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DATA RESOURCE PROFILE

Data Resource Profile: The Survey of Health, Ageing and Retirement in Europe (SHARE)

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SHARE is a unique panel database of micro data on health, socio-economic status and social and family networks covering most of the European Union and Israel. To date, SHARE has collected three panel waves (2004, 2006, 2010) of current living circumstances and retrospective life histories (2008, SHARELIFE); 6 additional waves are planned until 2024. The more than 150 000 interviews give a broad picture of life after the age of 50 years, measuring physical and mental health, economic and non-economic activities, income and wealth, transfers of time and money within and outside the family as well as life satisfaction and well-being. The data are available to the scientific community free of charge at www.share-project.org after registration. SHARE is harmonized with the US Health and Retirement Study (HRS) and the English Longitudinal Study of Ageing (ELSA) and has become a role model for several ageing surveys worldwide. SHARE's scientific power is based on its panel design that grasps the dynamic character of the ageing process, its multidisciplinary approach that delivers the full picture of individual and societal ageing, and its cross-nationally ex-ante harmonized design that permits international comparisons of health, economic and social outcomes in Europe and the USA.

Data resource basics

Population ageing is one of the great societal challenges of the 21st century. Beginning in the 1990s, this trend mostly affected wealthy countries but is coming up in poorer nations because of their declining fertility rates. According to Eurostat, the rate of older people (65 years and above) in Europe, in relation to persons in their working age, is expected to almost double from 17% in 2010 to 30% in 2060.[1] This is unparallelled in human history and poses big challenges to the welfare state. In 2060, for every one working person there will be one retired person. Although the demographic trends and their two main causes (low fertility and increasing life expectancy) are clear, not enough is known about consequences and implications of population ageing or its manageability through public policy. Understanding how the ageing process will affect all of us, and disentangling the influences of different cultures, histories and polices, is an important task for researchers in anthropology, demography, economics, epidemiology, gerontology, history and sociology in order to turn the challenges of population ageing into opportunities.

In response to the European Commission's strong interest in obtaining scientific evidence on population ageing in its member states, SHARE was created as a longitudinal survey infrastructure by and for researchers from multiple disciplines.[2] Although its development started only in 2002, SHARE has already become one of the crucial pillars of the European Research Area. Since 2011, it has been the first ever European Research Infrastructure Consortium (ERIC), with a new legal status and many of the advantages of major international organizations, as well as a long-term perspective up to 2024. The ultimate goal is to provide high-quality micro-level panel data of economic, social and health factors that accompany and influence ageing processes at the individual and societal levels. In addition to its multidisciplinary and longitudinal nature, SHARE was set up to be a cross-national enterprise to enable researchers investigating how different European welfare state regimes moderate and mediate consequences and implications of population ageing. The data from people aged 50 years and over collected in 18 European countries and Israel are provided free of charge to the scientific community.

Two more features make SHARE a highly valuable source for genuine cross-cultural comparisons. First, SHARE is closely modelled after and constantly harmonized with its sister studies HRS in the USA and ELSA in the UK. This model has sparked and informed exciting new survey research on ageing all over the world, e.g. Japan (JSTAR), China (CHARLS), Brazil (ELSI), South Korea (KLOSA) and India (LASI), which puts SHARE into a truly global perspective. Second, and as opposed to these global sister surveys, SHARE in itself is a multi-national survey. The SHARE interview is ex-ante harmonized and all aspects of the data generation process, from sampling to translation, from fieldwork to data processing, have been conducted according to strict quality standards. Maintaining this ex-ante harmonization in spite of national differences and decentralized funding poses great scientific and governance challenges.

The remainder of this article is structured as follows. We will first document eligibility rules and survey participation before we introduce the panel and life history questionnaires as well as methodological innovations. Then we summarize main findings as well as the strengths and weaknesses of SHARE and lastly indicate where readers may find more information about the study.

Data resource area and population coverage

After four waves of SHARE, more than 150 000 interviews have been conducted with about 86 000 respondents aged 50 years and over and their (younger) partners in 19 countries (Austria, Belgium, Czech Republic, Denmark, Estonia, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Netherlands, Poland, Portugal, Sweden, Slovenia, Spain and Switzerland; see Figure 1).

Figure 1 SHARE countries

The SHARE target population consists of all persons born in 1954 or earlier in Wave 1 (2004/05), 1956 or earlier in Wave 2 (2005/06) and 1960 or earlier in Wave 4 (2010/11), who have their regular domicile in the respective SHARE country. A person is excluded if she or he is incarcerated, hospitalized or out of the country during the entire survey period, unable to speak the country's language(s) or has moved to an unknown address. In addition, current partners living in the household are interviewed regardless of their age. All SHARE respondents who were interviewed in any previous wave are part of the longitudinal sample. They are traced and re-interviewed if they moved within the country (for more information see the SHARE methodology volumes[3,4,5]).

