ACTIVE AGEING INDEX (AAI)
IN NON-EU COUNTRIES AND AT SUBNATIONAL LEVEL

GUIDELINES

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Note

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Introduction

The Active Ageing Index (AAI) is a multidimensional composite index, developed under the joint project of the European Commission's Directorate General for Employment, Social Affairs and Inclusion (DG EMPL) and the Population Unit of the United Nations Economic Commission for Europe (UNECE).[1] The AAI is designed to produce a robust evidence base on active ageing by measuring to what extent the potential of older people is realized, "to monitor overall progress with respect to active ageing" (UNECE/European Commission, 2015). The index highlights strong and weak areas of development in active ageing and in this way informs policymakers about spheres of a particular concern as well as about the effectiveness of applied policies (Figure 1).

Composite indicators are increasingly recognised as a useful tool for policy analysis and monitoring, advocacy and public communication. Providing information in a summarized form, they benchmark the performance of a country or other entity for policy purposes, stimulate public interest and inform discussion. They recognize multidimensional phenomena and enable comparison. The number of composite indicators is growing constantly, including those dedicated to older population (OECD, 2008).

The AAI is a composite index well suited for policy advocacy and monitoring purposes. The added value of the AAI is in producing a single number covering the multifaceted phenomenon of active ageing which can be used easily as opposed to a dashboard of separate indicators. It is a stable and easy-to-use tool for multidimensional insights into the general situation with realization of older persons' potential. Serving as a simple single number representation of a complicated underlying basis, the AAI raises awareness among authorities at all levels about ageing-related processes and forms a basis for an informed choice. It also highlights the variety of contributions that older persons make to the economy and society thus strengthening social solidarity and enhancing communication between generations.

The AAI results can be analysed in relation to respective results of other countries, e.g. with a similar level of economic development and/or social welfare model, or in comparison to results for other years. Points of reference can also be defined based on policy objectives or expert opinions.

The AAI additionally serves as a visual structure for promotion of the active ageing concept among different stakeholders even if it is not yet calculated in a given country. Further, it can help trigger a fundamental shift in the public and state discourse from perceiving population ageing as an increasing burden on pension, health and social protection systems to understanding that it as an opportunity for societal development. Social policies based on the concept of active ageing are justified economically since their implementation can lead to a reduction in social expenditures in long-term care or at least prevent them from expanding by helping to keep age-related costs under control. This can also yield high economic and social returns and the AAI provides the quantitative evidence required to advocate and implement such policy reforms.

The provision of a detailed description of the methodology, empirical definitions of all indicators and the data sources used, and a focus on principles while allowing for flexibility in the methodology implementation make it possible to reproduce AAI results in countries outside the

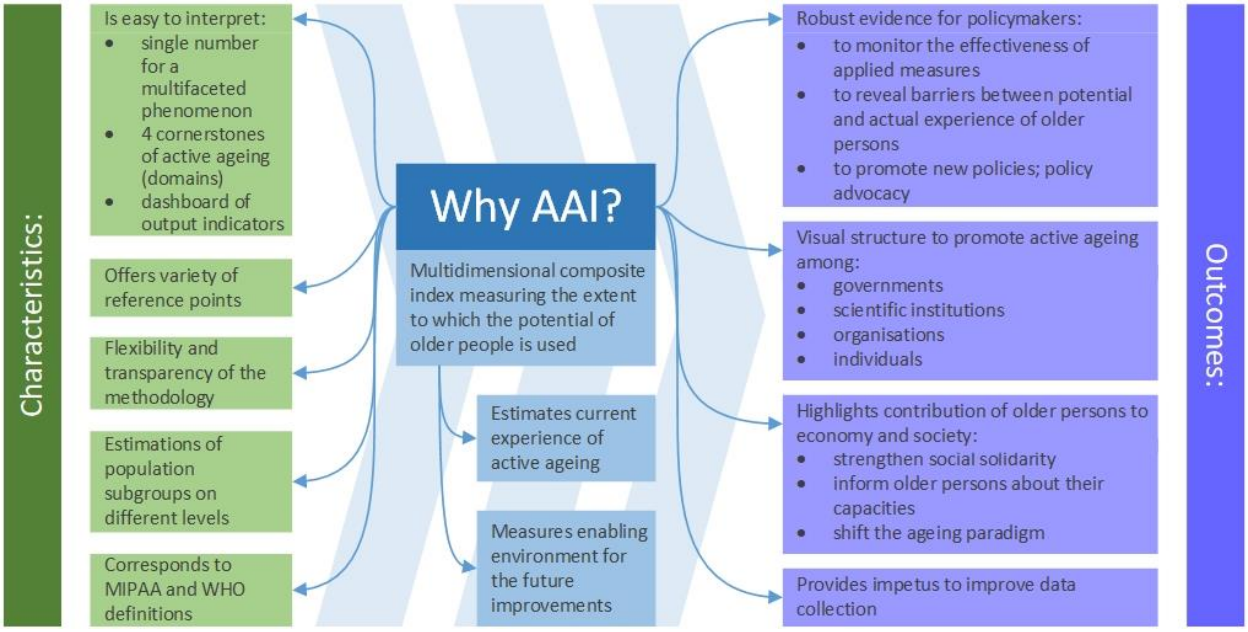
[1] https://statswiki.unece.org/display/AAI/VII.+About+the+project.

European Union (EU) and at subnational level, at which a large part of ageing-related policies is formed and applied. Flexibility and transparency of the methodology also provides an opportunity to estimate the AAI for different population subgroups, including division by type of settlement, level of welfare, residency in selected regions etc. if statistics are available.

The AAI brings out the gap between older people's desire to contribute to society and existing opportunities, revealing the structural and cultural barriers on the way to a society for all ages. The AAI can be used as a tool to promote change in the culture of distribution of employment, care, education and leisure during life from sequential to concurrent implementation based on work-life balance that benefits individuals and society. It can serve as a framework — and a yardstick — for individual life balance, being an individual checklist of possible social and economic activities and capabilities.

The AAI was introduced as a monitoring tool for active ageing policies and measures in the EU in 2012. In 2015, the UNECE Working Group on Ageing recommended that countries in the region use the AAI indicators for the monitoring of the implementation of the third cycle of the Madrid International Plan of Action on Ageing and its Regional Implementation Strategy MIPAA/RIS (United Nations, 2002) and evaluating their progress in active ageing policies. The results were included into the reporting in a form of a statistical annex.[2]

Figure 1. Rationale for using AAI



Although, up until now, the AAI has been published for the EU-28 only, a number of studies to calculate the AAI for other countries (e.g., Canada, Iceland, Norway, Serbia, Switzerland, Turkey) and at a subnational level (e.g., Germany) were carried out under the project. In addition, several countries and regions engaged into their own calculations of the AAI at subnational level (Italy, Poland, Biscay Province of Spain) or national (the Republic of Moldova, the Russian Federation,[3] Ukraine). The subnational AAI aims not only at cross-comparison of regions, but rather at identification of areas where the regions have higher/lower results, although a study

[2] The Synthesis Report on the implementation of the Madrid International Plan of Action on Ageing in the ECE region between 2012 and 2017 is available from http://www.unece.org/population/mipaa/reviewandappraisal.html.
[3] Varlamova, M., Ermolina, A., & Sinyavskaya, O. (2017).

of the experience of another region with higher index values can be useful for the policy formation. To calculate the AAI some of these countries included several AAI indicators in already existing surveys, and some carried out specially designed surveys to collect the necessary data. In this way, calculating the AAI at a subnational level and in non-EU countries may provide indirect benefits, including impetus to improve data collection, motivation to identify new data sources and resources to enhance the international comparability of statistics.

The main challenge in calculating the AAI for non-EU countries and at a subnational level is the lack of harmonized statistical sources at both international and country levels. The use of alternative variables (proxies) for the AAI indicators undermines comparability with the EU results at national level, but the "best comparability possible" principle should be applied, keeping in mind the meaning of individual indicators and the index as a whole.

To provide information on data sources and identification of proxies for active ageing indicators two workshops were organized by the UNECE in 2015 (Geneva) and 2016 (Minsk).[4] They brought together UNECE national focal points on ageing and specialists from the national statistical offices of the countries of Eastern Europe, Caucasus, Central Asia and Western Balkans. The workshops showed a need for clear methodological guidelines that would help calculate the AAI by providing advice on identification and usage of alternative data sources and variables.

These guidelines are based on the analysis of the fundamental and applied research and good practices implemented by the AAI users at all levels and in line with the UNECE Recommendations on Ageing-related Statistics (UNECE, 2016). They provide instructions on adjusting the flexible methodology of the AAI to various policy-related and scientific purposes, including calculations at national level in non-EU countries and at subnational level. The guidelines provide information on selection of appropriate data sources and variables for calculation of the AAI indicators so that the index preserves its core concept, structure and its functionality, and ways of adapting the original methodology.

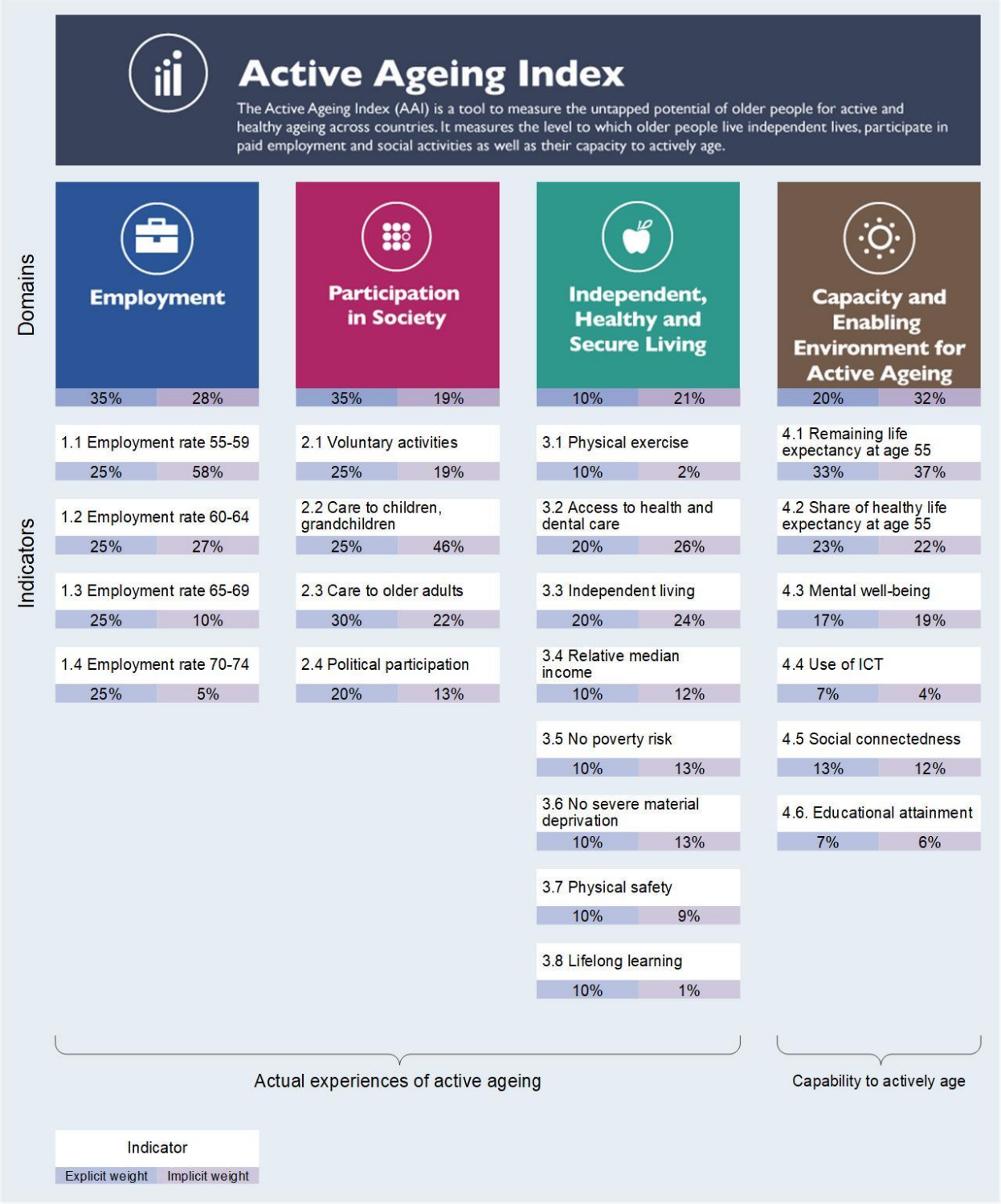
1. Active Ageing Index — conceptual and methodological framework

The AAI aims at measuring the extent of realized potential of older persons to contribute to economy and society. It consists of 22 indicators that are grouped into four domains: employment, participation in society, independent, healthy and secure living, and capacity and enabling environment for active ageing. The first three domains measure the current situation of active ageing, whereas the fourth domain evaluates factors that support or inhibit active ageing. The index focuses on people aged 55 and above. A number of indicators have an upper age boundary of 74 full years, which is largely due to the small sample of the uppers age categories in the surveys used for the AAI calculation. The disaggregation by sex is also provided for understanding the active ageing experiences and its potential for men and women separately.

