These are: physical abilities, cognitive function, metabolic and physiological health, general health status, mental and social well-being, safety and behaviour. Accordingly, healthy ageing relates to different dimensions of health: biological (adoption of healthy habits and behaviours with self-responsibility), psychological (feelings of optimism and happiness), spiritual (faith and religiosity), social (reciprocity in social support factors) and the ability to live autonomously and independently (Tavares et al. 2017). The social environment of the older adult (including support networks, family members and public) is also part of this multidimensional framework.

Active ageing is an approach and policy framework formulated during the Second World Assembly on Ageing in 2002. It is defined as the process by which older adults optimize their opportunities for health, participation and security to improve their quality of life (WHO 2002). Zaidi et al. (2017) define active ageing as a concept that captures continued participation in social, economic, cultural, spiritual and civic life, as well as well-being, autonomy and independence. In this model of ageing, health encompasses physical health and mental and social well-being; participation is understood as a set of diverse social, economic, cultural, spiritual and civic activities that the older adult can engage in; and the area of security is linked to the older adult's access to a secure physical and social environment, including social protection (income or pensions), food security or job satisfaction (Zaidi et al. 2017). Additionally, this model proposes another way of seeing the older adult as a person who continues to be the protagonist of their life, and who is able to participate in the community, not only as a recipient of care and services (Limón and Ortega 2011). In this sense, the concept is a more holistic view of old age that complements the healthy ageing model, as it integrates societal and personal factors.

2.2 Active Ageing Index

The Active Ageing Index (AAI) is a multidimensional index aimed at monitoring active ageing, and allows measuring the extent to which people's potential is realized as they age (Zaidi et al. 2013). The index consists of 22 indicators measured for the elderly population and grouped into four domains. These domains are: (i) employment, (ii) participation in society, (iii) independent, healthy and safe living, and (iv) capabilities and enabling environment for active ageing. Table A.1 in the Appendix shows all the domains and their indicators according to the review of Zaidi et al. (2013).[2]

The first domain, "employment", measures the participation of older people in the labour market, but not the intensity of employment (hours of work) or the quality of jobs. It only includes the employment rate in four 5-year age groups (55-59, 60-64, 65-69

[2]Originally, the domain of employment included the employment rate of four distinctive age groups.

and 70-74). The second domain, "participation in society", measures the contribution of older adults to unpaid economic activities, such as care work, as well as volunteering in organisations and political participation. The third domain, "healthy and secure independent living", examines financial security, opportunities to participate in the economy, the ability to participate in the labour market, access to health services and the autonomy of older adults. Lastly, the fourth domain is "capacity and enabling environment for active ageing". It encompasses the contextual opportunities for improving the quality of life of older adults, and thus incorporates remaining life expectancy, the absence of physical and mental limitations to perform daily activities, and human capital, such as educational attainment, internet use and social connectivity.

The first three domains measure the current condition of active ageing, or the actual experience of older adults in terms of leading independent, socially and economically autonomous lives. The last domain measures the factors that contribute to or hinder the achievement of active ageing (UN 2019). This domain is an input that can be used to design and adjust social policies to achieve better outcomes in the first three domains. The standard methodology for computing the AAI is similar to the Human Development Index: each of the four dimensions of ageing has a specific weight, while the indicators within each domain also have specific weights. The final value of the index has a direct and positive relationship with each of the indicators, the values of which range from 0 to 100 points. The index presents challenges that are common to other composite indices that attempt to measure multidimensional well-being. For example, the choice of relevant domains, the use of appropriate weights and the difficulty in accounting for individual heterogeneity in the index (Decancq and Lugo 2013).

Another possible limitation for the construction of the AAI is the lack of availability of harmonized data. However, two approaches can be followed: one that uses the same database for the index calculation and another approach that uses different data sources and international indicators, but that may have comparability problems. For example, for the AAI calculation in Europe, different data sources are used to capture the dimensions of active ageing.[3]

The AAI provides useful information for designing policies and interventions to address the domains and/or indicators that are under-performing (Zaidi et al. 2017). The estimation of the index allows for the comparison of average levels of active ageing across countries or regions. However, a greater amount of disaggregated information is needed for the design of better targeted policies for more-vulnerable groups within the older adult population. Although the AAI methodology did not originally aim to monitor active ageing at the individual level and its relationships with individual characteristics, it could be possible to provide more insights into the quality of ageing if the index were computed at the level of the individual (Gonçalves et al. 2017). In addition, the individual values

[3]The EU Labour Force Survey (EU-LFS), the European Quality of Life Survey (EQLS), the EU Statistics on Income and Living Conditions (EU-SILC), the European Social Survey (ESS), the ICT use survey and the European Health and Life Expectancy Information System (EHLEIS) are used.

for the AAI could allow the analysis of its distribution in a country; an aspect that has received limited attention in the literature.

2.3 Empirical applications

Although there are few empirical studies that attempt to measure the quality of ageing in Latin America in a comparative way, there is wider evolution of these studies in more-developed countries. One of the most recent studies is by Barslund et al. (2019), who adapted and computed the AAI at the individual level for 13 European countries between 2011 and 2015 with the aim of assessing the inequality of the index scores. Among the main results, they show that AAI inequality by age group decreases for older cohorts and that Gross Domestic Product (GDP) has a very weak correlation with the Gini index of AAI or the average AAI level. Another result is that European countries that have achieved the highest active ageing outcomes have also been able to keep inequality in active ageing experiences low.

Another study that examines the individual-level AAI with the purpose of analysing the heterogeneity of the quality of ageing within and across countries in Europe is by Olivera (2022). This study reveals that heterogeneity is significant, which reaffirms the importance of studying distributions and not just the average active ageing index to rank countries. It also analyses predictors of inequality with distributional regressions and finds that a higher proportion of more-educated people contributes to equalizing the distribution of active ageing across countries, while a greater proportion of men is associated with increased inequality.

In methodological terms, the studies by Barslund et al. (2019) and Olivera (2022) show the feasibility of calculating the active ageing index at the individual level, as it is closely related to and maintains the same characteristics as the country-level indicator. Some studies, such as those by Varlamova et al. (2017) and Barysheva et al. (2018), question the feasibility of applying the AAI to measure active ageing in Russia due to the lack of data availability and quality, as the country's rate of participation in international European surveys is low. Varlamova et al. (2017) estimate that the country's AAI equals 30.9 points, which places Russia in eighteenth 18th place in the European ranking. The domains with better performance are employment and the environment for active ageing. However, the better high performance in the employment domain is not related to a positive concept of ageing, as many pensioners who retired between the ages of 55 and 60 must keep working to avoid a drastic reduction in their living standards or falling into poverty. Moreover, there are no substantial gender differences in the domains of active ageing.

In the case of transition countries, Sidorenko and Zaidi (2013) compared the quality of ageing before and after the dissolution of the Soviet Union. The authors report a deterioration in the quality of ageing after the dissolution of the Soviet Union, which led to a reduction in public services for older adults. Therefore, they point out that these countries have major problems to solve, such as high mortality and migration.

Policy measures should focus on reforming the labour market, and promoting the social integration of older people and the inter-generational cohesion of society.

Experiencing similar country economic conditions does not guarantee equal quality of ageing. Karpinska (2018) shows that despite the large degree of similarity of economic and demographic conditions between the Czech Republic and Poland, outcomes in active ageing are different: the Czech Republic scores 34 on the AAI, while Poland scores 27.2. It is emphasized that in the Czech Republic, withdrawal from the labour market is much less attractive from a regulatory and financial point of view, thus the country stands out for its high levels of labour force participation of the adult population (67.1 per cent). In contrast to the Czech Republic, labour market participation is lower in Poland (45.9 per cent), due to reduced labour rights and greater labour flexibility. In terms of independent and healthy living, older adults in the Czech Republic have greater health care coverage and perform more care activities than in Poland.

There are three interesting studies that examine active ageing in Asian countries, which are characterized by larger populations. Xiong and Wiśniowski (2018), for example, applied the AAI methodology to the older adult population in China. They find that the overall index score is 26.7 points — lower than the European average and slightly below that of Poland, which has the lowest score in Europe. While older adults in China have a lower labour participation rate, they are physically more active and have a longer life expectancy than their counterparts in Europe.

In contrast to China, Korea performs better in employment than EU countries, while it performs less well in social participation and independent, healthy and secure living according to Um et al. (2019). One explanation for the high rate of employment participation is that older people work longer, due to their relatively immature pension system and low capacity to save for retirement. Other problems that can arise and make the situation worse include low levels of mental well-being, the risk of poverty and lower relative income levels.

The study by Guntupalli and Chakraborty (2018) computes the AAI for India at the sub-national level. The best performing domain is participation in society, while the domains of labour force participation and independent living show poor results. Despite the worse performance of women in employment, independent living and capacity for active ageing, the overall AAI results for men and women are similar due to higher rates of social participation among older women in India.

In Latin America, the size of the informal labour market is substantial, pension systems have low coverage and subsidies for the elderly are less developed than in EU countries. The estimation of the AAI may therefore present many more challenges in Latin American countries in terms of methodology and interpretation. This is because the AAI employment domain would be capturing the labour market problems and the absence of adequate pension systems, rather than the positive view of work as an independent and healthy way

of ageing.[4] Under these circumstances, studies including the one by Fanta (2018) that analyse the appropriateness of the AAI calculation for Latin American countries, such as Argentina, Chile, Bolivia, Ecuador, Guatemala and Peru, are very useful.

Fanta (2018) examined the potential limitations of applying the AAI, especially noting problems that could arise in three domains: employment, participation in society and independent living. The employment conditions of older adults reflect a critical problem of high levels of informality. Further, differences in labour participation between men and women are more associated with gender roles than with differences in levels of autonomous and healthy living. Although democracy has been recovering after several periods of dictatorship and armed conflict, information on political participation may suffer from problems of under-reporting due to individuals' fears. For the domain of independent, healthy and safe living, information on healthy activities is not sufficiently available in all the countries, or only manages to address problems of domestic violence. Therefore, the study in question recommends treating the results of the AAI with caution and instead proposes adapting the index to the particularities of Latin America or alternatively exploring other indices such as the Quality of Life of the Elderly (QLE) proposed by CELADE (2006).

Despite criticisms about the construction of the AAI for Latin America, Giraldo et al. (2021) described the current position of people over 60 and estimated the active ageing index for Colombia. They find that the indicator is 37.6 points, which is above the European average. One of the domains that perform well is employment, which raised the overall index. The high employment rate of older people in Colombia is not necessarily related to better living conditions, but rather to the need to finance the cost of living in old age, as only 28.5 per cent of older adults receive a pension.

The study by Olivera and Tournier (2016) applied in Peru combines the concept of *successful ageing*, as a measurement of well-being in old age, with the conceptual approach to multidimensional poverty (Alkire and Foster 2011) in order to find the determinants of a quality ageing process. This makes it possible to take advantage of all the information produced in order to find the number of individuals with successful ageing under the widely accepted multidimensional poverty approach. The study shows a strong direct relationship between work and the quality of ageing: being employed can help older people maintain good levels of cognitive functioning and mobility. The study also finds that better quality of ageing is associated with high self-esteem, empowerment and the absence of mental disabilities.

Lastly, Bernal et al. (2022) study the effects of a non-contributory pension programme in Peru on dimensions of healthy ageing using the approach of Lu et al. (2019). Among

[4] According to the study by Aranco et al. (2022) is significantly higher in Latin America than in other regions. In 2019, 35.8% and 10.9% of people aged 65-79 and 80+, respectively, were economically active. By contrast, in the European Union (EU28), only 10.8% of the 65-74 age group and 1.5% of the 75+ age group were economically active in 2019 (according to Eurostat statistics). The differences in the percentages of men are even larger.

their main results, they find that pension transfer has positive effects on objective and subjective health indicators, nutrition and reducing mortality risk factors. These results are mediated by increased access to health services and disease detection.

3 Data and methods

3.1 Data

This study computes the AAI for older adults in 18 Latin American countries. Taking into account the information available for these countries, the methodological strategy of Olivera (2022) is closely followed to find the index at the individual level.

Since each individual should be given an index value, it is advisable to exploit a database of individuals that contains the necessary information to estimate as many indicators as possible. This database is the 2020 *Latinobarometro*, the sample for which is multistage, stratified (by region and urban-rural areas) and randomly selected in each country. The target sample for each country was 1,200 cases, although the average final sample size across countries is 1,122. For this study, the sample of individuals who are at least 55 years old is used, which brings the total sample to 4,856 people.

Similarly to other indices that attempt to measure multidimensional well-being, the construction of the AAI presents challenges. For example, the choice of relevant domains, the use of weights and the difficulty in accounting for individual heterogeneity in the index (Decancq and Lugo 2013). As can be seen below, the original methodology for the construction of the AAI was taken as a starting point, but the domains, indicators and weights recommended in the AAI literature were adapted according to data availability and the Latin American reality (Olivera 2022; Zaidi et al. 2017; Giraldo et al. 2021).

3.2 Simulation of the Active Ageing Index

Employment is one of the four domains of the AAI, but its relevance in capturing active ageing is not straightforward in the Latin American region. Due to large informal labour markets, pension coverage is low, meaning that only a small proportion of older adults are in receipt of a pension. Consequently, people are unable to retire and tend to work into old age in order to finance their living costs. Benjamin et al. (2003) called this feature of labour markets *ceaseless toil* when analysing the labour supply of elderly people in rural China. That is, without pensions, these people would have to work as long as they were able to (with negative effects on their health), or for their whole life. Thus, the inclusion of the employment dimension in the AAI could actually capture negative features of the labour markets and pension systems. Moreover, its inclusion in the index could imply penalizing countries that have a more developed and comprehensive pension system (for example, Argentina and Uruguay). For these reasons, the employment domain is not

included in the computation of the AAI.[5]

The weights for each domain were adapted after the exclusion of the employment domain in order to respect their relative values. Likewise, the weights of the indicators that are part of each domain were adapted in the same way for any that could not be estimated due to lack of information in the database. In the second domain of *Participation in society*, the indicators for childcare and eldercare are not available in our sample. In the third domain of *Independent, healthy and secure living*, the indicators for physical exercise, access to health care and dental care, independent living and lifelong learning are also unavailable. The final value of the index, instead of ranging from 0 to 100 as in the original method, lies within a range of 0 to 1. The details of the adaptation of the weights are summarized in Table A.1 in the Appendix.

For the second domain, *participation in society*, data is available to calculate two of its four indicators. Indicator 2.1 takes the value of 1 if the individual undertakes voluntary work for the community on important issues, and the value of 0 otherwise. Indicator 2.4 takes the value of 1 if the individual has an interest in politics, and the value of 0 otherwise. Taking into account the relative weights of the three domains with available information, the total weight of the second domain is 53.8 per cent.

For the third domain, *Independent, healthy and secure living*, four of its eight indicators can be calculated. Indicator 3.4 originally measured the ratio of the average disposable income of people aged 65 and over to the equivalent average disposable income of people aged under 65 (at the country level). In order to individualize this indicator and avoid a large number of missing observations, the indicator uses a survey question about the self-placement of the individual in the distribution of wealth in the country (on a scale of 1 to 10 groups, with 1 being the poorest and 10 the richest). This dummy indicator measures the ratio between the individual's self-reported scale and the average reported by people aged 25-54.[6] Indicator 3.5 originally measured the poverty risk of the older adult population, but we use a question about whether the individual or their family has had enough food to eat. Individuals who answered that they have never or rarely not had enough food are assigned the value of 1, while those who have not had food sometimes or often are assigned the value 0 in the indicator. Indicator 3.6 takes the value of 1 if the individual reported that their household income covered basic needs without hardship (that is, no experience of deprivation), and takes the value 0 otherwise. The physical security indicator (indicator 3.7) takes the value of 1 if the individual never worried that they could become a victim of violence, and the value of 0 otherwise. The relative weight of the third domain is 15.4 per cent.