The AAI for the EU uses several data sources to capture various dimensions of active ageing: EU Labour Force Survey, European Quality of Life Survey, EU Statistics on Income and Living Conditions etc. At present, the index as per its original methodology is calculated for the 28 countries of the European Union. The AAI methodology and the originally used datasets make the index comparable in time and across EU countries.

[4] Both workshops were co-funded by the European Commission, while the second workshop was organized with the additional support from the United Nations Population Fund's Eastern Europe and Central Asia Regional Office (EECARO).

Figure 2. The structure of the AAI



The methodology of the index construction is similar to the Human Development Index of the United Nations. All indicators are presented as positive coefficients with the value ranging from 0 to 100 points, where the higher value reflects the higher level of older persons' potential realization. For example, the more older people participate in voluntary activities, the higher their active ageing outcomes are.

The AAI individual indicators are interpretable and provide a useful way of guiding public policies. The index consists of outcome indicators, and supplemented by context indicators, and not of input or process indicators. It means that the index shows the actual activity of the current

generation of older people through which they contribute to the economy and society, in the selected time period. **Consideration must be given to the fact that the index is not built to measure the well-being of older people — meaning that no such value judgment should be made that higher level of economic and social activity necessarily reflects well-being of older persons.** Thus, the AAI provides the quantitative evidence required to operationalize the multidimensional concept of active ageing and suggests policy reforms aimed at activating the potential of older people.

The indicators are grouped into domains with given weights, which were assigned taking into account the average value of the indicator and expert assessment of the significance of the particular sphere for active ageing. The overall AAI is calculated as the weighted arithmetic mean of the four domain values. Its value can be interpreted as the degree of realization of the potential for active ageing.[5]

The structure of the index and weights used are shown in Figure 2. The AAI methodology assumes two types of weights — explicit and implicit. Implicit weights are the expert assessment of the significance of the spheres in the overall index. Explicit weights are introduced to compensate the difference in the magnitude of values of the indicators and domains. Explicit weights are developed in the way that would make the proportion of the average final values in the total index close to those proposed by the experts (see Box 1 for more information). Same explicit weights are used for calculations for men and women.

Box 1. Weights correction

The need for correcting the weights depending on the average value of the indicator can be illustrated with an example: the importance of the educational level and the level of employment in the group of 70–74 years is similar: 6 per cent of indicator's weight × 32 per cent of the domain's weight = 1.9 per cent of the final index for education and 5 per cent × 28 per cent = 1.4 per cent for employment.

The average employment rate in the EU in 2016 (AAI-2018) for this age group was 6.1 per cent, the percentage of older persons aged 55–74 with the upper secondary or tertiary educational attainment — 65.3 per cent. That means that educational attainment would have more weight in the total index not because of its higher importance to active ageing, but because the value of this indicator is quite high. This makes 1.3 for the total index from education and only 0.09 from employment, meaning the last has more than 14 times less influence for the final value.

We could have standardized our indicators, but that reduces transparency and direct interpretation. Instead, weights were recalculated in order to smooth out different magnitude of the indicators and not to let indicators with average high values dominate others that are not less important. Explicit weight can partly correct this shift, making 0.91 and 0.53 correspondingly — which is quite close to the initial expert proportion.

Easily replicable and transparent methodology provides possibilities to disaggregate the AAI beyond sex, e.g. by education, occupation, area of living (urban/rural). Different clusters for comparisons can also be segregated: educational level, income level, age structure etc., showing

[5] For detailed explanation of the weighting method see Zaidi et al., 2013.

which population categories are disadvantaged in terms of their potential realization, thus highlighting the need for policy interventions.

Analysing the AAI results by age subgroups could help to specify policy measures and eliminate the influence of age structure in comparisons. It could be done if data for 5-year age groups were available at the chosen level of estimation. But to be kept in mind — a proportion of the older population group may be in institutions, thus falling out of standard surveys. The original AAI does not cover population in institutions.[6] However, the study of such population groups may present an interesting research problem for the future. In 2017, the UNECE Task Force on measuring old-age population in institutions was established to address the issue. Formed by 24 representatives from 19 countries and organizations (including Eurostat and OECD) it aims to develop standard definitions and classifications of "institution" and "institutional populations" and to provide guidelines for statistical offices on inclusion of mentioned populations in the production of statistics on ageing-related topics.

2. Calculating AAI in various contexts

The AAI is a flexible framework which can serve different policy and scientific purposes. It can be applied at national and subnational levels, in countries / regions with different level of data quality and availability. To apply AAI in these various contexts adjustments might be needed.

The AAI can be calculated in 10 steps (Figure 3).

1. Depending on users' needs and available statistical sources, two tracks of the AAI calculations can be defined: a) to follow closely the original methodology and obtain results comparable to the EU-AAI at the national level; b) to produce the AAI for local purposes. In both cases the essence of the index has to be preserved — the index should still measure how much of older men and women's potential to contribute to the economy and society is realized and how much their environment enables them to do so. It is also vital to keep the four domains as they reflect the multidimensional concept of active ageing as per the Vienna Ministerial Declaration goals[7]: longer working life, participation and social inclusion, health and independence of older persons, and intergenerational solidarity.
2. In order to collect data for the AAI indicators for non-EU countries or at subnational levels the preliminary stage of reviewing available data sources is required. It is recommended to apply the following criteria for their evaluation:
   - □ the questionnaire has at least some information necessary to calculate AAI
   - □ data are of good quality with available written documentation on sampling and fieldwork procedures (including information on non-response), and on the representativity of the resulting data
   - □ the sample should be a probability sample, not a quota or other convenience sample
   - □ there is no upper age limit, or the age limit is not lower than 74
   - □ it is a repeated or longitudinal survey so that information can be used for different years to observe dynamics

[6] With the exception of life expectancy.
[7] http://www.unece.org/population/ageing.html.

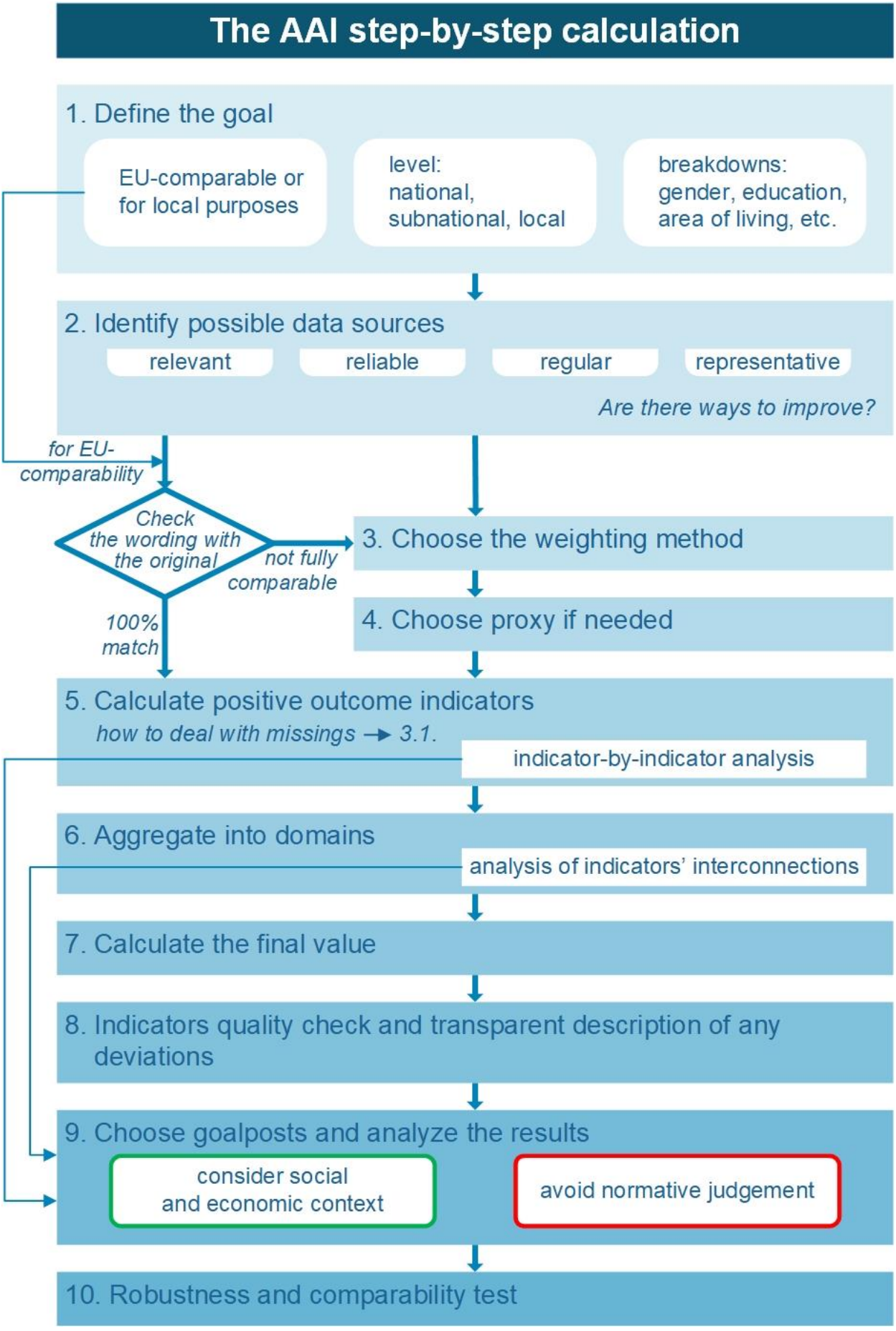
- □ data should be comparable across its intended area; comparability with other areas using different AAI methodology should be assessed if such comparisons are intended.

3. In case AAI is produced for subnational level and/or in non-EU countries, weighting methods different from the original could be chosen (see section 2.1).
4. If some of the original data sources are unavailable for calculation or the wording of underlying variables differs, alternative variables (proxies) for the AAI indicators need to be identified.
5. The next stage in calculating the AAI is to compute its indicators (more about this in the section 2.3) making sure that they correlate positively with activity and are presented as positive coefficients (e.g. not "poverty risk", but "no poverty risk"). The indicator-by-indicator analysis is provided here to study specific aspects of active ageing and, if possible, to compare their progress in dynamics.
6. The calculated indicators are multiplied by their respective explicit weights and are aggregated into domain values. The interconnectedness of the indicator within the domain should be checked here.
7. The total index value is calculated by aggregating the domains values using the respective weights.
8. The quality and accuracy of the calculation should be verified, and all deviations from the original methodology should be described, including inconspicuous ones, with justification of their necessity and relevance.
9. The results should be analysed within the socio-economic contexts and aggregate the outcomes of all level analyses. The normative judgement of the index should be avoided (see section 3.3). Users could also set goalposts — targets or benchmarks — for assessing how much could be gained by applying appropriate policies. These could be results of high-performers, EU average (if relevant for the analysed entity), or statistically defined benchmarks.
10. Robustness and comparability test should be performed (see section 4).

The depth of analysis and the possibility of clustering population subgroups depend on the availability of statistical data — the sample should be representative and sufficient for analysis, and replicability of the indicators should be ensured. It is also recommended not to use data from more than four years before the year of calculation and to check the accuracy of proxies through correlation and sensitivity analyses as the quality of the index depends on the quality of data used for its underlying indicators.

In cases where the original methodology cannot be fully complied with, it is necessary to provide a detailed description of deviations and their potential consequences for the obtained results. In addition, in the case of intentional changes, the consistency of the methodology of an adjusted index should be ensured in order to reduce the possibility of random changes throughout time (breaks-in-series) and data manipulation risk for political and other non-scientific purposes. The transparent methodological review and the rationale for any deviations should be presented along with the estimation results.

Figure 3. Step-by-step construction of the AAI



2.1. Dealing with weights

The original methodology makes it easy to assess the impact of individual indicators to the final value and adjust them depending on policy needs. The original weights are a combination of subjective expert opinions and an average value of the indicator for the EU countries. A large part of the final EU-AAI value is formed by the employment rate at age 55–59 and 60–64, care to children, grandchildren and older adults, remaining life expectancy and the share of healthy life expectancy in it, political participation and mental well-being. Lifelong learning, physical exercise and physical safety are at the other end of the list and account together in many cases for only 3 per cent of the final result.

Political priorities and the level of values for countries outside the EU can differ significantly, affecting the distribution of weights within the domains and within the final index. The first possibility is a correction of weights taking into account the priorities of social development or/and the average value of the indicators. For example, one of the goals of a government is the development of voluntary activity of older people. Let's assume that from the expert point of view the significance of this activity in all social activities of people over 55 is 0.3. At the moment, however, less than 1 per cent of older people are involved in unpaid voluntary activities through the organizations in a given country. Accordingly, a double increase of the indicator will be hardly noticeable in the general value of the index. The situation can be partly rectified by further increasing the weight, e.g. up to 0.55. The sum of the weights in a separate domain and the sum of weights of the domains in the index should be equal to 1. Weights can also be used to limit the impact of proxy variables. If an indicator needs to be approximated and only poor approximations are available, the methodology could be made more robust by lowering its weight and relying more on better-measured indicators. When doing this, attention should be paid to the relationship between the indicators, some of which go hand-in-hand and reinforce one another, while others are less positively correlated (and some might even be negatively correlated). The modified methodology should provide detailed description of the rationale behind the weighting mechanism and methods used in order to preserve the results from manipulation and misinterpretation.