[5]For comparative purposes, Table A.2 in the Appendix shows what the AAI would look like if the employment domain was included. It shows that countries with very low coverage of pension systems (such as Bolivia) would be ranked in first place, to the detriment of countries with more mature systems, such as Argentina and Uruguay.

[6]The survey includes a question on 10 income brackets, but it has a large number of non-response observations (14%). Given the small sample sizes per country, it is preferable to use the alternative question, which has only 2% of observations with no information.

All six indicators of the fourth domain *Capacity and enabling environment for active ageing* can be computed with the micro-data. Indicator 4.1 measures the life expectancy of the individual according to age and sex. It uses the life tables by sex, age and country estimated by the United Nations Population Division for the year 2019. The indicator 4.2 measures *Health Life Expectancy* (HLE) according to age and sex. This calculation uses the HLE available in the Global Burden Disease (GBD) database for 2019 by country, sex and five-year age groups.[7] Adjustments to a Gompertz function had to be used in order to obtain HLE for each calendar age instead of the five-year age groups. Indicators 4.1 and 4.2 are both divided over the number of years remaining until the individual reaches the maximum age of 105. The mental health indicator (indicator 4.3) takes the value of 1 if the individual has not felt lonely in recent weeks, and the value 0 otherwise. Indicator 4.4 takes the value of 1 if the individual has used any social network on the Internet, and the value of 0 otherwise. Indicator 4.5 uses a *proxy* variable for social connectedness, which takes the value of 1 if the individual shares opinions with family or friends, and the value of 0 otherwise. Indicator 4.6 takes the value of 1 if the individual has secondary or higher education (university or technical), and the value of 0 otherwise. The relative weight of the fourth domain is 30.8 per cent.

Table 1 presents the average AAI per country. The top countries in Latin America are Uruguay (0.466), Argentina (0.453), Dominican Republic (0.447), Chile (0.419), Costa Rica (0.383) and Paraguay (0.385). The countries with low levels of AAI are Bolivia, Honduras, Nicaragua and Guatemala.

[7]The data is extracted from https://www.healthdata.org/gbd/2019.

Table 1: Active Ageing Index in Latin America

	AAI		Dimensions					
			Participation in society		Independent, healthy and secure living		Capacity and enabling environment	
	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank
Uruguay	0.466	1	0.379	3	0.718	1	0.492	2
Argentina	0.453	2	0.395	2	0.589	6	0.488	3
Dominican Rep	0.447	3	0.426	1	0.515	11	0.448	6
Chile	0.419	4	0.279	6	0.643	5	0.552	1
Paraguay	0.385	5	0.278	7	0.652	3	0.439	8
Costa Rica	0.383	6	0.255	11	0.648	4	0.474	4
Colombia	0.358	7	0.272	8	0.513	13	0.430	10
Brazil	0.352	8	0.229	15	0.666	2	0.408	12
Panama	0.349	9	0.233	13	0.546	9	0.453	5
Peru	0.347	10	0.288	4	0.433	17	0.407	13
El Salvador	0.347	11	0.269	9	0.514	12	0.399	14
Venezuela	0.345	12	0.287	5	0.359	18	0.441	7
Ecuador	0.333	13	0.250	12	0.465	16	0.413	11
Mexico	0.325	14	0.197	17	0.549	8	0.439	9
Bolivia	0.320	15	0.267	10	0.507	14	0.319	18
Honduras	0.310	16	0.225	16	0.524	10	0.353	17
Nicaragua	0.307	17	0.230	14	0.479	15	0.357	16
Guatemala	0.306	18	0.191	18	0.550	7	0.385	15

In the Appendix, Table A.3 shows the result of the average AAI for each country, considering equal weights for each domain and within each domain; that is, each indicator has the same relative weight. This exercise is useful to assess how sensitive the indicator is to changes in weights. There are no significant changes in the top rankings. The changes are more noticeable for countries that have lower performance in the original ranking.

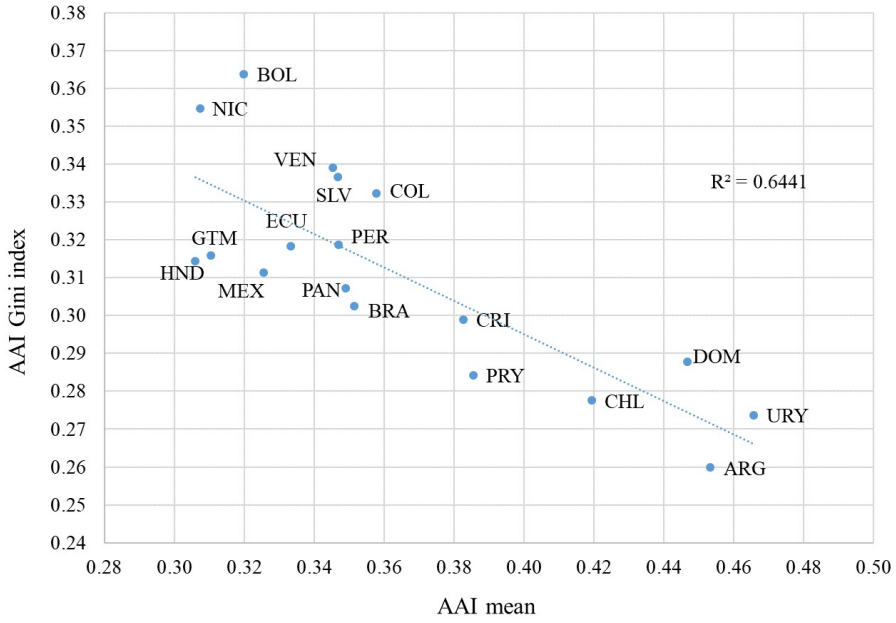
3.3 Inequality in the distribution of AAI

Table 2 shows the average and Gini indices of the AAI for each country. One of the first observations is the evidence of a negative correlation between the average level of the AAI and its inequality measured by the Gini index. Thus, countries with better active ageing are also places with a more equal distribution on this indicator. However, this relationship is not uniform, as shown in 1. For example, Colombia has a better average level for the AAI compared with Brazil, but the distribution is more unequal than in Brazil. The same is true if Bolivia is compared with Honduras.

Table 2: Means and Gini indices of Active Ageing Index

	AAI		Gini	
	Mean	Rank	Level	Rank
Uruguay	0.466	1	0.274	2
Argentina	0.453	2	0.260	1
Dominican Rep.	0.447	3	0.288	5
Chile	0.419	4	0.278	3
Paraguay	0.385	5	0.284	4
Costa Rica	0.383	6	0.299	6
Colombia	0.358	7	0.332	14
Brazil	0.352	8	0.302	7
Panama	0.349	9	0.307	8
Peru	0.347	10	0.319	13
El Salvador	0.347	11	0.337	15
Venezuela	0.345	12	0.339	16
Ecuador	0.333	13	0.318	12
Mexico	0.325	14	0.311	9
Bolivia	0.320	15	0.364	18
Honduras	0.310	16	0.316	11
Nicaragua	0.307	17	0.355	17
Guatemala	0.306	18	0.314	10

Figure 1: Correlation between the means and Gini indices of AAI



A high level of active ageing is desirable for any country; however, in a context where inequalities (including those in the quality of ageing) have worsened due to the COVID-19 pandemic, it is important to study the distribution of the quality of ageing for relevant policy-making decisions (OECD 2017). It would therefore be useful to determine which

countries achieve the best results for active ageing, by taking into account the average level of the AAI and the equality of the distribution. Undertaking this task necessarily involves the use of normative judgements about how to value inequality.