The second opportunity is to express positive indicators in "normalized" terms. To use this method minimum and maximum values should be determined (in most indicators these are "natural" values, as is the case for employment rates, which naturally range from 0 to 100; for other indicators, one could use an observed lowest value of the indicator minus 10 per cent for the lower boundary and observed highest value + 10 per cent for the upper boundary). After that the equation "normalized indicator = (actual value – minimum value) / (maximum value – minimum value) times 100" is applied. Normalization allows passing from any dimensionality indicators to the data range from 0 to 100, while maintaining the ratio of the individual values to the minimum and maximum boundaries. When analysing the indicators for a number of years, it is necessary to compare them using the same normalization boundaries. This method makes it possible to use only one type of weights — implicit, but complicates the direct interpretation of obtained results.

The third option is to use the indicator system separately, without the weighting and aggregation procedures. Indicators of the AAI reflect the goals, objectives and principles of the Madrid International Plan of Action on Ageing (United Nations, 2002) and can be used independently to

assess social progress in the field of active ageing. In this case, however, the advantages of an integrated comprehensive picture provided by composite indicators are missing.

If cross-country comparisons are important, the original methodology should be followed as closely as possible. For domestic policy purposes the original methodological framework might be adjusted if needed, but transparent description of the deviations of the methodology should be available to all the possible users.

2.2. The Active Ageing Index — data sources

Calculations of the AAI for EU countries are based on the following data sources: 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 & Life Expectancy Information system (EHLEIS). Extending the AAI to countries not covered by these surveys raises an issue of data availability.

This is also an obstacle at a subnational level: most of the above-mentioned surveys cover to some extent subnational levels (at least NUTS-2) but often with an insufficient sample. In this case the AAI should be seen as a framework, with a set of domains and indicators, to be based on while allowing necessary replacement of missing data with the most relevant substitutes.

In order to look into trends within a given territorial entity or to compare and rank municipalities, indicators should be comparable among localities over time. For specific purposes the AAI can be complemented with the indicators that would respond to the topical political questions within the original domain structure. Specific indicators are selected based on the level (national, regional, local) of policy responsibilities and the time period (short-, medium-, long-term) before a given policy yields results reflected in a change of an indicator value.

The AAI can be calculated using two approaches to the selection of data sources: mono-base and multi-base. A calculation based on a single database allows for analysis of individual indicators and factors affecting them and provides opportunities for comparison among different population groups. It also allows for the use of some multidimensional statistical methods (for example, the identification of interrelated indicators by correlation analysis, the determination of the weights of indicators on the basis of regression analysis, the combination of several indicators in aggregated indicators by methods of factor or principal component analysis). Calculation of the multi-base index allows to combine the most appropriate wording of questions from different surveys, compare the values of the indicators obtained from different databases and find indicators comparable at the international level. However, the multi-base approach often leads to problems with temporal comparability. For example, waves of different surveys may not coincide by years and calculation of individual values of the final index becomes challenging.

Data for calculation of indicators can be obtained from a variety of sources. Checking for sample size for the older population groups to ensure robustness of results is vital at this step (for further information see e.g. Kish, 1965). This is even more significant in case of further disaggregation e.g. by income, education etc. Examples of some surveys are given below. They differ

significantly in samples, wording of the questions, possibilities for disaggregation and clustering. Several groups of data sources can be distinguished:

- International surveys and databases provide cross-country comparability and coherence over time, good quality of questionnaires with a significant number of questions asked. Their sampling, however, is usually rather small, which may impede further subdivision.
    - The European Union Labour Force Survey (EU LFS)[8] is a large sample household survey providing quarterly results on labour participation of people aged 15–74 (by 5-year bands) as well as on persons outside the labour force in the EU-28, four EU candidate countries and three countries of the European Free Trade Association (EFTA). Conducted from 1983. Sample size: 4,000–137,000 interviews in each country.
    - The European Union Statistics on Income and Living Conditions (EU-SILC)[9] is a cross-sectional and longitudinal multidimensional microdata on income, poverty, social exclusion and living conditions. Conducted every year from 2003, starting from six countries, now covering EU-28 and Iceland, Montenegro, Norway, Serbia, Switzerland, the former Yugoslav Republic of Macedonia, and Turkey. Sample size: 4,000–18,000 interviews in each country.
    - The European Social Survey (ESS)[10] is a long-term comparative study of changes in attitudes, values and behaviour of the population of Europe. Conducted every two years from 2002. Sample size: 1,500–3,000 interviews in each country.
    - The European Quality of Life Surveys (EQLS)[11] is a pan-European survey (EU-28 and five candidate countries) that examines both the objective circumstances of European citizens' lives and how they feel about those circumstances and their lives in general. The survey is conducted by Eurofound every four years since 2003. Sample size: 1,000–2,000 interviews in each country.
    - The Survey of Health, Ageing and Retirement in Europe (SHARE)[12] — is a cross-national panel database of microdata on health, socio-economic status and social and family networks of individuals aged 50 or older. The survey is conducted every two years since 2004, but before the last wave, only for 20 EU countries and Israel. The SHARE is harmonized with similar panel surveys in Brazil, China, India, Japan, Korea, Mexico, South Africa and the United States.[13] There is also a SHARELIFE module that focuses on people's life histories. The sampling size differs significantly among countries as SHARE does not define a minimum net sample size. The total amount of panel and refreshment respondents is between 2,000 and 6,000 per country.
    - The Generations and Gender Survey (GGS)[14] a longitudinal study of the dynamics of the family and intergenerational and gender relations. The first GGS panel waves were

[8] https://ec.europa.eu/eurostat/web/microdata/european-union-labour-force-survey.
[9] https://ec.europa.eu/eurostat/web/microdata/european-union-statistics-on-income-and-living-conditions.
[10] www.europeansocialsurvey.org.
[11] https://www.eurofound.europa.eu/surveys/european-quality-of-life-surveys.
[12] http://www.share-project.org.
[13] Bergmann, Michael; Kneip, Thorsten; De Luca, Giuseppe; Scherpenzeel, Annette (2017). Survey Participation in the Survey of Health, Ageing and Retirement in Europe (SHARE), Wave 1–6. Based on Release 6.0.0 (March 2017). SHARE Working Paper Series 31-2017. Munich: Munich Center for the Economics of Aging (MEA).
[14] https://www.ggp-i.org

conducted in 2004 and till now GGS has been conducted in 20 European and 4 non-European countries. Although some of them participated in one wave only. The average country sample size is 10,000.

- The Human mortality database (HMD)[15] — detailed mortality and population data for 39 countries collected under a joint initiative of the Department of Demographics at the University of California, Berkeley in the United States and the Max Planck Institute for Demographic Research in Rostock, Germany.

- National surveys are produced by national statistic offices and provide significant samples and high accessibility of data. Their questionnaires are usually quite narrowly specialized, and a number of AAI indicators are missing, e.g. social participation aspects. For some variables national surveys apply international standard definitions, such as the International Labour Organisation's definitions of employed person; this helps the comparisons. The upper age limit for respondents is often set, which can lead to overestimated values.
  - Microcensus can be used if carried out annually (e.g. in Germany) or every 2–3 years (if conducted every 10 years only, its usage for the AAI is very limited unless it is combined with ordinary census). Sample size: usually from 1 per cent to 5 per cent of the population, which makes it an ideal base for analysing small subpopulations.
  - Time Use Surveys (TUS) provide measures of the amount of time people spend on various activities. These surveys are based on the diaries and require additional research into the recalculation mechanism of time in hours into output variables of the original AAI.
  - Special purpose national surveys, where relevant information for some indicators could be found[16]:
    - Labour Force Surveys
    - Statistics on Income and Living Conditions
    - National Household (Budget) Surveys
    - ICT Use Surveys
    - Surveys of Social Needs
    - Health Surveys.
- Socio-demographic surveys (in most cases longitudinal) conducted by major research institutes — in most cases longitudinal surveys conducted by major research institutes, with a sufficient sample size and multifaceted questionnaires, containing issues important for the calculation of the AAI. As they are not always harmonized, the coherence across countries is limited and the issue of credibility of the source is crucial, thus the objectivity of the data should be checked. Good examples include:
  - The German Ageing Survey (DEAS)[17] — a nationwide representative cross-sectional and longitudinal survey of the German population aged 40 and older conducted by the

[15] http://www.mortality.org
[16] Many of these surveys are based on internationally comparable methodology, which facilitates their use
[17] https://www.dza.de/en/research/deas.html

German Centre of Gerontology. Since 2008 the survey has been conducted every three years. Sample size: from 4,000 to 10,000 people.

  - The Canadian Longitudinal Study on Aging[18] is a large longitudinal study of 50,000 men and women aged between 45 and 85 years. The survey is conducted by the Canadian Institute of Health Research. Presently, the first wave of re-contacting recruited respondents is in progress.
  - The Russian Longitudinal Monitoring Survey (RLMS): a series of nationally representative surveys (26 waves from 1992 until now) designed to monitor the effects of reforms on the health and economic welfare of households and individuals in the Russian Federation. This survey is conducted annually by the National Research University — Higher School of Economics. Sample size: 17,000 respondents in the representative sample of the last waves.
  - Social Diagnosis (SD)[19], a social survey, which has been conducted every two years on objective and subjective quality of life in Poland with the sample size exceeding 20,000 individual respondents but only till 2015.

- Registers — a regularly updated list of residents serving the purpose of administrative accounting for the population. Registers contain a limited number of socio-demographic characteristics, but they can be a great source of information at the local level.
- Special data collection cases:
  - Extension of the questionnaire of an existing survey in the Russian Federation. Within the project on the calculation of the AAI for the Russian Federation, it was proposed to include the original wording of the AAI questions into the RLMS. Questions on voluntary activity and care to children and older adults were integrated into the 2016 wave. In 2017, two more questions (political activity and material deprivation) were added, which makes it possible to calculate the AAI in the framework of the single survey.
  - Specially conducted survey in the Biscay Province (Spain): University of the Basque Country conducts a telephone survey (via call centres) of the population aged 55 and over in the Biscay Province. The questionnaire is based on the original AAI questions and methodology to obtain the necessary data for AAI estimation and comparison. Sample size is about 1,000 respondents. Currently, the third round is in progress.

2.3. AAI domains and indicators: rationale and suggested alternative variables

2.3.1. Employment domain

The first domain, Employment, measures to what extent the potential of older people to contribute through paid activities is realized. It is calculated for four five-year groups: 55–59, 60–64, 65–69, 70–74 (full years). Employed persons are considered to be those who during the reference week performed work, even for just one hour (part-time and full-time workers are taken into account on the same basis), for pay, profit or family gain or who were not at work but

[18] https://www.clsa-elcv.ca
[19] http://www.diagnoza.com

had a job or business from which they were temporarily absent because of, e.g., illness, holidays, industrial dispute or education and training. Results may differ in accordance to pension schemes and labour market regulations, but generally show the real experience of active ageing in terms of participation in the labour market. The main goal of the first domain is to measure the activity of older people in employment, but not the intensity of employment or the quality of jobs. Social attitudes toward the employment of older people, the work environment that is adapted to the ageing workforce etc. are factors that influence the length of working lives and the preservation of ability to work and their effects are to some extent reflected in the outcome indicators of the domain. However, these factors should be the subject of additional research while formatting policies aimed at increasing the involvement of older people in the labour market. The AAI does not take into account the number of working hours or motivation for employment. Additional contextual research is needed to see if older persons work longer out of necessity rather than because of new opportunities provided by policy measures and reforms.

The data can be obtained from the Labour Force Surveys that are conducted regularly on a quarterly or annual basis or from household social surveys. The oldest age group could be more problematic as in some countries surveys of labour force only cover respondents up to 70 or 72 years old due to a small number of observations in a sample.

Redistribution of weights due to the lack of data for the oldest age group would lead to a significant overestimation of the indicator, so it should be used with caution if comparability with the original index is needed. The division into age subgroups allows for deeper analysis of employment trends and identification of target groups for removing barriers and stimulating employment. However, taking into account the weights of the original methodology, if such data disaggregation is not possible due to a sample size, the larger age groups could be taken instead.

The median values for the EU-28 countries for employments are 67.8 for 55–59 years old, 37.6 for 60–64 years old, 11.1 for 65–69 years old, 5.7 for 70–74 years, reflecting the tendency of the decline in paid activity with age.[20] Male employment rates on average are higher in all age groups and this gap increases with age.

2.3.2. Participation in society domain

The second domain, Participation in society, measures contributions of older persons made through unpaid productive activities — care for own children, grandchildren and older adults as well as voluntary and political activity. This input is often underestimated, and the AAI helps to promote greater recognition of how older people contribute to society and thus stimulate measures to create more supportive conditions for them (Zaidi et al., 2013). The indicators of this domain can be divided into two subgroups: family and community-based care, and other social activities. This makes it possible to cover the social activity of older people in different cultures and social environments. Countries with a good system of state-provided care tend to get lower results of the care-related indicators, this should be taken into account when selecting target values.

The indicator "**Voluntary activity**" measures non-market unpaid productive activities of the older population offered in the form of organized voluntary activities. The original question does

[20] Here and below the data refer to the EU-28 countries and are from year 2016 (2018 AAI) for all the indicators unless stated otherwise.

not include the informal voluntary activities (i.e. activities carried out outside of voluntary organisations). This may undervalue the contribution on territories with a lack of voluntary structures.

The original AAI question is based on the EQLS and is defined as the share of persons aged 55+ doing unpaid voluntary work through the organizations at least once a week in the last 12 month including organizations helping older people, young people, disabled or other people in need, educational, cultural, sports or professional associations, social movements and charities and other voluntary organizations.

Data for this question could be found in national social surveys, special research studies on voluntary works, broad longitudinal surveys and Time Use Surveys. The same wording is used in the ESS-2012, and similar wording appears in the SHARE.

Examples of possible alternative variables

Proxy	Survey question[21]	Answer categories[22]	Impact of the proxy use
Organized voluntary activity with a different scale of answers	Social Survey (Israel)	**More than five hours per month** Less than five hours per month Not on a regular basis	Close to the original, provided that the comparison of the time scales is done correctly.
	How often in the past twelve months did you do voluntary or charity work? SHARE-2016	**Almost daily** **Almost every week** Almost every month Less often	
Organized voluntary activity without intensity; organized and informal voluntary activity combined	Have you in the last year done any voluntary work for people outside the family or for a social organisation? SD (Poland)	**Frequently** Rarely No	Overestimates the value of the indicator, could be corrected through reweighting with lower coefficient.
	Did you perform any unpaid work on a voluntary basis or in the interests of other persons who are not members of your household during the past year? Statistical Survey of Income and Participation in Social Programs (the Russian Federation)	**Yes, I have done this type of work in the interests of an organization, a foundation (the collective in an organization, a foundation)** Yes, I have done this type of work in the interests (at the request of) private individuals No, I have not done this type of work	
	Which of the activities listed on this card — if any — have you done in the past twelve months?	**Voluntary or charity work**	

[21] Here and afterwards: examples of questions taken from national surveys, if no official translation was available, were either translated into English by authors or extracted from other documents prepared in English (including UNECE / European Commission 2016 and 2017) and could differ from other versions of translations.
[22] Here and afterwards: in bold are the categories the authors recommend using for the calculations.

Proxy	Survey question[21]	Answer categories[22]	Impact of the proxy use
	SHARE -2014		
Membership in voluntary organizations	Are you a member of any public, voluntary or charitable organizations (movements)? CMLC (the Russian Federation)[23]	**Yes** No	The effect is not clear. The indicator may be overestimated for countries with a wide network of volunteer organizations and underreported for regions where it is not the case. Being a member of a voluntary organization does not necessarily mean being an active volunteer and vice versa.
Percentage of people aged 55+ who is engaged in social (voluntary) activities	Percentage of people aged 55+ who indicated in their diaries that they spend at least some time on social (voluntary) activities Time Use Surveys (TUS)		Only activities carried out during two random days can be monitored; it is recommended considering voluntary activities regular if they are recorded at least on one of the days of the survey.

The values of the "voluntary activity" indicator in the EU range from 1 for Hungary to 25.2 in the Netherlands with a median value of 5.8. This means that 14 EU countries have less than 5.8 per cent of population actively engaged in voluntary activities. Men on average are more active than women, but 10 EU countries show inverse results.

The indicator **"Care to children, grandchildren**" is designed to capture the unpaid social contribution of older population in the form of care provision to their own children or grandchildren. The initial question was taken from the European Quality of Life Survey (EQLS) and measured the share of older population aged 55+ providing care to their children, grandchildren at least once a week. In the EQLS 2016 the question was modified (the word "educating" was added, the question changed the filter of respondents, and caring for children and grandchildren was split into two separate categories), which lead, in many cases, to a decrease in the indicator value.

There is no restriction on the residence of children, so in countries and areas, where independent living of older persons is less socially acceptable the indicator is expected to be higher. However, there are restrictions on the intensity of care and family affiliation — a kinship between the respondent and cared children is necessary. It helps to divide intrafamily activities from extrafamily ones but limits the diversity of activities included into this unpaid contribution.

Examples of possible alternative variables

Proxy	Survey question	Answer categories	Impact of the proxy use
Frequency of implementation differs from the original, does not explicitly include grandchildren	Does the range of your daily activities include childcare (for your own or other people's children without being paid)? CMLC (the Russian Federation)	**Yes** No	Includes unpaid help for other children, but takes into account only care provided on a daily basis, which is more frequent than in the original. Thus, using this variable would lead to a decrease in the results compared to the use of the original wording.

[23] Comprehensive Monitoring of Living Conditions of the Population — national survey, conducted since 2011 every 2–3 years.

Proxy	Survey question	Answer categories	Impact of the proxy use
No family affiliation or only grandchildren	Do you look after or supervise other people's children privately, e.g., your grandchildren or children of siblings, neighbours, friends, or acquaintances? DEAS (Germany)	**Grandchild** Child of siblings Child of neighbours Child of friends or acquaintances Other (please note): No	Care to others' children could also be included, if general activity towards children needs to be measured. Own children are not included which could result in understating, although it is not expected to be significant, considering the age group.
	During the last 12 months, have you regularly or occasionally looked after [your grandchild/your grandchildren] without the presence of the parents? SHARE	**Yes** No	Question is limited by additional care characteristics, care for children is not included, "regularly" is difficult to compare with "once or twice a week" category The influence cannot be determined unequivocally, since the proposed intensity of contacts overstates the indicator's value, while the condition "without the presence of the parents" and the absence of care for children category — leads to underreporting.
	How often do you take care of your grandchild (any of your grandchildren)? GGS	Number of times per week, per month, per year **Scale: at least once a week or 52 times a year or 4 times a month**	Care for children is not included, which may underestimate the values of the indicator.
Percentage of people aged 55+ who provide care for children	Percentage of people aged 55+ who indicated in their diaries that they spent some time on activities involving children (usually under 18 years old of age) on selected two days Time Use Surveys In the Polish TUS eight activities related to children are coded: 380 – Care to children, 381 – Nursing and looking after children, 382 – Teaching children, 383 – Reading, playing and conversations with children, 384 – Going out with children, 389 – Other activities related to children, 423 – Care to own children living in another household, 424 – Care to others' children	The Polish survey considers respondents who had one of these children-connected codes written down in the diary for at least one 15-minute interval as those who perform care to children regularly.	The wording needs additional control and resolution on a time period, which is considered to be adequate for the purposes of the indicator. It is recommended to consider provision of care to children regular if it is indicated in the diaries on both days of the survey.

The values of this indicator in EU range from 16 in Lithuania to 46.5 in Cyprus with a median value of 26. Women are on average more active in providing care for children and grandchildren, but in 8 EU countries men are as much or even more active.

"Care to older adults" is the second indicator of the domain that captures the intrafamily contribution of older people: here in the form of care provision to older adults. The original question was taken from the EQLS and measured the share of older population aged 55+ providing care to elderly or disabled relatives at least once or twice a week. In 2016, the question was modified to include neighbours and friends, reflecting the shift from purely family-based care to informal community care. The AAI indicator changed its name into "Care to infirm and disabled". The sources for the question are the same as mentioned in "care to children and grandchildren".

The values of the indicator range from 9 for Hungary to 37.5 in France with a median value of 16.4. Women are on average more active in providing this type of care, but in five EU countries the situation is different. This variable is highly correlated with cultural traditional patterns of caring for older people, the accessibility and quality of institutions for caring, and the efficiency of measures to support family care. Life expectancy also plays a significant role as low indicator values could reflect the low prevalence of old relatives due to early mortality.

Examples of possible alternative variables

Proxy	Survey question	Answer categories	Impact of the proxy use
Different frequency, no family affiliation	In the last 12 months, have you provided regular assistance to anyone with eating, getting up, getting dressed, bathing, using the bathroom, etc.? Do not include childcare here. GGS	**Yes** No	"Regular" is not fully comparable with "once or twice a week", and family affiliation is disregarded. The use of this proxy would lead to overreporting.
No family affiliation	Are there people you look after or care for regularly due to their poor state of health, either on an informal or volunteer basis? How much time do you spend per week helping the person you care for? Please give a weekly average number of hours. DEAS (Germany)	**Yes** No	Impossible to calculate separately contribution to family and to the society, but captures the total activity, which corresponds to the new wording of the original question. Number of hours per week could be taken into account, for example by setting the required level to at least one hour per week.
	Do you spend any time looking after or giving help to family members, friends, neighbours or others because of any of the reasons on this card? Do not count anything you do as part of your paid employment	**Yes** No	

Proxy	Survey question	Answer categories	Impact of the proxy use
	In general, how many hours a week do you spend doing this? ESS-2014	Less than 1 hour a week 1–10 hours a week 11–20 hours a week 21–30 hours a week 31–40 hours a week 41–50 hours a week More than 50 hours a week	

The "**Political participation**" indicator analyses the participation in political and trade union activities and the abilities of older people to influence decision-making of these organizations, thus empowering older people. The question is taken from the EQLS and measures the share of older people aged 55+ attending a meeting of a trade union, a political party, political action group, a protest or demonstration, signing a petition, including an e-mail or on-line petition or contacting a politician over the last 12 months. In this way, not only the membership, but attempts to actively participate in the life of society through the influence on political decisions are essential. The ESS question is very close to the original one.

Values of the "political participation" indicator among the EU countries vary considerably from 4.3 for Romania to 48.4 in Sweden. The median is 15.7. With the exception of nine countries men are significantly more politically active.

Examples of possible alternative variables

Proxy	Survey question	Answer categories	Impact of the proxy use
Only one or two aspects of political participation are taken into account	If you think back over the past 12 months: How often on average do you engage in the following activities? e: How often do you go to political meetings, i.e., held by parties, unions, or citizens' initiatives? DEAS (Germany)	**Daily** **Several times a week** **Once a week** **1–3 a month** **Less often** Never	Describes only separate sides of political activity, the value of the indicator can be understated These actions should be a direct activity, so to boycott certain products wouldn't be regarded as a contribution.
	If you think back over the past 12 months, have you often engaged in the following activities: been involved in a citizens' initiative, taken part in a demonstration, supported a political party during election campaign? German Longitudinal Election Survey (GLES)	**Yes** No	
	Have you attended any public meeting in the last year (but not at your workplace)? SD (Poland)	**Yes** No	

Proxy	Survey question	Answer categories	Impact of the proxy use
Share of voters and other election-related activities			Usually not indicative since in some countries voting is mandatory. But other election activities can be taken as a measure, e.g.: taking part in elections as an observer or on the side of some parties or candidates (as agitator, activist or staff officer, interviewer).
Share of older people in authorities	Other possible variables include share of older people in parliament, among elected local authorities etc.		Does not answer the original question, but can be used for local purposes as an indication of empowerment of older persons.

2.3.3. Independent, healthy and secure living domain

The third domain "Independent, healthy and secure living" aims at measuring financial security, comfort of living, health opportunities and the actual experience of older people who provide for themselves and live autonomously, thus contributing to the society. Eight indicators of the domain serve as output indicators of how helpful and well-tuned the environment is for the needs of older people so that they can remain in charge of their own lives as long as possible.

The **"Physical exercise"** indicator measures the share of people aged 55 years and older taking part in sport or physical exercise every day or almost every day. Performing moderate physical activity can be considered as an indicator of maintaining the necessary balance and mobility to allow people to remain active in their communities and able to function independently. The cross-country and cross-group comparison can be limited because of differences in what is defined as physical exercise, e.g. for people living in rural areas gardening or walking long distances can be taken for granted and not included in measurement if it is not specifically explained in the preamble. Therefore, the answer to this question should be considered as an expression of a subjective opinion about a respondent's own level of physical activity. Among other things this indicator can indirectly reflect the availability of sports facilities and programmes suitable for older people. The original question is taken from the EQLS. The information for the other countries can be obtained from relevant social surveys or Time Use Surveys.

Examples of possible alternative variables

Proxy	Survey question	Answer categories	Impact of the proxy use
Frequency differs from the original	Undertaking physical exercise or sport three times a week Social Survey (Israel)		Quite close to the original, could be regarded as an equivalent to "almost every day".
	During this year, have you been engaged in active leisure activities? If yes — how often? Sport section Fitness Swimming, water sports Outdoor games (hockey, football, volleyball,	Occasionally **Regularly**	Term "regularly" needs to be defined not to result in overreporting, as once a week could also be regarded as regular activity.