Policy-makers may have different views about how to value the distribution of the AAI in a country. For some, the distribution or degree of AAI inequality may not be important to evaluate the ageing conditions in the country and therefore it is advocated to only observe the AAI mean. For others, however, the inequality of AAI must be accounted for in the assessment of the country. Therefore, the S-Gini family of inequality indices (Donaldson and Weymark 1980) is used to take into account how different views on the degree of inequality lead to different assessments of active ageing. These indices are able to incorporate the levels of importance of inequality explicitly.

$$I_\rho = 1 - \sum_{i=1}^{n} \left[\left(\frac{n-i+1}{n} \right)^\rho - \left(\frac{n-i}{n} \right)^\rho \right] \frac{AA_i}{\mu} \tag{1}$$

In the expression 1, i indicates individual's position in the ranking of the AAI distribution ($AA_i \leq AA_{i+1}$). Similar to the parameter e of the Atkinson index (Atkinson 1970), which indicates the degree of aversion to inequality, the parameter ρ captures the importance attached to inequality. In this way, normative judgements can be incorporated into the evaluation of AAI distributions. For example, if $\rho = 1$, the welfare of all individuals is given the same relative weight and $I_\rho = 0$. In contrast, for $\rho > 1$, the welfare of people with lower AAI is relatively more important than the welfare of people with higher AAI. As the value of ρ increases, there will be a greater concern about inequality. The best-known case occurs when $\rho = 2$, that is, the inequality index becomes the Gini index. In this study the analysis is performed using different values of the parameter ρ: $\rho = 1$, $\rho = 2$, $\rho = 5$ and $\rho = 10$.

The attributes of an AAI distribution (mean and inequality) can be compared between countries by means of a Social Welfare Function (*Social Welfare Function, $SWF = W_\rho$)*, which also captures the tension between efficiency and equity concerns. The desirable properties of this function are that its value increases with the mean of AAI and decreases with the level of inequality (equation 2).

$$SWF = W_\rho = \mu\,(1 - I_\rho) \tag{2}$$

The SWF is equal to the mean under the conservative view that equity concerns do not matter at all (when ρ=1). If inequality is considered important for assessing the quality of ageing, then the parameter ρ must be greater than 1. For the same distribution, I_ρ will increase with ρ and hence the value of SWF will decrease. The SWF can be used to compile a new country classification. It is worth mentioning that the original AAI

methodology is based on country-average data, which implies that the degree of inequality concern of the indicator is not taken into account in the construction of the index.

3.4 The determinants of inequality in active ageing

The predictors of inequality in the AAI are estimated by means of re-centred influence function (RIF) regressions proposed by Firpo et al. (2009). This method can estimate the degree of association between a small change in a covariate and a change in an inequality statistic, such as the Gini index. These regressions consist of two stages. In the first, the influence function (IF) of each individual on the AAI Gini index is calculated as a function of their own AAI and the total distribution of AAI. A greater proportion of individuals in the tails of the distribution increases inequality, while a greater proportion of individuals close to the average reduces the level of inequality. In the second stage, after calculating these statistics, linear estimations of IF are performed on predictors (gender, age, education, etc.), making it possible to find the effect of a small change in the predictor on the level of inequality, keeping the distribution of the other covariates constant. The interpretation of the coefficients of this regression is simple. For example, a positive coefficient for the higher education variable implies that greater participation of individuals with this level of education, keeping all other factors constant, leads to an increase in inequality in active ageing.

Formally, the Gini index is defined with the following formula:

$$G = 1 - 2\mu^{-1} \int_0^1 GL(p; F_Y)dp \tag{3}$$

Where $p(y) = F_Y(y)$ and where $GL(p; F_Y)$ is the generalized Lorenz curve of F_Y given by $GL(p; F_Y) = \int_{-\infty}^{F^{-1}(p)} z \, dF_Y(z)$. The Lorenz curve reflects the relationship between the cumulative change of variable Y and the total size of the cumulative total population size up to a given value of Y. Monti (1991) derives RIF expressions for the Gini index (G) (see also Firpo et al. 2018), which is shown below:

$$RIF\,(y; G) = 2\frac{y}{\mu}G + 1 - \frac{y}{\mu} + \frac{2}{\mu}\int_0^y F\,(z)\,dz \tag{4}$$

Equation 5 shows the second stage of the Gini-RIF regressions. The sub-indices i and c refer to the individual and the country. The dependent variable is the Gini influence function (which was previously estimated in the first stage) for each individual divided by the corresponding country's AAI Gini index ($\widetilde{RIF}_{i,c}$). Thus, the dependent variable measures the relative contribution of each individual to the country's AAI Gini index.

The individual covariates ($X_{i,c}$) included in the regressions are dichotomous variables for the age groups 65-74 and 75+ (55-64 is the reference group), primary education,

secondary education and higher education (no education is the reference group), male, having access to water and sanitation services, and being a recipient of social assistance before the pandemic. The $country_c$ variable captures the country fixed effects, and the error term $\varepsilon_{i,c}$ is assumed to be normally distributed. β_1 and β_2 are vectors of coefficients to be estimated for each variable including $X_{i,c}$ and $country_c$.[8]

$$\widetilde{RIF}_{i,c} = \alpha + \beta_1 X_{i,c} + \beta_2 country_c + \varepsilon_{i,c} \tag{5}$$

4 Results

4.1 Welfare evaluation

Table 3 shows the results of the S-Gini computation and the new country rankings based on SWF values. As explained above, the SWF values when $\rho = 1$ are identical to the AAI mean. With the Gini criterion ($\rho = 2$ and $\rho = 5$), there is no significant change in the overall country rankings, that is, the rankings based on the AAI averages of these countries are the same as those based on the SWF. Thus, under the assumption that the Gini index is the relevant inequality statistic, the rankings of these countries remain the same even after including inequality concerns.

Guatemala illustrates an interesting case. The country is at the bottom of the ranking when there are no inequality concerns, but given that its Gini index is relatively low for active ageing (it ranks tenth in inequality levels), the country moves to sixteenth place after taking these concerns into account ($\rho = 2$). It continues to improve in the rankings when equality concerns are higher (fourteenth when $\rho = 5$ and remains at this level when $\rho = 10$). One of the countries that drop in the rankings is Bolivia. It drops two positions from fifteenth to seventeenth place (when $\rho = 2$) for its level of inequality (the highest in the region) and falls to the last position with the highest level of inequality concerns (when $\rho = 5$ and $\rho = 10$).

It can be observed that when the average AAI is all that matters, Bolivia (fifteenth) is a better place to grow old than Guatemala (eighteenth). However, if concern for equality also matters (when the parameter of $\rho = 5$), then Guatemala (14th) is better than Bolivia (18th). Uruguay and Argentina are always in the top two places in the rankings; therefore, they can be considered as the countries with the most equitable quality of life for ageing and the best active ageing.

The results show that with a high level of concern for equality (when $\rho = 10$) in the AAI distribution, the best countries for ageing are Uruguay, Argentina and Chile, while the worst according to the ranking are Bolivia, Nicaragua and Honduras.

[8] Tables A.4 and A.5 in the Appendix show the descriptive statistics of the variables used in the regression analysis.