Proxy	Survey question	Answer categories	Impact of the proxy use
	badminton, etc.) Sport tourism, hiking CMCL (the Russian Federation)		
	Participated regularly in sports activities, including walking, jogging; cycling; swimming; football; basketball; volleyball; athletic sports activities and others during the last four weeks Time Use Survey (Turkey)		
	Which of the following kinds of physical activity did you do during the 12 months preceding survey? How many times a month? Jogging, skating, skiing Gym Walking Sport walking Cycling Swimming Dancing, aerobics, shaping, yoga Basketball, volleyball, football, hockey Badminton, tennis, table tennis Wrestling, boxing, karate RLMS (the Russian Federation)	The sum of all kinds of physical activity in a month is **16 times and more**	The proxy is quite close to the original, but walking for pleasure should be excluded to improve comparability.
	How often do you do sports such as hiking, soccer, gymnastics, or swimming? DEAS (Germany)	**Daily** **Several times a week** Once a week 1–3 times a month Less often Never	Quite close, but the list of sports is rather narrow, the results could be underreported.
	Do you practise any sport or physical activity? SD (Poland)	No, I do not practise any sport or physical activity **Aerobics** **Running/jogging/ Nordic walking** **Gym** **Cycling** **Skiing or other winter sports** **Swimming** **Football or other team sports** **Yoga** **Martial arts** **Another sport or type of physical activity**	Although the term “practise” implies a certain regularity of activities, it is not possible to establish a direct link with the scale of frequency used in the original methodology.

Proxy	Survey question	Answer categories	Impact of the proxy use
Percentage of people aged 55+, who are engaged in sports	Percentage of people aged 55+ who indicated in their diaries that they engaged in any of the following sport-related activities: walking; jogging and running; cycling; ball games; gymnastics and fitness; water sports; other exercises Time Use Survey (the Republic of Moldova)		There is a concern on whether walking for pleasure should be included in the list or not. It is also necessary to decide the required number of references to physical activity in the diary — since the original wording takes into account every day or almost every day it is recommended to consider both days of the study.
Ability to lead an active life	Can you lead an active life on a par with others? CMLC (the Russian Federation)	**Yes, I can do it on a par with others** No, I cannot, because of health state or age **I do not have such interest or desire**	Rather refers to the capacity of active ageing than to the experience, and strongly depends on respondent's subjective perceptions of others' physical capacity, but can serve as a proxy if other options are unavailable.
Not only sport activities	Attaining more than 5 times 30 minutes of moderate activity per week, or more than 3 times 20 minutes of vigorous activity per week, or equivalent WHO Global Health Observatory Data Repository		As per the WHO definition, physical activity is a broader category than that of physical exercise (sport). As a result, the use of this variable might lead to overreporting.
	How often do you engage in vigorous physical activity, such as sports, heavy housework, or a job that involves physical labour? SHARE	**More than once a week** Once a week Once to three times a week Hardly ever, or never	Not only sport, but also heavy housework is included as well as physical labour. "More than a week" could be lower, than the recommended intensity. Use of this variable is expected to result in overreporting.
	ESS-2012: how many of the last 7 days you were physically active continuously for 20 minutes or longer? ESS-2014: on how many of the last 7 days did you walk quickly, do sports or other physical activity for 30 minutes or longer? ESS-2016: on how many of the last 7 days you were physically active continuously for 20 minutes or longer?	Number of days — **4 and above**	Being physically active is broader, than to take part in sport or physical exercise; the question differs through waves, thus limiting comparability.

Physical activity of older people differs significantly among the EU-28 countries, partly because of differences in respondents' perception of what activities are regarded as taking part in sport or physical exercise. The results vary from 1.8 for Bulgaria to 47.6 for Finland. The median is 16. In the majority of EU countries men tend to be more physically active (3.3 percentage point higher results on average).

The "**Access to health and dental care**" indicator is designed to capture the importance of enablement through access to health and dental care. The reasons for the unmet needs are various. From the lack of specialists to transport difficulties and financial insecurity, unmet needs should be considered for each country separately. The focus is placed on the actual treatment and not just the formal coverage, as it reflects the actual experience. The indicator refers to respondents who say that over the last 12 months there was no occasion when the person really needed (from respondent's subjective perspective) medical or dental examination or treatment but was not able to receive it. The original question is taken from the European Union Statistics on Income and Living Conditions (EU-SILC).

Examples of possible alternative variables

Proxy	Survey question	Answer categories	Impact of the proxy use
Reasons for unmet need specified	During this year have you had such a situation when you needed a medical treatment or consultation, but did not apply to a medical organization? If yes, why…	I do not expect to get effective treatment (there are no necessary specialists, medicines or equipment) Not satisfied with the work of the medical organization (the need for pre-recording, long queues, inattention, poor conditions for patients) I couldn't reach the medical organization without physical assistance It was hard to reach the medical organization I have no information about where I can get necessary medical care **There was no time** The necessary treatment can be obtained only for a fee **I prefer self-treatment** **Other reasons**	The calculation should take into account the "no" answer to the survey questions, and answer categories in bold selected as reasons for the "yes" answer.
	Have you received the necessary dental care the last time you sought it this year? CLMC (Russia)	**Yes** No	
	Have you delayed getting care for any of the following reasons in the past 12 months? ...You couldn't get through on the telephone. ...You couldn't get an appointment soon enough. ...Once you get there, you have to wait too long to see the doctor.	Yes **No**	The number of reasons is limited, thus the use of this proxy is expected to lead to overreporting.

Proxy	Survey question	Answer categories	Impact of the proxy use
	...The (clinic/doctor's) office wasn't open when you could get there. ...You didn't have transportation. National Health Interview Survey (Israel)		
	During the last 12 months, have you found yourself in a situation when you were unable to go through or postponed indefinitely a medical examination for the following reasons… Selective supervision of quality and availability of service in education, health care and social service, assistance of employment of the population — 2015 (the Russian Federation)	Only paid consultation was suggested, for which there is no money Remoteness of medical organizations Did not have information where I could have such an examination Waiting time, unsuitable schedule of specialist's work hours **Lack of time** **Could not (or postponed indefinitely) for other reasons** **No, there were no such cases**	For the purpose of this indicator those who had no such cases, and those who postponed for reasons of lack of time or due to other personal reasons are considered as having no unmet needs.
Limited list of reasons	In the last 12 months, was there a time when you were unable to get medical consultation or treatment you needed for any of the reasons listed on this card? Could not pay for it Could not take time off work Had other commitments The treatment you needed was not available where you live or nearby The waiting list was too long There were no appointments available Other reason ESS-2014	Yes **No**	Separate reasons could not be omitted; this leads to the inclusion of personal circumstances as a reason for not getting medical treatment which could arguably mean that a respondent did not really need help.
	Was there a time in the past 12 months when you needed to see a doctor but could not because of the cost? SHARE	Yes **No**	Only financial security aspect is taken thus the index would overreport the real availability of services.
	Have you refrained from acquiring dental prosthesis due to financial reasons? Have you refrained from visiting a doctor due to financial reasons? SD (Poland)	Respondents who answered "no" to both questions were considered as not having problems with access to health and dental care	

Proxy	Survey question	Answer categories	Impact of the proxy use
Last year experience	About how long has it been since you last saw a dentist? Include all types of dentists, such as orthodontists, oral surgeons, and all other dental specialists, as well as dental hygienists. During the past 10 months, have you seen or talked to any of the following health care providers about your own health? ...A mental health professional such as a psychiatrist, psychologist, psychiatric nurse, or clinical social worker. National Health Interview Survey (Israel)	Never **6 months or less** **More than 6 months, but not more than 1 year ago** More than 1 year, but not more than 2 years ago More than 2 years, but not more than 5 years ago More than 5 years ago **Yes** No	Indicators do not reflect the need for medical care, so it is difficult to interpret the result.
Availability of local services	Do you have problems with availability of state and municipal health care services in your local area? CMLC household questionnaire (the Russian Federation)	Yes **No** Don't know	Does not reflect the real provision of the medical care and its availability for the population.

The median value of the indicator in EU-28 is 89.7, ranging from 64.5 in Latvia to 98.6 in Austria. On average in the EU there is almost no difference between the unmet needs for medical and dental treatment of men and those of women (88.1 and 87.4 respectively).

The "**Independent living arrangements**" indicator aims to capture decisional autonomy regarding one's own life in the older age, which means being self-sustaining, running finances independently, taking own decisions. The indicator refers to people aged 75 and above who live in a single-person household or who live as a couple (two adults with no dependent children). Living with other members of the household does not necessarily mean a loss of independence but this cannot be checked for each case. The indicator differs significantly depending on cultural patterns, availability of housing and financial situation in the region of study.

The original question is based on the European Union Statistics on Income and Living Conditions (EU-SILC). The information for this indicator could be found in censuses, social surveys, household budget surveys by identifying respondents aged 75+ living in single households or in two-person households, where the second person is not a dependent child.

The median value of the independent living arrangement indicator in EU-28 is 85, meaning that in 14 countries more than 85 per cent of people aged 75+ live autonomously. The indicator value

ranges from 64.7 in Poland to 99.2 in Sweden. The Eastern and Southern countries tend to have lower results for this indicator than Northern and Western ones.

The **financial security** is represented in the AAI by three indicators: estimation of the financial situation of older people with respect to the rest of society, poverty risk and risk of material deprivation. The financial block describes abilities of older people to lead a financially independent life and the level of their economic comfort, thus indirectly reflecting the adequacy of social support measures. The original data are taken from the European Union Statistics on Income and Living Conditions (EU-SILC). Other users can find respective data in national income and living conditions statistics or relevant surveys such as household budget surveys.

The "**Relative median income**" indicator is calculated as the ratio of the median equivalised disposable income of people aged 65 and above to the median equivalised disposable income of those aged below 65. The age threshold of 65 was selected to measure the sufficiency of income of older people for maintaining their living standard after retirement. For national calculations the age limit can be equated to the retirement age. To calculate the equivalised disposable income it is necessary to sum up all household members' incomes, income received at the household level, deduct taxes and social contributions paid and divide by the number of "equivalent adults" using the "OECD-modified scale".[24]

In case statistics on household income are not available, a proxy indicator of an average pension as a proportion of an average salary can be calculated, but this would probably lead to underreporting as only one type of income would be taken into account.

The relative median income ranges from 60.2 for Estonia to 100 for Greece, France, Hungary, Italy, Luxemburg and Spain (for some countries the upper boundary of 100 was enforced for this indicator as the ratio exceeded this value).

The "**No poverty risk**" indicator is the reverse for the classical poverty risk indicator, calculated as a share of people aged 65 years and older, whose equivalised disposable income is below the at-risk-of-poverty threshold, which is set at 50 per cent of the national median equivalised disposable income, meaning extreme poverty risk. As with the previous indicator, a person's disposable income is calculated as a part of household disposable income not taking into account the real distribution of funds within the household. The indicator is also relative, since it depends on the overall situation with the level of income in the country or region.

If data are not available, an indicator "Proportion of people aged 60+ living in households where the equivalised income/consumption is below the poverty line threshold of 50 per cent of the national equivalised median income/consumption (equivalising factor is the square root of household size)" of the AgeWatch Index[25] could serve as a remote proxy, or at least point to data sources.

The indicator value ranges from 77.1 in Latvia to 98.6 in Denmark.

The indicator "**No severe material deprivation**" shows the proportion of individuals aged 65+ who can afford certain goods considered by most people necessary (to pay their rent, mortgage or utility bills; to keep their home adequately warm; to face unexpected expenses; to eat meat or proteins regularly; to go on holiday; to have a television set; a washing machine; a car; a

[24] http://www.oecd.org/eco/growth/OECD-Note-EquivalenceScales.pdf.
[25] http://www.helpage.org/global-agewatch.

telephone). Severe material deprivation refers to a state of economic and durable strain, defined as the enforced inability (rather than the choice not to do so) to afford at least four out of the nine above-mentioned items. National methodology and signs of deprivation could be used for inside-country monitoring.

Examples of possible alternative variables

Proxy	Survey question	Answer categories	Impact of the proxy use
Combination of related questions about household	Did you have any occasions during the 12 months preceding survey when your household couldn't pay for… To pay their rent, mortgage or utility bills Could your household afford… To keep their home adequately warm If we talk about total household income, how easy do you make both ends meet? Could your household afford… To go on holiday every year; To eat meat, chicken or fish at least every other day. Does your household have — or want to have — the following items in your household? A television set; A washing machine; A domestic or foreign car; A mobile telephone GGS (2011)	Yes/**No** **Yes**/No Very difficult Difficult Slightly difficult **Rather easy** **Easy** **Very easy** **Yes**/No **Yes, your household has** Your household wants to have but can't afford **Your household doesn't have for other reasons**	The definition of severe material deprivation is the same as in European methodology, 5 regarded as sign of material deprivation. The proxy is very close to the original, but not fully comparable.
General level of household living	How would you rate your current standard of living? DEAS (Germany)	**Very good** **Good** Average Bad Very bad	Proxy corresponds more to the general standard of living then to enforced inability to afford basic goods. Impact is difficult to assess.
	Which of the descriptions on this card comes closest to how you feel about your household's income nowadays? ESS	**Living comfortably on present income** **Coping on present income** Finding it difficult to live on present income Finding it very difficult to live on present income	

The results for EU-28 vary from 62.5 in Bulgaria to 99.8 in Luxemburg. The median EU-28 value is 95.6. Men are on average more financially secured by all financial indicators.

The "**Physical safety**" indicator measures if older persons feel (very) safe in their local area using the question from the European Social Survey (ESS): How safe do you — or would you — feel walking alone in this area after dark? The question is not only about crime and hazard level but the overall safety of the environment including illumination level, quality of sidewalks etc.