Table 3: Social Welfare Functions

País	($\rho = 1$)		($\rho = 2$)			($\rho = 5$)			($\rho = 10$)		
	AAI	Rank	S-Gini	SWF	Rank	S-Gini	SWF	Rank	S-Gini	SWF	Rank
Uruguay	0.466	1	0.274	0.338	1	0.503	0.232	1	0.590	0.191	1
Argentina	0.453	2	0.260	0.336	2	0.494	0.229	2	0.590	0.186	2
Dominican Rep.	0.447	3	0.288	0.318	3	0.554	0.199	4	0.657	0.153	5
Chile	0.419	4	0.278	0.303	4	0.497	0.211	3	0.591	0.172	3
Paraguay	0.385	5	0.284	0.276	5	0.509	0.189	5	0.600	0.154	4
Costa Rica	0.383	6	0.299	0.268	6	0.517	0.185	6	0.610	0.149	6
Colombia	0.358	7	0.332	0.239	9	0.555	0.159	9	0.634	0.131	9
Brazil	0.352	8	0.302	0.245	7	0.512	0.172	7	0.595	0.142	7
Panama	0.349	9	0.307	0.242	8	0.521	0.167	8	0.603	0.138	8
Peru	0.347	10	0.319	0.236	10	0.563	0.152	12	0.647	0.122	13
El Salvador	0.347	11	0.337	0.230	11	0.561	0.152	11	0.633	0.127	10
Venezuela	0.345	12	0.339	0.228	12	0.584	0.144	15	0.669	0.114	15
Ecuador	0.333	13	0.318	0.227	13	0.546	0.151	13	0.629	0.124	12
Mexico	0.325	14	0.311	0.224	14	0.522	0.156	10	0.610	0.127	11
Bolivia	0.320	15	0.364	0.204	17	0.612	0.124	18	0.689	0.100	18
Honduras	0.310	16	0.316	0.212	15	0.555	0.138	16	0.656	0.107	16
Nicaragua	0.307	17	0.355	0.198	18	0.587	0.127	17	0.659	0.105	17
Guatemala	0.306	18	0.314	0.210	16	0.524	0.146	14	0.607	0.120	14

Note: The parameter ρ captures the importance attached to inequality. If $\rho = 1$, the welfare of all individuals is given the same relative weight. By contrast, for $\rho > 1$, the welfare of people with lower AAI is relatively more important than the welfare of people with higher AAI.

4.2 Determinants of inequality (Gini-RIF)

Table 4 shows the results of the RIF-Gini regressions for the pooled sample of countries. The first set of estimates in the table does not include country fixed effects, while the second set does. Although the coefficients of both estimates are similar, it is preferable to focus on the results that include country fixed effects, because it is possible to control for unobserved characteristics at the country level, leading to less-biased estimates. The coefficients are interpreted as percentage points. No significant relationship is found between marginal changes in the proportion of men and individuals in the 65-74 age group with the change in the AAI Gini index. Similarly, higher proportions of individuals speaking an indigenous language, with primary education, with higher education and being beneficiaries of government social assistance are not associated with significant changes in AAI inequality. On the other hand, the coefficient 0.086 for the 75+ age group means that a 1 per cent increase in the proportion of individuals of this age in the country is associated with an increase of about 0.086 per cent in the inequality index. The association of secondary education with AAI inequality is negative. A 1 per cent increase in the proportion of people with secondary education is associated with a 0.150 per cent reduction in AAI inequality. In addition, there is a negative association between access to water and sewerage services and AAI inequality. An increase of 1 per cent in the proportion of individuals with better access to public infrastructure and services reduces

the inequality index by 0.070 per cent.

Table 4: Estimates of Gini-RIF regressions for the Active Ageing Index

	Model 1		Model 2	
	coeff.	s.e.	coeff.	s.e.
Male	-0.004	(0.016)	-0.002	(0.016)
Age 65-74	0.009	(0.023)	0.007	(0.023)
Age 75+	0.088***	(0.019)	0.086***	(0.020)
Indigenous language	-0.018	(0.016)	-0.030	(0.030)
Primary education	-0.009	(0.014)	-0.012	(0.016)
Secondary education	-0.136***	(0.017)	-0.150***	(0.020)
Tertiary education	-0.019	(0.031)	-0.031	(0.032)
Access to water and sewerage	-0.066*	(0.036)	-0.070*	(0.037)
Received government assistance	-0.008	(0.027)	-0.011	(0.029)
Constant	1.093***	(0.034)	1.097***	(0.039)
Observations	4,245		4,245	
R2	0.016		0.017	
Country fixed effects	No		Yes	

Notes: The dependent variable is the Influence Function (IF) of each individual in the AAI Gini index of the country estimated in the first stage and divided by the Gini index of the corresponding country. The reference group for age is 55-64, and for education level is 'no education level'. The standard errors are robust and clustered by country. Statistical significant levels are *p<0.10, **p<0.05 and ***p<0.01.

Overall, the RIF-Gini regressions above reveal predictors of the distribution of active ageing in Latin America, but they could mask between-country heterogeneity. In order to examine how the relationship of these predictors varies with within-country inequality in AAI, separate RIF-Gini regressions are run for each country. Table 5 shows the coefficients resulting from this exercise for each country. The coefficient of gender is statistically significant for only two countries (Uruguay and Paraguay). It is observed that in these countries, an increase in the proportion of men can reduce inequality as measured by the Gini of the AAI. In two countries (Argentina and Ecuador) the coefficient of the proportion of individuals aged 65-74 on AAI inequality is negative, but it is positive in Venezuela. The proportion of individuals aged 75 years and over has a positive relationship with AAI inequality in three countries (Chile, Nicaragua and Venezuela). Thus, there is no clear relationship between having a relatively larger number of people who are already retired and the equality of the distribution of active ageing.

With respect to indigenous language, it is observed that a higher proportion of individuals speaking an indigenous language reduces AAI inequality in Argentina, the Dominican Republic and Venezuela, while this relationship is positive in Chile and Honduras. That is, an increase in the proportion of people who speak an indigenous language in Chile and Honduras increases AAI inequality.

The association between secondary education and AAI inequality is negative and statistically significant in seven countries. Thus, an increase in the proportion of people with

this level of education is associated with a more equal distribution of active ageing. One possible reason why an increase in education may reduce inequality in AAI is that higher education may attenuate inequalities in other dimensions. For example, individuals with low levels of education also tend to exhibit poorer health and lower income and life expectancy (Cutler and Lleras-Muney 2010; Cutler and Lleras-Muney 2012). Increasing the education level of these individuals may compensate for deficiencies in other dimensions, such as health status (Clark and Royer 2013; Van Der Heide et al. 2013) and thus equalize the distribution of active ageing. In the context of the RIF-Gini regressions, individuals with secondary education are mostly located in a section of the AAI distribution associated with negative values in the influence function. The magnitude is larger in Peru and Bolivia. Contrary to the above, there is no clear trend between the higher proportion of individuals with primary and tertiary education and the level of AAI inequality between countries.

There is no clear relationship between access to water and sewerage services and inequality in AAI. While in the Dominican Republic, Honduras and Nicaragua, this access is associated with a reduction in inequality, in Chile and Mexico it is associated with an increase in inequality in active ageing.

Lastly, an increase in the proportion of people who received social assistance from the government (such as cash transfers or subsidies) before the pandemic is associated with a reduction in AAI inequality (in Ecuador, Mexico and Peru). An important mechanism that may explain this is that receiving economic support could guarantee at least a minimum level of food consumption, reduce the risk of falling into poverty, reduce levels of depression and increase individual autonomy and empowerment.

An interesting result of the Gini-RIF at the country level shows that education is always important to ensure a more equal distribution of the quality of ageing. However, it is difficult to draw a direct conclusion from the short-term analysis, because the population analysed made their education investment decisions a long time beforehand. Nevertheless, this analysis highlights the long-term effects of educational attainment on the quality of ageing and its distribution. In any case, one conclusion from these results is that the effects of education go beyond earnings potential and can affect the quality of ageing and its distribution.