Examples of possible alternative variables

Proxy	Survey question	Answer categories	Impact of the proxy use
Different scale	If you think of your home and living environment, which of the following statements would apply to you? I do not feel safe on the streets after dark DEAS (Germany)	Strongly agree Agree **Disagree** **Strongly disagree**	Connections with the original scale are not direct, but proxy is quite close to the original.
Crime estimations	Share of people aged 65+ who are not worried about being physically attacked Georgian crime survey (Georgia)		Estimates only certain aspects of safety perception, thus the results would be overreported.
	Have you or a member of your household been the victim of a burglary or assault in the last five years? ESS	Yes **No**	
	Vandalism or crime is a big problem in this area? SHARE	Strongly agree Agree **Disagree** **Strongly disagree**	
Satisfaction with safety	To what extent are you satisfied with safety in your town, city of residence? SD (Poland)	**Very satisfied** **Satisfied** **Rather satisfied** Rather not satisfied Not satisfied Not satisfied at all	Satisfaction couldn't be directly interpreted in term of safety.
	Percentage of people aged 50+ who feel safe walking alone at night in the city or area where they live Gallup WorldPoll		The sample size and quality of the survey procedure require additional assessment 50+ instead of 55+

Physical safety ranges from 39.9 in Latvia to 91.7 in Slovenia; the median value is 75.4. As expected, women feel much more vulnerable in all EU countries — the average gender gap is 16 points.

The "**Lifelong learning**" indicator measures attendance by people aged 55 to 74 in courses, seminars, conferences or private lessons within or outside the regular education system during the last four weeks preceding the survey, including both private and work-related purposes. Lifelong learning updates existing educational capital, provides added value for the labour market and builds new social connections.

The original indicator is calculated on the basis of the EU Labour Force Survey (EU-LFS). For non-EU countries it can be obtained from national LFS, general social surveys, Time Use Surveys or special surveys, e.g. Sample survey of population participation in lifelong learning (the Russian Federation). For this indicator, information should be collected on all types of education or training regardless of its relevance to the respondent's current or possible future job. This includes formal and non-formal education and training.

Examples of possible alternative variables

Proxy	Survey question	Answer categories	Impact of the proxy use
Time period differs from the original	Did you take — or do you take — professional courses, training programs or any other courses including language courses, training in the workplace during the 12 months preceding survey? RLMS (the Russian Federation)	**Yes** No	Despite significant difference in timing — "within 12 months" and "now", the results for the Russian Federation on these questions appeared to be quite close, but the sensitivity of questions should be checked for each individual country.
	Do you take part in any courses or other kinds of additional education? CMLC (the Russian Federation)	**Yes** No	
	During the last 12 months, have you taken any course or attended any lecture or conference to improve your knowledge or skills for work? ESS	**Yes** No	The indicator is expected to be overreported.
	Which of the activities listed on this card — if any — have you done in the past 12 months? SHARE	**Attended an educational or training course**	
	During the last two years has this person participated in any activity aimed at gaining new professional qualification or other skills SD (Poland)	**Yes** No	

Lifelong learning indicator in EU-28 is rather low with the median value of 3.2, ranging from 0.2 in Croatia to 19.3 in Denmark. Women are more active in updating their knowledge and skills in all countries except Luxembourg.

2.3.4. Capacity and enabling environment for active ageing domain

The fourth domain "Capacity for active ageing" measures substantive opportunities and empowerment to enhance active and healthy ageing. It incorporates human assets (remaining life expectancy), health capital (in terms of absence of limitations to everyday activities and mental

well-being) and human capital (educational attainment, Internet use, social connectedness). The first three domains refer to actual experience of the current generation of independent, autonomous, socially and economically active and secure lives. The fourth domain captures the factors that can facilitate or hinder gaining this experience. It is the capital that can be mobilized through social policies to achieve higher results in the firth three domains.

To calculate the indicator on **Proportion of life expectancy achievement in the target of 105 years of life expectancy**, the life expectancy at age 55 is divided by 50 and multiplied 100. It is necessary to convert the indicator into a positive coefficient. The indicator shows available human assets, the foundation on which you can put various bricks of active ageing, as no active ageing is possible without an opportunity to live long enough. The indicator can be obtained from life tables and age-specific mortality rates, published by national statistical offices. Sometimes it's published only disaggregated by sex and needs recalculation for total population. For many countries the Human Mortality Database can be used as a source of data. If estimations of life expectancy for subpopulations are necessary it could be done based on longitudinal surveys with sufficient samples using regression modelling.

The results for EU-28 differ from 47 for Bulgaria to 60.4 for Spain with the median value of 56.9, i.e. for half of EU countries the life expectancy at the age of 55 is at least 28.5 years. Women tend to live longer, with an average difference of 9 points.

The "**Share of healthy life years in the remaining life expectancy at age 55**" indicator captures the share of years spent in good health in the remaining life expectancy. Thus, expected years of good health at 55 are divided by remaining life expectancy at age 55 used for calculations of the previous indicator. Quantity of years does not mean their quality which can be reduced due to illnesses. Healthy Life Years (HLY) are measured as the remaining number of years spent free of activity limitation caused by health problems. Originally the indicator is calculated with the data from the European Health and Life Expectancy Information System (EHLEIS), using the SILC question "Self-perceived long-standing limitations in usual activities due to health problem".

If the indicator cannot be obtained from annual state demographic statistics, it can be calculated using life table and information from social surveys using the Sullivan method.[26] To calculate an average healthy life expectancy, we need some index π expressing either the average fraction of a year during which persons of that age group are free of disability or the proportion of healthy people in that age group. This information can be drawn from social surveys.

Examples of possible alternative variables

Proxy	Survey question	Answer categories	Impact of the proxy use
Direct question on limitations	Are you hampered in your daily activities in any way by any longstanding illness, disability, infirmity or mental health problem? ESS	Yes, a lot Yes, to some extent **No**	The difference between "yes, a lot" and "yes to some extent" depends among other things on enabling environment and mentality of the respondent.

[26] A Single Index of Mortality and Morbidity Daniel F. Sullivan SMHA Health Reports, Vol. 86, No. 4 (Apr., 1971), pp. 347–354 (please see http://www.eurohex.eu/pdf/Sullivan_guide_pre%20final_oct%202014.pdf for details).

Proxy	Survey question	Answer categories	Impact of the proxy use
	To what extent are you permanently restricted by illness in carrying out your everyday work? German Survey on Volunteering (FWS):	**Not restricted** **Have no illness** Severely restricted Somewhat restricted	Close to the original idea.
	Difficulty with any of listed activities that influences their daily life 1) Seeing 2) Hearing 3) Walking or climbing steps 4) Remembering or concentrating 5) Communicating 6) Self-care Population census (Georgia)		Could be used for national index, comparability with the EU results needs to be additionally checked.
Self-assessment of health status	In general, how would you assess your health? CMCL (the Russian Federation), Household Budget Survey (the Republic of Moldova), ESS, SHARE	**Very good** **Good** Fair Bad Very bad	The wording of the question does not give an understanding of to what extent the daily activities of older people are limited because of bad health. Classifying "fair" health as poor or good is to be decided upon by users depending on the context.
Number of chronic conditions	Do you have heart diseases? Do you have lung diseases? Do you have liver diseases? Do you have kidney diseases? Do you have diseases of the gastrointestinal tract? Do you have spine diseases? etc. RLMS (the Russian Federation)	To calculate the indicator the limiting factor can be taken as the presence of 2 or more diseases, while all diseases are assessed as equally limiting the everyday life	The connection between the number of diseases and the limitation of daily activity is not unambiguous. Not all kind of chronic diseases limit daily activity equally. The effect on the indicator is not possible to predict.
Presence of long standing illness or health problem	Do you have any long-standing illness or health problem? Please look at the following list: has a doctor ever told you that you are suffering from one of the illnesses listed? DEAS (Germany)	**No** Yes, one Yes, several	
Data on Global Burden of Disease	World Health Organisation		The attention should be paid to how strong the impact is of a given disease on daily activities of a person.
Having a disability status	National health statistics		May underestimate the value depending on the procedure for obtaining a disability status.

The proportion of healthy people with no significant limitations for each age group is multiplied by the number of person-years lived in the interval resulting in the number of healthy person-years lived in the interval. The life table is then recalculated taking into account this new variable. For national monitoring the simple indicator of the proportion of healthy (in terms of proxies suggested above) people aged 55+ can be used.

As an alternative source of information Global Burden of Disease Study 2016[27] of the Institute for Health Metrics and Evaluation can be considered. Calculations are based on estimates of the prevalence of 2,337 sequelae by age, sex, country and year; and disability weights for 235 unique health states that collectively cover the range of functional health losses and symptoms associated with the 2,337 sequelae. However, data sources for calculation require additional verification.

Share of healthy life years in the remaining life expectancy at age 55 varies from 35.7 for Latvia to 79.7 for Sweden with the median 54.1 which is equal to 15.4 years of expected disability-free life. But a careful qualitative interpretation is needed as the peculiarities of mortality patterns can bias the results. For example, due to high level of early mortality of the Russian population, the share of healthy life years in the remaining life expectancy exceeds the values of all EU countries, but should not be misinterpreted: it does not indicate Russia's success in this dimension and will fall with the rise of general life expectancy. Women in all EU countries have a lower proportion of healthy life expectancy in general life expectancy at the age of 55, meaning that they are living longer but experiencing limitations in their daily activities.

The "**Mental well-being**" indicator measures self-reported feelings of positive moods and spirits. This indicator is derived from the EQLS using WHO-5 questionnaire and ICD-10 measurement model. Five survey questions, capturing the subjective feelings over the last two weeks form a composite measure of mental well-being. The original WHO-5 questionnaire has the following wording: I have felt cheerful and in good spirits; I have felt calm and relaxed; I have felt active and vigorous; I woke up feeling fresh and rested; My daily life has been filled with things that interest me. Response categories of each of these five survey questions are: All of the time (5); Most of the time (4); More than half of the time (3); Less than half of the time (2); Some of the time (1); At no time (0). The total indicator is a sum of the figures given in brackets above, thus it ranges from 0 to 25, where 25 means that a person had a positive life experience all of the time during the last two weeks.

According to the WHO, a raw score below 13 indicates poor mental well-being and is an indication of depression under the Major Depression (ICD-10) Inventory.[28]

Examples of possible alternative variables

Proxy	Survey question	Answer categories	Impact of the proxy use
Recalculation of the indicator, using the same method but different questions	ESS-2012: a) ...you were happy? b) ...you felt calm and peaceful? c) ...you had a lot of energy? d) …your sleep was restless? (reversed) e) …you enjoyed life? Response categories of each of these five survey questions are:		Proxies are quite close to the original, comparability needs verification for each country.

[27] http://ghdx.healthdata.org/gbd-2016
[28] See http://www.who-5.org/ for more details.

Proxy	Survey question	Answer categories	Impact of the proxy use
	None or almost none of the time Some of the time Most of the time All or almost all of the time The raw scores are calculated by assigning values to the response options: from 0 for "none or almost none of the time" to 3 for "all or almost all of the time", except for the issue d) "your sleep was restless?", for which a reverse scale is used. The presence of depression was defined for respondents with the integrated score below 8. ESS-2014 — using the same methodology, but with 3 different subquestions: a) ...you were happy? b) ...you felt depressed? (reversed) c) ...you couldn't get going? (reversed) d) …your sleep was restless? (reversed) e) …you enjoyed life?		
	N. 0. I think that I don't look worse than I used to. 1. I am worried because I look old or unattractive. 2. I feel that I look worse than I used to. 3. I am sure that I look terrible. O. 0. I have as much energy as ever to work. 1. I find it hard to get to doing anything at all. 2. It is extremely hard for me to get to doing anything at all. 3. I'm not able to do anything. P. 0. I sleep at least as well as I used to. 1. I do not sleep as well as I used to 2. In the morning, I wake up 1–2 hours earlier and find it difficult to fall asleep again. 3. I wake up several hours too early and I can't get back to sleep. Q. 0. I am no more tired or fatigued than usual 1. I get tired or fatigued more easily than usual 2. Almost everything I do makes me tired. 3. I am too tired to do anything. R. 0. I have not experienced any change in my appetite. 1. My appetite is somewhat less than it used to. 2. My appetite is much less than before 3. I have no appetite at all T. 0. I am not worried about my health any more than I used to be 1. I am worried about such ailments as: stomach pains, upset stomach, or constipation 2. I am very worried about my health; I think about it constantly 3. My health condition is so worrying that I cannot think of anything else.		

Proxy	Survey question	Answer categories	Impact of the proxy use
	U. 0. I have not noticed any recent change in my interest in sex 1. I am less interested in sex than I used to be 2. I am much less interested in sex now 3. I have lost interest in sex completely Respondents, who are contented with at least five mentioned areas of their life out of seven are marked as being in positive mental well-being. SD (Poland)		
	GGS contains a question on the following feelings during the previous week: (1) felt that could not shake off the blues even with help from family or friends, (2) felt depressed, (3) thought that life had been a failure, (4) felt fearful, (5) felt lonely, (6) had crying spells, (7) felt sad		
	DEAS (Germany): Below is a list of the ways you might have felt or behaved. Please tell me how often you have felt this way during the past week: I was bothered by things that usually don' bother me (A), I felt that I could not shake off the blues even with help from my family or friends (B), I had trouble keeping my mind on what I was doing (C), I felt depressed (D), I felt that everything I did was an effort (E), I thought my life had been a failure (F), I felt fearful (G), My sleep was restless (H), I was happy (J), I talked less than usual (K), I felt lonely (L), I enjoyed life (M), I felt sad (N), I felt that people dislike me (O), I could not get "going" (P)	Rarely or none of the time (less than 1 day) Some or a little bit of the time (for 1 to 2 days) Occasionally or a moderate amount of time (for 3 to 4 days) Most or all of the time (for 5 to 7 days)	
Life satisfaction, level of overall happiness	How satisfied are you with your life as a whole nowadays? RLMS (the Russian Federation), ESS, Life Satisfaction Survey, EBRD and World Bank How happy are you? ESS	**Fully satisfied** **Rather satisfied** Yes, and no Not very satisfied Not at all satisfied or a Scale 1–10 (**6 and above**) Scale 1–10 (**6 and above**)	The wording is too general, it is necessary to carry out additional studies to select the thresholds, as subjective self-assessments depend on cultural national characteristics.
Number of people first time diagnosed with depression	Annual statistics of health care		Underestimates the variable, as in the original question the subjective evaluation is used.

Mental well-being value ranges from 45.9 for Romania to 87.4 for Finland with the median value of 67, indicating that in 14 EU countries more than 67 per cent of people aged 55+ are in the situation of "good" mental well-being.

The "**Use of ICT**" indicator is designed to estimate the degree to which older people's environments enable them to connect with others with the help of information and communication technologies. It measures the share of people aged 55–74 using the Internet at least once a week (in the last 3 months). The upper boundary is determined by characteristics of its source — the annual questionnaire on ICT (Information and Communication Technologies) usage in households and by individuals (Eurostat). Information can be obtained from the special ICT surveys or any other relevant household living conditions survey.

The share of active Internet users in the age group 55–74 differs from 24 for Romania to 91 for Luxembourg. The median is 50 meaning that in half of the EU countries more than half of the population use the Internet at least once a week. Men are more active at using the Internet than women except for in six countries.

Examples of possible alternative variables

Proxy	Survey question	Answer categories	Impact of the proxy use
With different scale of answers or time period	How often do you use the Internet? CMLC (the Russian Federation)	**All the time (more than once per week)** From time to time Do not use	Once a week is not included in counting, thus can lead to slight underreporting.
The intensity of use is not taken into account	During the past 7 days, have you used the Internet, for e-mailing, searching for information, making purchases, or for any other purpose at least once? SHARE	**Yes** No	The value would be lower than with the original question.
	Did you use the Internet during the past 12 months? RLMS (the Russian Federation)	**Yes** No	High probability of overreporting, as a long time period is combined with missing frequency.
	Do you use the Internet? SD (Poland)		
Availability of Internet access	Does the household have an Internet access from the home desktop computer, laptop or mobile phone? SD (Poland)	**Yes** No	Reflects having a possibility to use the Internet, but does not take into account the actual usage or the adequacy of skills for Internet communication, thus leading to overreporting.
Percentage of people aged 55+, who communicate using the computer	Time spent on communication using the computer should be mentioned in the diary to meet the goal of the indicator		Only activities carried out during two random days could be monitored — it is recommended to consider the adequate usage if communication activities are recorded in the diary on both surveyed days.

The "**Social connectedness**" indicator measures contacts outside the household which occur by choice. Being a key element of an active and fulfilling life, it is also vital to both mental and physical health. The indicator measures the share of people aged 55 or above who meet socially with friends, relatives or colleagues at least once a week. "Meet socially" implies meeting by choice, rather than for reasons of either work or pure duty. Indicator could be correlated with household size (negatively in case the majority of relatives are living together), age-friendly environment and health status. The original question is taken from the ESS, and a similar question can be found in EQLS.

Social connectedness differs from 17.3 for Hungary to 73.8 for Portugal with the EU median of 53.9. It means that in 14 EU countries more than half of the population aged 55 and above meet with friends and relatives at least once a week. Women are on average more socially active, but in 14 EU countries men show higher results.

Examples of possible alternative variables

Proxy	Survey question	Answer categories	Impact of the proxy use
Face-to-face contact	On average, how often do you have direct face-to-face contact with the following people living outside your household? Any family members or relatives (only in 2016) Any of your friends or neighbours EQLS	**Every day or almost every day** **At least once a week** One to three times a month Less often Never	Proxy is very close to the original.
Phone or e-mail contacts included	Meet socially or talk by phone with friends at least once a week Social Survey (Israel)		The result is expected to be much higher than if only contacts in person are included.
	During the past twelve months, how often did you have contact with {…}, either personally, by phone, mail, email or any other electronic means? SHARE	**Daily** **Several times a week** **About once a week** About every two weeks About once a month Less than once a month Never	
Restriction on place of contacts or social group	How often do you visit friends and acquaintances or invite them over to your home? DEAS (Germany)	**Daily** **Several times a week** **Once a week** 1–3 times a month Less often Never	Relatives are not included; meetings only at respondents' or their friends' homes, which would result in underreporting.
	In the last month, how many times have you gone to: cinema, theatre, concert, restaurant, cafe, pub, meeting with friends. SD (Poland)	All respondents who stated at least four social meetings were marked as "socially connected"	Relatives are not included, although meeting with them can be as socially significant as with other categories. The effect of use is difficult to estimate as it depends on the cultural patterns and availability of social activities, but on average it is expected to overstate the indicator's value.

Proxy	Survey question	Answer categories	Impact of the proxy use
Percentage of people aged 55+, who are engaged in social activity	Time spent being engaged in any following activities outside the household: visits or (and) hosting guests; parties; theatre, cinema and concerts; travel related to social life Time Use Survey (the Republic of Moldova) Time spent on social activities with somebody outside of the household Time Use Survey (Serbia)		Only activities carried out during two random days could be monitored — it is recommended to consider positive social contacts if listed activities are shown at least in one of the days of the survey The effect of use is not possible to estimate.
Social life and entertainment	Other questions about the frequency of visits to cinema, theatre, concert, restaurant, cafe, pub		Could be used if no other alternatives are found, but reflects different type of activity.
Social capital	From whom would you get support in each of the following situations? **If you needed help around the house being ill** **If you needed advice about a serious personal or family matter** If you needed help when looking for a job **If you were feeling a bit depressed and wanting someone to talk to** If you needed to urgently raise [1/12 of annual national at-risk-of-poverty threshold] to face an emergency EQLS	**A member of your family / relative** **A friend, neighbour, or someone else, who does not belong to your family or relatives** A service provider, institution or organisation Nobody	Reflects the social capital of older people that can be used in emergency difficult life situation, although the value is difficult to compare to the original wording.

The "**Educational attainment of older persons**" indicator measures percentage of older persons aged 55–74 with upper secondary or tertiary educational attainment (ISCED scale). Relatively high educational attainment should reflect the acquisition of key competences in the form of knowledge, skills and attitudes, that provide added value for social cohesion and active citizenship by offering flexibility and adaptability, satisfaction and motivation. However, it partly reflects the accessibility of higher levels of education 30–50 years ago and the educational gender gap.

The original question is taken from the EU Labour Force Survey, but data could also be obtained from censuses and social surveys, using the question that describes the highest obtained level of education and the ISCED scale.

There is a significant gap in educational attainment of older persons in EU countries — from 20.6 per cent of people with upper secondary education and higher in Portugal to 88.8 per cent in Lithuania. The median value is 70.5. Results for women exceed those for men in only four countries, which is connected with the historical peculiarities of access to education.

3. Proxies, methodological adjustments and interpretation of the results

To calculate the AAI, one needs to have a clear understanding of the goals and objectives for which the index will be used.

If the goal is international comparison, it is necessary to follow the original methodology as accurately as possible, including the weighting of the indicators and operations with missing values. Studies should seek to provide an indication of the level of comparability and factors which should be taken into account when comparing AAIs calculated in an alternative way.

If the index is calculated for the purposes of development / monitoring of local policies and some adjustments are made, it should nonetheless preserve its global meaning, the definitions of the domains, and rationale behind the indicators. The methodology and data sources can be adjusted as long as the indicators and data sources meet the criteria of relevance, replicability, accuracy and comparability (if the AAI is calculated for several territorial entities). In this case the keystone would be to maintain a consistent methodology through the years and to provide a detailed description of the changes made. In addition, attention needs to be paid to choosing the most relevant survey years, taking note of which indicators are updated and which are not from one AAI wave to the next.

3.1. Missing variables and values

If one (or more) of the indicators is not available and no suitable proxies are identified, a reweighting procedure, as in the original methodology, could be used. The total sum of weights within domains is reduced by the weight of the missing indicator. Technically it means implicit imputation — an average value of other indicators for a given country for the missing value is used, which could lead to a distortion. Therefore, comparisons could be limited to reweighed areas (countries, regions). When a reweighed region is compared to a region where the AAI is computed on a full range of indicators, the latter is also recommended to be computed "reweighed" to assess the comparison.

Missing values and answer options such as "Refusal to answer" or "No answer" further complicate the calculation. "No answer" should be clearly distinguished from the "Do not know" answer. It is important that the missing values are not substantial. This needs to be assessed with regard to the missing values, their weight and their variability. While comparing a region with another, what matters is the variability of the missing value (expressed as standard error) times its weight. The variability of the missing indicator can be approximated by the observed variability in regions/countries where it is available. The AAI difference between the two regions must be compared to the impact as measured above (weight times variability, expressed in standard error or equivalent unit).

When more than one indicator is missing, calculations become trickier as the AAI is defined expecting a high level of co-variability between indicators; as such, the possible variations in the impact of the missing indicators cannot be reasonably approximated by the sum of their standard errors. Here some reasoning may be necessary, short of a full-fledged computation that can be intensive.

Missing values could also be restored through regression modelling or as a median of the neighbouring observations. An alternative option is to replace the missing values with the average arithmetic or median, but this distorts the distribution of the investigated factor. It must

be considered that these methods introduce complexity in the calculation and that assessing their impact on the AAI comparison, for instance to assess whether observed differences are not due to the missing values, may become arduous. Instructions in the source surveys should be additionally analysed to identify the source of missing values, their characteristics, and proposed strategies for working with them.

Addressing the undefined answers "Don't know" or "Difficult to answer" is built on a similar principle as for the missing values, unless the undefined answers are not substantial.

If the international comparability is not the goal, any method of treating missing values from the discussed above can be used. In the original AAI, missing values are not explicitly imputed to raise credibility and comparability across space and over time.

3.2. Use of proxies

If one (or more) indicator is replaced by a proxy, the comparison would be more or less limited, depending on the degree of differences between the proxy and the original question. If the survey is international, then the accuracy of the proxy can be checked by calculating the proxy values for the countries already participating in the AAI and comparing the results with the original ones. In other cases, decisions can be made based on experts' opinions.

The problem opposite to the absence of necessary data is its diversity, when more than one proxy for the indicator can be calculated and none of them are close enough to the original. There could be two main strategies in such a case.

The first — to select one that is derived from a more reliable survey with a bigger sample and available for more years. The second way is to combine several proxies of one indicator into a single number. This measure can be more reliable than each source taken separately.

The second method was applied by a research team of the Institute of Gerontology at the Technical University of Dortmund in a research study dedicated to the AAI at a local level in Germany (UNECE, 2016). In that case the data from several surveys were used also to increase case numbers at a local level. A higher weight was given to surveys with higher numbers of respondents, but this relationship was not linear.[29] Also, the factor weighting to the lowest mean was implemented to assure proper relation of proxies. In all the other aspects the original AAI methodology was followed.

To apply the second method, different questions from a selected set of surveys need to be put onto the same scale before they can be combined; it may not be easy to do so. This method hinders clear interpretation of the results as combined indicators cannot be directly interpreted, but at the same time it incorporates better scientific balance and objectivity into the model.

In any case, the quality of the indicators used should be evaluated and described.

3.3. Analysis of results

To correctly interpret the AAI results, one needs to remember that the AAI does not measure level of well-being or happiness of older persons as such, but the extent of realisation of older persons' potential. Thus, normative judgement should be avoided at all levels of disaggregation

[29] Assuming that the surveys are separate, the weights should be roughly (inversely) proportional to the computed standard deviations, i.e., to the square root of the sample sizes.

starting from single indicators to the total index: higher means more active, not "better". As it was already mentioned in the methodological section, the AAI uses outcome indicators and not process indicators or descriptive information about institutional arrangements. This means the index shows the situation of the current generation of people aged 55 and older, being partly the consequence of the environment supporting or restraining this activity.

Domain results point to areas where a given territorial entity is falling short and also shows the gap between the real experience of active ageing and the capabilities to it. The results calculated for selected groups (defined by sex/gender, income, education, place of living etc.) help to identify inequalities and population categories that are more disadvantaged. Gender and socio-economic inequalities in realizing the potential are present in the results of all countries, but the difference appears to be more substantial in countries with lower overall AAI results. Inequalities are often accumulated throughout the life course and calculating the AAI by education and socio-economic level or by area of living help to define vulnerable groups and take political steps at earlier stages of life cycle.