Table 5: Estimates of Gini-RIF regressions for the AAI by country

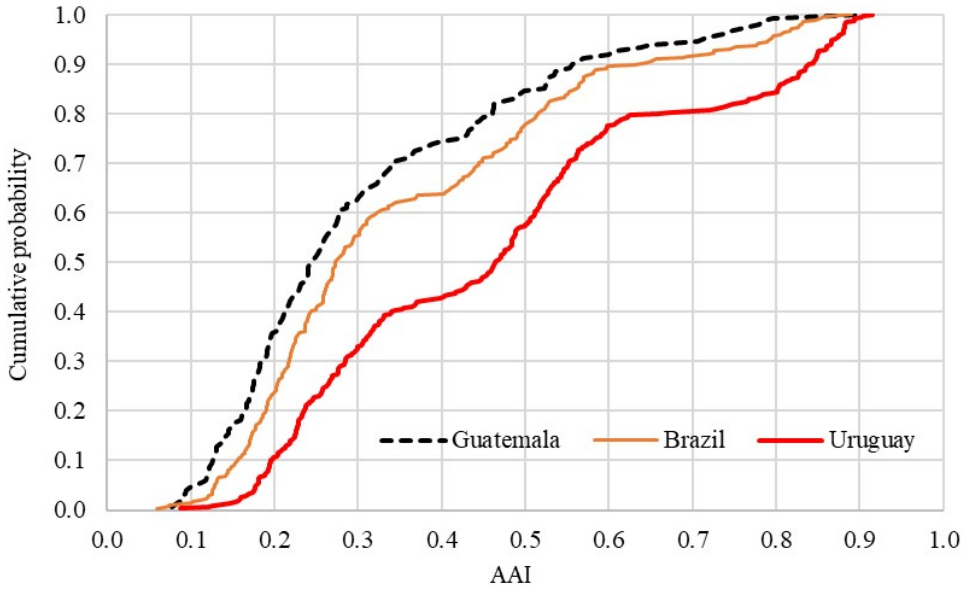
Country	Male	Age 65-74	Age 75+	Indigenous language	Primary education	Secondary Education	Tertiary education	Access to water and sewerage	Received government assistance	Constant	Obs.	R2
Argentina	0.140	-0.189*	0.130	-0.502***	0.073	-0.145	-0.103	0.212	0.511	0.750*	235	0.106
Bolivia	-0.052	0.001	0.025	0.017	-0.014	-0.269***	-0.078	0.036	0.003	1.036***	199	0.047
Brazil	0.087	0.059	0.089	0.118	-0.017	-0.090	0.145	-0.128	-0.015	1.056***	277	0.037
Chile	-0.010	0.042	0.250***	0.413***	0.178***	-0.056	0.165	0.605***	0.136	0.265*	354	0.127
Colombia	-0.054	0.057	0.149	-0.180	-0.041	-0.064	0.228**	0.026	0.128	0.957***	238	0.080
Costa Rica	0.026	0.100	0.036	NA	-0.062	-0.238**	0.021	0.290	-0.102	0.782***	233	0.044
Dominican Rep.	-0.020	0.025	0.038	-0.357**	-0.043	-0.238**	-0.077	-0.295*	0.029	1.319***	176	0.057
Ecuador	0.020	-0.145**	0.085	-0.247	-0.042	-0.228*	-0.119	-0.054	-0.207*	1.207***	223	0.056
Guatemala	0.057	-0.131	-0.128	0.078	-0.096**	-0.201	-0.057	-0.087	-0.052	1.153***	147	0.057
Honduras	0.097	0.091	0.023	1.355***	0.071	0.039	-0.327***	-0.796***	-0.054	1.622***	148	0.147
Mexico	0.078	-0.058	-0.028	-0.183	-0.043	-0.135	-0.050	0.222**	-0.216***	0.875***	288	0.043
Nicaragua	-0.017	-0.016	0.444***	NA	0.002	0.096	-0.093	-0.257**	0.059	1.191***	114	0.113
Panama	0.007	-0.006	0.072	-0.096	-0.082	-0.238*	-0.075	0.023	-0.129	1.135***	193	0.043
Peru	0.045	0.101	-0.034	-0.000	-0.125***	-0.293***	-0.175	0.027	-0.337**	1.105***	234	0.080
Paraguay	-0.186***	0.121	0.237	-0.109	-0.026	-0.003	0.056	-0.109	0.025	1.228***	213	0.064
El Salvador	-0.021	-0.060	0.142	0.058	-0.003	-0.067	-0.146	-0.067	0.026	1.082***	212	0.032
Uruguay	-0.098*	0.016	0.051	-0.001	-0.026	-0.199*	-0.171	0.023	-0.012	1.102**	376	0.033
Venezuela	0.036	0.130**	0.142**	-0.524***	0.001	-0.132	-0.066	-0.115	-0.004	1.089***	385	0.054

Notes: The dependent variable is the Influence Function (IF) of each individual in the AAI Gini index of the country estimated in the first stage and divided by the Gini index of the corresponding country. The reference group for age is 55-64, and for education level is 'no education level'. The standard errors are robust and clustered by country. Statistical significant levels are *p<0.10, **p<0.05 and ***p<0.01.

4.3 Comparison of AAI distributions

An alternative way to compare the quality of ageing across countries is to look at the cumulative distribution of the index. Figure 2 illustrates the cumulative distribution of the AAI for three countries with distinctive different levels and distributions of the index: Uruguay (the country that lies first in the ranking), Brazil and Guatemala (the country that ranks last). For all levels of the index, Uruguay dominates Brazil and Brazil dominates Guatemala. This is best observed by drawing a vertical line at a given level of the AAI. For example, for an AAI level of 0.3 points, it is observed that approximately 63 percent of individuals in Guatemala, 56 per cent in Brazil and 33 per cent in Uruguay have an AAI value below 0.3. If we look at the median of each distribution, we find that the bottom 50 per cent of individuals in Guatemala, Brazil and Uruguay have an AAI of 0.245, 0.273 and 0.465, respectively.

Figure 2: Cumulative distribution of AAI in Uruguay, Brazil and Guatemala



4.4 country-level determinants

It is also worth investigating the role of country-level variables on the levels of active ageing. For this purpose, the previous regressions are augmented with variables related to social protection policies (health and pensions). Countries with higher levels of public spending on pensions, higher coverage of pension systems, higher quality of health services or lower levels of poverty in the older population are expected to have better levels of active ageing and a less unequal distribution of the AAI.[9]

[9]Since most macroeconomic variables are in percentages or expresed in scales from 0 to 100, the original 0 to 1 scale of the AAI is transformed to a 0 to 100 scale in order to facilitate the interpretation of the estimated coefficients.

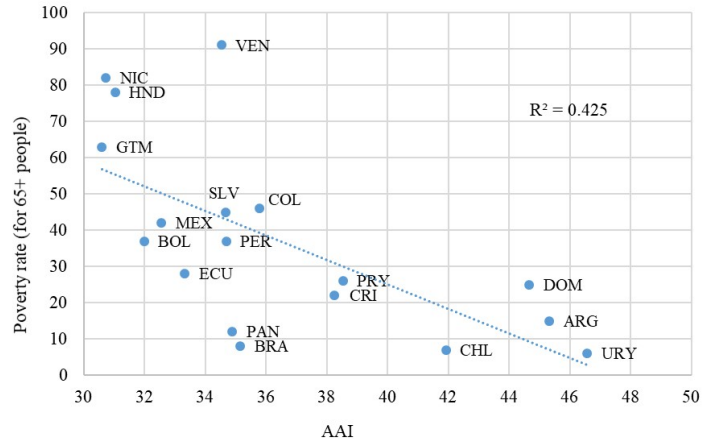
Table 6: Linear regression coefficients of country-level variables on the AAI

	Coeff.	s.e.	Obs.	R2
Poverty rate among people aged 65 and over	-0.113***	(0.0121)	4,245	0.145
Pension coverage	0.021*	(0.012)	4,245	0.128
Average replacement rate of pensions	0.161***	(0.026)	3,746	0.141
Social expenditure (% PBI)	0.726***	(0.120)	3,860	0.140
Public expenditure on pensions (% GDP)	0.63***	(0.112)	4,245	0.135
Public expenditure on pensions (% total public expen.)	0.151****	(0.032)	4,245	0.133
Public expenditure on health (% GDP)	0.768***	(0.247)	3,860	0.132
Index of access and quality of health care	0.159***	(0.041)	4,245	0.131