The AAI points to problematic areas, but does not provide the policy advice per se or indications to specific policy measures. Nor does it reveal the reasons that led to the obtained results. The index provides the quantitative evidence of active ageing and needs to be supplemented by additional qualitative contextual research and analysis to reveal underlying processes.

While comparing results across countries, it is important to keep in mind their social and economic contexts (e.g. indicators for general population, type of welfare state etc.), including differences in the age and sex structure of population. The AAI methodology has no adjustment to correct for such differences, while they, inter alia, influence the abilities for contributing to society. For example, the Russian Federation's high early mortality rate means that the population is younger than the population of many European countries. Furthermore, the age structure of the older population is shifted toward the younger ages. The gender disparity is also significant. Higher proportions of younger elderly and more females in the population theoretically give the Russian Federation a capacity for higher indicators of active participation in social life and healthy living, as the potential for active ageing naturally decreases with age and women are more active in social participation.

The presentation of trends in the AAI results needs to be supported by an indicator-by-indicator analysis of the changes and the contribution of each indicator to the index. Depending on the case, some contextual information might be needed while presenting AAI results (e.g. employment domain results accompanied by the information on the overall employment level in the country/region) or local policy review and the goals of the social policy in place (e.g. universal coverage by institutional social care). It is important not just to look at a single indicator but to analyse it in its linkage to the others, since different spheres of active ageing are closely connected with each other and have a multidirectional influence.

The relative position of a country (ranking) is not a priority in the AAI interpretation. In the original methodology only changes of about 3 percentage points and over are considered significant, which often is more than the difference in AAI values between countries ranked next to each other. Nevertheless, ranking allows for better visualization of the results and draws attention of general public and policymakers to the issues of active ageing and its practical implementation.

One of the key steps in analysing the AAI results is setting targets or goalposts, since 100 points is not the target to be achieved. One way of defining a goalpost is to use maximum values of each indicator for men and women over a given period of time to calculate domain scores and the overall AAI. These goalposts are not stable and distance to them cannot be regarded as a measure of progress. Each user could establish their own reasonable targets, depending on policy objectives, planning horizon, and available resources. Fixed goalposts provide the advantage of comparability over time and are recommended for policy purposes. The AAI results could be compared with:

- the highest AAI in the area or over a given time period,
- mean or median of AAI results of a country (in case of subnational calculations) or a group of countries/region (in case of cross-country comparison),
- results of a neighbouring country or a country with a similar level of socio-economic development,
- an expert opinion that takes into account the speed of potential changes of this indicator in the conditions of a given country,
- proportionally defined goal (e.g. +25 per cent to the results of a base year).

4. Robustness of the AAI in non-optimal cases

Building a composite index requires carrying out multivariate analysis as well as assessment of the index robustness. The original AAI is calculated using a multi-base approach, thus correlations between indicators could not be checked directly, but if the index is relying on a single database, multicollinearity check is highly recommended.

Uncertainty analysis shows how much our decisions regarding the structure of the index, the weighting method, the imputation method and normalization techniques affect the resulting values of the index. This implies gaining an understanding of how these choices may affect the AAI score. This can be done in several ways.

The first way is to assess the potential impact of using alternative sources based on each indicator's average value, variability, and weight. In simple cases, concerning replacing only one or 2–3 indicators with low weights, this may be sufficient. In general, and in view of the close relationship between the indicators (and their proxies) in the AAI, this approach may be insufficient.

For a more complete assessment of the impact of using alternative methodologies we need a series of simulations (usually using the Monte Carlo method) with pre-determined choices. The sensitivity analysis summarizes the effect of all the choices and shows their contribution to the final value. A detailed description of the robustness analysis procedures can be found in “Sensitivity Analysis in Practice: A Guide to Assessing Scientific Models” by Andrea Saltelli and others (Saltelli, 2014).

To test the robustness of the AAI for non-EU countries or at a subnational level, the following approaches could be recommended:

- estimation and the evaluation of the indicators in dynamics,

- calculation of the indicators based on different data sources and comparison of the ranking results and obtained values,
- computation of proxy indicators for the EU-28 countries and comparison of discrepancies with the original results.

Conclusion

The AAI is a stable and easy-to-use tool for carrying out comparisons at national and subnational levels, observing active ageing trends over time and monitoring implementation of active ageing measures and policies. Any adjustments to the original methodology hinder international comparability (unless such adjustments are performed also for the other countries intended for comparison), but provide a powerful method for comparisons among localities and analysis of trends within given territorial entities as long as they ensure consistency of the indicators through time and across population groups that are compared.

The AAI shows potential for improvements in four spheres of active ageing and can be used to demonstrate how the situation progresses over time. It provides the quantitative evidence required for policy measures, informs advocacy work and helps formulate policy responses and persuade the public about the need for change and the benefits of it. Calculation of the AAI for population subgroups defined by different characteristics such as level of education, type of living area, socio-economic status and other, is a useful political tool that directs economic and social resources to the groups with the highest unrealized potential. The AAI serves as a conceptual framework for active ageing policies at all levels — from supranational to individual.

The process of adaptation of the AAI in non-EU countries and at subnational levels includes the following steps: setting a goal and defining the methodological track, analysing data availability and its quality, identifying data gaps, selecting proxies, choosing a strategy for missing values and proxy interpretation. Robustness and sensitivity analyses of composite indicators should also be provided and well as the detailed and transparent description of all the deviations from the original methodology and their rationale and consequences. Results of these need to be integrated into the dissemination, as potential users need to be aware of the quality of the data and the reliability of the comparisons.

Adequate target values and goalposts that take into account the context prevent normative interpretation of the AAI results and make the index an efficient tool to shape or adapt active ageing policies as well as to monitor their implementation. Thus, the AAI provides the quantitative evidence required to operationalize the multidimensional concept of active ageing and introduce social policy reforms.

The AAI provides accurate, accessible and readily communicable information on the realization of the potential of the older population, reveals gaps in statistics, invites attention to the challenges of population ageing with a focus on older people's potential being an asset for the societal progress, stimulates dialogue between politicians, researchers, NGOs and the rest of the society and helps to create age-friendly environments that aim to empower older citizens and build a society for all ages.

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Annex 1. Original wording of the AAI indicators[30]

Indicator	Survey question(s)
1.1 – 1.4 Employment rate, for the age groups 55–59, 60–64, 65–69, 70–74	Did you do any paid work in the 7 days ending Sunday the [date], either as an employee or as self-employed? **1. Yes** 2. No Even though you were not doing paid work, did you have a job or a business that you were away from in the weekdays ending Sunday the [date] (and that you expect to return to)? **1. Yes** 2. No 3. Waiting to take up a new job/business already obtained EU-LFS
2.1 Voluntary activity, 55+	Please look carefully at the list of organizations and tell us, how often did you do unpaid voluntary work through the following organizations in the last 12 months? a. Community and social services (e.g. organizations helping the elderly, young people, disabled or other people in need). b. Educational, cultural, sports or professional associations c. Social movements (for example environmental, human rights) or charities (for example fundraising, campaigning) e. Other voluntary organizations 1. **Every week** 2. Every month 3. Less often/occasionally 4. Not at all EQLS
2.2 Care to children, grandchildren, 55+	In general, how often are you involved in any of the following activities outside of paid work? a. Caring for and/or educating your children b. Caring for and/or educating your grandchildren **1. Every day** **2. Several days a week** **3. Once or twice a week** 4. Less often 5. Never EQLS
2.3 Care to infirm and disabled, 55+	In general, how often are you involved in any of the following activities outside of paid work? d. Caring for disabled or infirm family members, neighbours or friends under 75 years old e. Caring for disabled or infirm family members, neighbours or friends aged 75 or over **1. Every day** **2. Several days a week** **3. Once or twice a week** 4. Less often 5. Never EQLS
2.4 Political participation, 55+	Over the last 12 months, have you …? a. Attended a meeting of a trade union, a political party or political action group b. Attended a protest or demonstration c. Signed a petition, including an e-mail or on-line petition d. Contacted a politician or public official (other than routine contact arising from use of public services) **1. Yes** 2. No EQLS

[30] https://statswiki.unece.org/display/AAI/V.+Methodology

Indicator	Survey question(s)
3.1 Physical exercise, 55+	Percentage of people aged 55 years and older undertaking physical exercise or sport almost every day Take part in sports or physical exercise / How frequently do you do each of the following? **1. Every day or almost every day** 2. At least once a week 3. One to three times a month 4. Less often EQLS
3.2 Access to health and dental care, 55+	Percentage of people aged 55 years and older who report no unmet need for medical or dental examination or treatment during the 12 months preceding the survey EU-SILC
3.3 Independent living arrangements, 75+	Percentage of people aged 75 years and older who live in a single person household or who live as a couple (2 adults with no dependent children) EU-SILC
3.4 Relative median income, 65+	The relative median income ratio is defined as the ratio of the median equivalised disposable income of people aged 65 and above to the median equivalised disposable income of those aged below 65. Household disposable income is established by summing up all monetary incomes received from any source by each member of the household (including income from work, investment and social benefits) — plus income received at the household level — and deducting taxes and social contributions paid. In order to reflect differences in household size and composition, this total is divided by the number of 'equivalent adults' using a standard (equivalence) scale, the so-called 'modified OECD' scale, which attributes a weight of 1 to the first adult in the household, a weight of 0.5 to each subsequent member of the household aged 14 and over, and a weight of 0.3 to household members aged less than 14. The resulting figure is called equivalised disposable income and is attributed to each member of the household. EU-SILC
3.5 No poverty risk, 65+	Percentage of people aged 65 years and older who are not at risk of poverty People at risk of poverty are defined as those with equivalised disposable income after social transfers below the at-risk-of-poverty threshold, which is set at 50 per cent of the national median equalized disposable income after social transfers EU-SILC 2010, 2012
3.6 No severe material deprivation, 65+	Percentage of people aged 65 years and older who are not severely materially deprived. Severe material deprivation refers to a state of economic and durable strain, defined as the enforced inability (rather than the choice not to do so) to afford at least four out of the following nine items: 1. To pay their rent, mortgage or utility bills 2. To keep their home adequately warm 3. To face unexpected expenses 4. To eat meat or proteins regularly 5. To go on holiday 6. A television set 7. A washing machine 8. A car 9. A telephone EU-SILC
3.7 Physical safety, 55+	Percentage of people aged 55 years and older who are feeling very safe or safe to walk after dark in their local area How safe do you — or would you — feel walking alone in this area (Respondent's local area or neighbourhood) after dark? Do — or would — you feel **1. Very safe** **2. Safe** 3. Unsafe 4. Very unsafe ESS

Indicator	Survey question(s)
3.8 Lifelong learning, 55–74	Percentage of people aged 55 to 74 who stated that they received education or training in the four weeks preceding the survey Did you attend any courses, seminars, conferences or received private lessons or instructions within or outside the regular education system within the last 4 weeks? **1. Yes** 2. No EU-LFS
4.1 Remaining life expectancy achievement of 50 years at age 55	Remaining life expectancy (RLE) at 55 divided by 50 to calculate the proportion of life expectancy achievement in the target of 105 years of life expectancy European Health and Life Expectancy Information System (EHLEIS)
4.2 Share of healthy life years in the remaining life expectancy at age 55	Healthy Life Years (HLY) measures the remaining number of years free of activity limitations caused by health problems. It combines information on quality and quantity of life European Health and Life Expectancy Information System (EHLEIS).
4.3 Mental well-being, 55+	Five survey questions are used to calculate a composite measure of mental well-being Q45a: I have felt cheerful and in good spirits Q45b: I have felt calm and relaxed Q45c: I have felt active and vigorous Q45d: I woke up feeling fresh and rested Q45e: My daily life has been filled with things that interest me Response categories of each of these five survey questions are: 1. All of the time 2. Most of the time 3. More than half of the time 4. Less than half of the time 5. Some of the time 6. At no time The raw score is calculated by reversing the value order of the variable, and then totalling the figures of the five answers. The raw score is converted so as to range from 0 to 25, 0 representing worst possible and 25 representing best possible quality of life. According to WHO, a raw score below 13 indicates poor well-being and is an indication for testing for depression under the Major Depression (ICD-10) Inventory (see http://www.who-5.org/ for more details). EQLS
4.4 Use of ICT, 55–74	How often on average have you used Internet in the last 3 months? **1. Every day or almost every day** **2. At least once a week (but not every day)** 3. At least once a month (but not every week) 4. Less than once a month Eurostat, ICT Survey
4.5 Social connectedness, 55+	How often socially meet with friends, relatives or colleagues?' 1. Never 2. Less than once a month 3. Once a month 4. Several times a month **5. Once a week** **6. Several times a week** **7. Every day** European Social Survey (core questionnaire)
4.6 Educational attainment of older persons, 55–74	Highest ISCED level attained 0 Pre-primary 1 Primary 2 Lower secondary **3 (Upper) Secondary** **4 Post-secondary non-tertiary** **5 Tertiary** EU-LFS