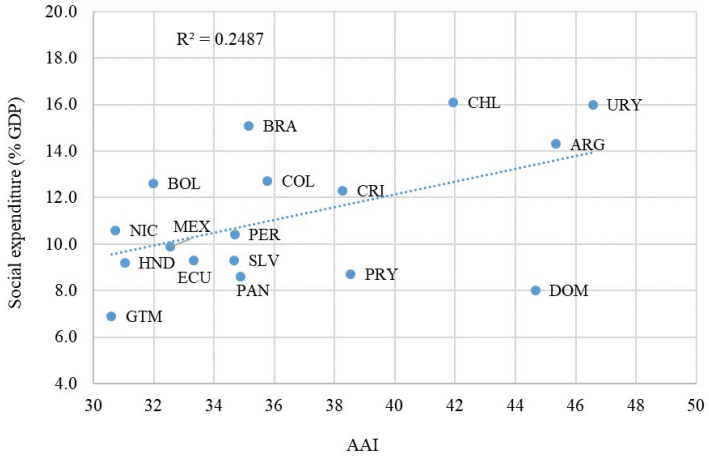
Notes: The dependent variable is the AAI of the individual. All regressions control for gender, age group, indigenous language, education level, access to water and sewerage, and whether the individual received state financial support before the pandemic. The standard errors are robust. Poverty rate and pension coverage variables are from the Inter-American Development Bank's Labour Markets and Social Security Information System. The figures for pension coverage and replacement rate include both contributory and non-contributory pension schemes. The social expenditure and public pension expenditure variables are from Arenas de Mesa (2020).The variables about public expenditures are from Aranco et al. (2022). The information about the index of access and quality of health care come from Haakenstad et al. (2022). Statistical significance levels are *p<0.10, **p<0.05 and ***p<0.01.

Table 6 reports the results of the AAI regressions against country-level variables and covariates used in the previous regressions. It is found that the poverty rate in the older adult population is negatively related to the level of active ageing; that is, an increase in the poverty rate of one percentage point (pp) is related to a decrease of 0.11 pp in the AAI. Figure 3a shows that countries with low levels of poverty are those at the top of the AAI ranking, such as Uruguay (6 per cent), Argentina (15 per cent) and Chile (7 per cent), which also have a less unequal distribution. There are other countries with low poverty rates, such as Brazil (8 per cent) and Panama (12 per cent), but with low levels of active ageing and unequal distribution. Although these isolated cases exist, in general a negative relationship between poverty and the AAI is observed. This may be due to the fact that countries with lower poverty rates have more-developed social protection policies and larger fiscal budgets. In this respect, it is found that social expenditure is positively related to the AAI (no information on social expenditure is available for Venezuela). It is observed that a 1 per cent increase in social spending is related to an increase of approximately 0.726 points in the index. That is, countries with higher spending on developing people's basic capabilities and generating better social opportunities to fight poverty develop a better environment for active ageing. Uruguay and Chile have the highest levels of social spending in Latin America (approximately 16 per cent of GDP), while Guatemala has the lowest level (6.9 per cent). Figure 3b shows this relationship.

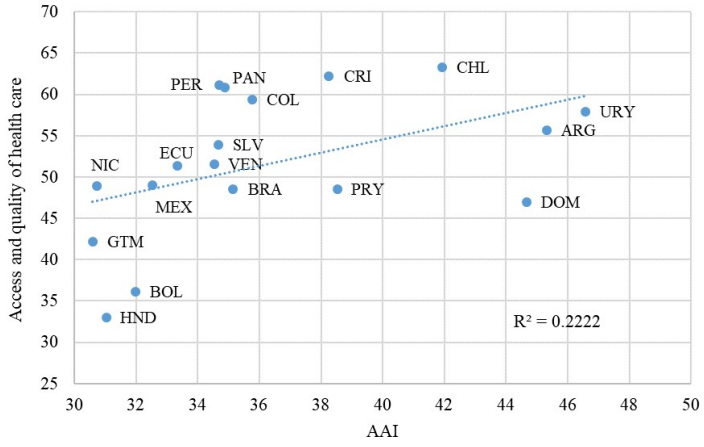
Figure 3: Correlations of AAI with country-level variables



(a) Old age poverty rate and the AAI



(b) Social expenditure and the AAI



(c) Index of access and quality of health care and the AAI

Similarly, greater public spending on pensions and health is positively related to the AAI. Although the relationship between pension coverage and the AAI is weak and positive, the replacement rate of pensions has a significant and positive relationship with the

AAI.[10] The latter is a key variable in pension systems, as it indicates how large or limited consumption opportunities in old age are, relative to active working life (food, health and recreation). The countries in Latin America with the highest replacement rates are El Salvador, Brazil, Uruguay, Costa Rica and Colombia (respectively, 64, 54.9, 54, 54 and 53.4 per cent). The results show that a higher replacement rate is positively related to the levels of the AAI.

The relationship between public health spending and the AAI is positive. An increase of 1 per cent in public health spending is associated with an average increase of 0.768 per cent in the index. This relationship does not reflect the quality of care in the countries.[11] Therefore, we report how the index of access and quality of health care for older adults is related to the AAI. This index allows us to compare the access to and quality of health care across countries and age groups, using risk-standardized mortality rates and mortality incidence rates (see Haakenstad et al. 2022). The countries with a high index in Latin America, around 60 points, are Chile (63.3), Costa Rica (62.2), Peru (61.1) and Panama (60.8). Honduras (33) and Bolivia (36.1) are the worst performers in the index (below 40 points). The results show that an increase of 1 point in this quality index increases the AAI by 0.159 points. Figure 3c shows a positive relationship between the AAI and the index of access to and quality of health care. While Uruguay, Argentina, Dominican Republic and Chile perform well in the index of access to and quality of health care, Honduras, Bolivia and Guatemala all show worse performance.

5 Conclusions

This research finds substantial heterogeneity in the quality of ageing among older adults in Latin America. It is argued that it is not only important to measure average active ageing in order to rank countries, but that it is also desirable to quantify its distribution. Measuring this distribution allows value judgements to be introduced to better assess active ageing within countries and to make comparisons between countries. Countries that show similar averages of active ageing may have notably different distributions, therefore any conclusions about the best place in which to age must be made with caution.

The study uses RIF-Gini regressions to identify the predictors of inequality in active ageing. In this way, it is possible to estimate how a small change in a covariate can affect the distribution of active ageing and its inequality statistic, which in the case of the present study is the Gini index. It is found that an increase in the proportion of people aged 75 and over implies an increase in AAI inequality. The association of secondary education with AAI inequality is negative, in that a 1 per cent increase in the proportion of people with secondary education is associated with a 0.150 per cent reduction in AAI inequality. On the other hand, there is a negative association between access to water

[10] There is no available information about pension replacement rate for Nicaragua and Venezuela.
[11] There is no available information on public health expenditure for Venezuela.

and sewerage services and AAI inequality, where a 1 per cent increase in the proportion of individuals with increased access to public infrastructure and services is associated with a 0.070 per cent drop in the level of AAI inequality.

Important differences are also found in the quality of active ageing in Latin America. For example, the average AAI value in Uruguay is 50 per cent higher than in Guatemala. Or to put it another way, 40 per cent of the population in Guatemala has worse active ageing than the bottom 10 per cent of the AAI distribution in Uruguay.

Some limitations of this study are related to data availability. The *Latinobarometro* data was chosen because its information covers all Latin American countries and most of the AAI indicators. However, the analysed sample is relatively small in some countries. In addition, some indicators had to be estimated and/or adapted, because they are not included in the database: for example, standard life expectancy and healthy life expectancy.

This study nevertheless contributes to the public debate on the inequalities experienced in old age and how these relate to the social and economic conditions experienced in early life. It also explores the relationships between country-level variables and the AAI, finding that improvements in social protection systems and reductions in old-age poverty levels have significant associations with the levels of active ageing in Latin America.

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Appendix

Table A.1: Weights for the AAI

Dimensions	Original weights	Adapted weights for Latin America
Dimension 1 - Employment	0.35	0
1.1 Employment rate 55-59	0.25	0
1.2 Employment rate 60-64	0.25	0
1.3 Employment rate 65-69	0.25	0
1.4 Employment rate 70-74	0.25	0
Dimension 2 - Participation in society	0.35	0.54
2.1. Voluntary activities	0.25	0.56
2.2. Care for children and grandchildren	0.25	0
2.3. Care for older adults	0.3	0
2.4. Political participation	0.2	0.44
Dimension 3 - Independent, healthy and secure living	0.10	0.15
3.1. Physical exercise	0.1	0
3.2. Access to health and dental care	0.2	0
3.3. Independent living	0.2	0
3.4. Relative median income	0.1	0.25
3.5. No poverty risk	0.1	0.25
3.6. No material deprivation	0.1	0.25
3.7. Physical safety	0.1	0.25
3.8. Lifelong learning	0.1	0
Dimension 4 - Capacity and enabling environment	0.20	0.31
4.1. Remaining life expectancy	0.33	0.33
4.2. Proportion of healthy life expectancy	0.23	0.23
4.3. Mental health	0.17	0.17
4.4. Use of ICT	0.07	0.07
4.5. Social connectedness	0.13	0.13
4.6. Educational attainment	0.07	0.07

Table A.2: Simulation of the AAI including the employment domain

			Domains			
Country	Ranking	AAI	Employment	Participation in society	Independent, healthy and secure living	Capacity and enabling environment
Bolivia	1	0.448	0.686	0.267	0.507	0.319
Paraguay	2	0.444	0.551	0.278	0.652	0.439
Dominican Rep.	3	0.443	0.438	0.426	0.515	0.448
Chile	4	0.434	0.460	0.279	0.643	0.552
Argentina	5	0.411	0.334	0.395	0.589	0.488
Uruguay	6	0.411	0.310	0.379	0.718	0.492
Peru	7	0.404	0.509	0.288	0.433	0.407
Ecuador	8	0.385	0.482	0.250	0.465	0.413
Venezuela	9	0.376	0.434	0.287	0.359	0.441
El Salvador	10	0.373	0.423	0.269	0.514	0.399
Honduras	11	0.370	0.481	0.225	0.524	0.353
Colombia	12	0.360	0.363	0.272	0.513	0.430
Costa Rica	13	0.355	0.304	0.255	0.648	0.474
Brazil	14	0.351	0.350	0.229	0.666	0.408
Guatemala	15	0.347	0.423	0.191	0.550	0.385
Nicaragua	16	0.344	0.414	0.230	0.479	0.357
Mexico	17	0.339	0.365	0.197	0.549	0.439
Panama	18	0.337	0.316	0.233	0.546	0.453

Table A.3: Simulation of the AAI when weights are equal

	AAI		AAI (equal weghts)	
Country	Mean	Rank	Mean	Rank
Uruguay	0.466	1	0.539	1
Argentina	0.453	2	0.508	2
Dominican Rep.	0.447	3	0.461	4
Chile	0.419	4	0.506	3
Paraguay	0.385	5	0.447	6
Costa Rica	0.383	6	0.460	5
Colombia	0.358	7	0.398	9
Brazil	0.352	8	0.433	7
Panama	0.349	9	0.403	8
Peru	0.347	10	0.372	13
El Salvador	0.347	11	0.387	11
Venezuela	0.345	12	0.364	14
Ecuador	0.333	13	0.373	12
Mexico	0.325	14	0.388	10
Bolivia	0.320	15	0.357	17
Honduras	0.310	16	0.357	16
Nicaragua	0.307	17	0.342	18
Guatemala	0.306	18	0.363	15

Table A.4: Descriptive statistics by country

Country	Male	Age group			Indigenous language	Education level				Access to water and sewerage	Received government assistance
		55-64	65-74	75+		No education	Primary	Secondary	tertiary		
Argentina	0.46	0.57	0.38	0.05	0	0.2	0.48	0.14	0.18	0.95	0.03
Bolivia	0.55	0.68	0.24	0.07	0.46	0.55	0.27	0.1	0.08	0.94	0.21
Brazil	0.47	0.51	0.36	0.12	0.05	0.61	0.10	0.2	0.1	0.95	0.22
Chile	0.49	0.57	0.34	0.09	0.01	0.16	0.21	0.44	0.19	1	0.15
Colombia	0.49	0.55	0.3	0.15	0.02	0.35	0.34	0.17	0.13	0.93	0.16
Costa Rica	0.48	0.63	0.26	0.11	0	0.18	0.52	0.18	0.12	0.99	0.1
Dominican Rep.	0.6	0.55	0.28	0.17	0	0.52	0.29	0.12	0.07	0.88	0.19
Ecuador	0.58	0.63	0.27	0.1	0.02	0.14	0.89	0.44	0.18	0.9	0.09
Guatemala	0.53	0.59	0.32	0.09	0.12	0.66	0.19	0.11	0.05	0.83	0.08
Honduras	0.58	0.57	0.35	0.07	0.02	0.58	0.32	0.09	0.02	0.97	0.1
Mexico	0.55	0.54	0.31	0.15	0.03	0.34	0.37	0.21	0.08	0.97	0.16
Nicaragua	0.58	0.67	0.25	0.08	0	0.63	0.24	0.09	0.04	0.84	0.1
Panama	0.57	0.61	0.27	0.12	0.08	0.23	0.36	0.28	0.14	0.89	0.15
Peru	0.56	0.62	0.32	0.06	0.16	0.35	0.24	0.23	0.18	0.92	0.07
Paraguay	0.48	0.62	0.29	0.09	0.69	0.39	0.78	0.19	0.02	0.93	0.16
El Salvador	0.46	0.61	0.24	0.15	0	0.68	0.31	0.11	0.05	0.92	0.19
Uruguay	0.42	0.48	0.34	0.18	0	0.13	0.49	0.24	0.14	1	0.07
Venezuela	0.44	0.57	0.3	0.12	0.01	0.14	0.43	0.26	0.17	0.97	0.47

Table A.5: Descriptive statistics of country-level variables

Country	Poverty rate (65+ people)	Pension coverage	Pension Replacement rate	Social expenditure (%GDP)	Public expenditure in pensions (%GDP)	Public expenditure on pensions (% expen.)	Public expenditure on health (%GDP)	Index of access and quality to health care
ARG	15	84.27	44.7	14.3	7.1	32.5	9.2	55.7
BOL	37	97.54	18.7	12.6	3	7.4	6.3	36.1
BRA	8	87.58	54.9	15.1	11.1	37.5	9.7	48.5
CHL	7	87.32	28.4	16.1	4.1	17.7	9.3	63.3
COL	46	55.37	53.4	12.7	5.1	26.6	7.5	59.4
CRI	22	66.53	54	12.3	2.8	14	7.4	62.2
DOM	25	23.53	48.1	8	0.1	0.6	5.7	47
ECU	28	52.74	50.1	9.3	2.7	11.1	8.3	51.4
GTM	63	11.47	35.1	6.9	1	8.1	6.3	42.2
HND	78	5.37	44.4	9.2	1.4	6.1	7.2	33
MEX	42	72.33	33.4	9.9	1.7	6.4	5.6	49
NIC	82	18.61		10.6	2.7	14.8	8.9	48.9
PAN	12	79.74	36.3	8.6	3	17.5	7.4	60.8
PER	37	48.15	21.1	10.4	1	4.5	5	61.1
PRY	26	51.54	50.3	8.7	2.8	18.1	7.1	48.5
SLV	45	15.01	64	9.3	2.6	13.6	7.3	53.9
URY	6	87.13	54	16	7.9	26.3	7.7	57.9
VEN	91	88.77			4.8	25		51.6
Average	37.2	57.4	43.2	11.2	3.6	16.0	7.4	51.7

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