SHARE is a multinational survey, which involves differences in sampling resources between countries. Consequently, sample frames are chosen in accordance with the best available frame resources in the country to achieve full probability sampling. Most SHARE countries have access to population registers. SHARE provides sampling design weights to compensate for unequal selection probabilities of the various sample units. Without such weights it is not possible to obtain unbiased estimators of population parameters of interest.

Survey frequency

Figure 2 gives an overview of the countries participating in each wave of SHARE and additionally shows the field times. Despite the complexity of the survey instrument and partially de-centralized funding, most countries managed to stick to the schedule of having a SHARE data collection every 2nd year. The major exceptions are the later fieldwork periods in Israel in Waves 1 and 2 and, due to funding problems, in Poland in Wave 4. Also, due to lack of sufficient funding following the economic crisis, Greece could not take part in the fourth wave, but will join again in coming waves. After merging the Irish SHARE study with TILDA, the Irish LongituDinal Study on Ageing,[6] there will be no stand-alone SHARE in Ireland after Wave 3. However, TILDA has taken over substantial parts of the SHARE questionnaire into their study.

The gross samples for the initial wave in 2004 were locally drawn in each of the 12 participating countries. They have been based on sampling frames which acknowledged country-specific circumstances such as the availability of register information, need for screening, expected response rate, etc. This has resulted in more than 50 000 addresses overall. Response rates in the first wave, defined as the proportion of selected households including at least one eligible person from whom an interview was successfully obtained, were about 62% on average. In total 31 115 interviews were released. Existing variation in performance over countries was for the most part consistent with previously known patterns from other international surveys. Cooperation at the individual level was only slightly lower than at the household level. Conditional on household participation an interview could, on average, be obtained from more than 85% of eligible household members.

In the second wave of SHARE, three new countries entered the study. Response rates for the new countries were on average very similar to Wave 1 (about 61%). Additionally, refreshment samples were drawn to increase net sample size and compensate for attrition in the longitudinal sample. Here, response rates were on average a little lower than in the first wave (54%). Individual retention with regard to the longitudinal part of the sample was about 73%. Starting in Wave 2, end-of-life interviews on deceased respondents were administered to relatives or other persons close to the deceased. In total, 34 415 Wave 2 interviews plus 533 end-of-life interviews (EOL) were released, including 18 742 longitudinal interviews. For the third wave, the SHARELIFE study, no additional households were sampled; 26 836 interviews and 1139 EOL interviews were conducted in panel households, including 1158 first interviews with new or previously non-cooperating spouses. The resulting individual retention rate was about 77%. In Wave 4, net sample size was substantially increased by including four new countries and drawing refreshment samples in most of the established countries. Altogether, 58 489 interviews, of which 21 566 were longitudinal, and 1110 EOL interviews were included in release 1. Based on preliminary calculations, response rates in the baseline (56%) and refresher samples (49%) were on average lower than in previous waves. In this

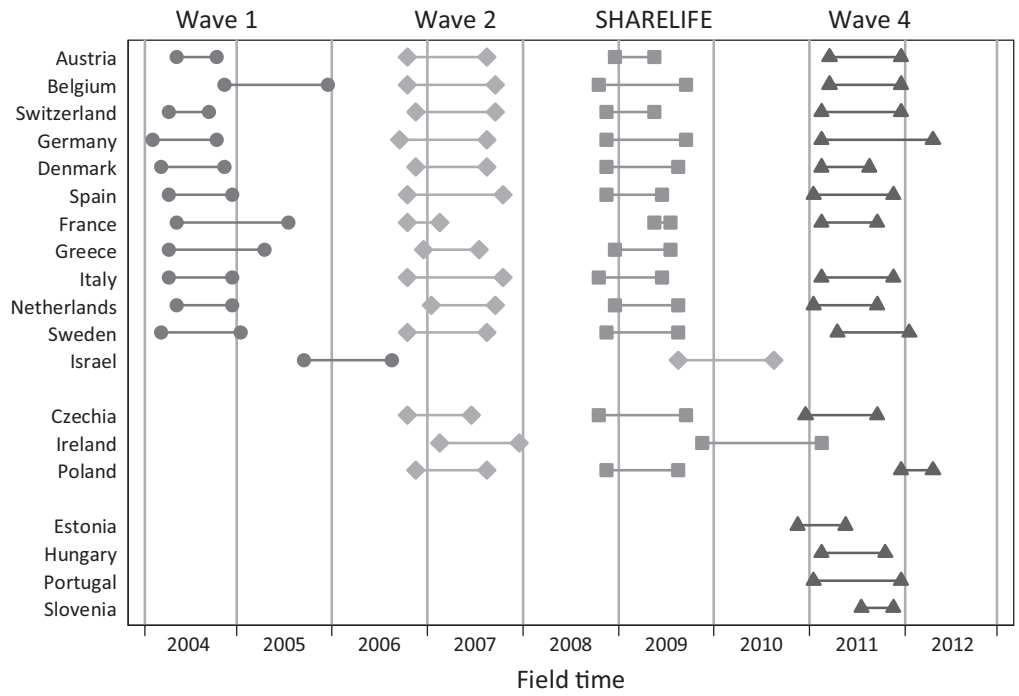
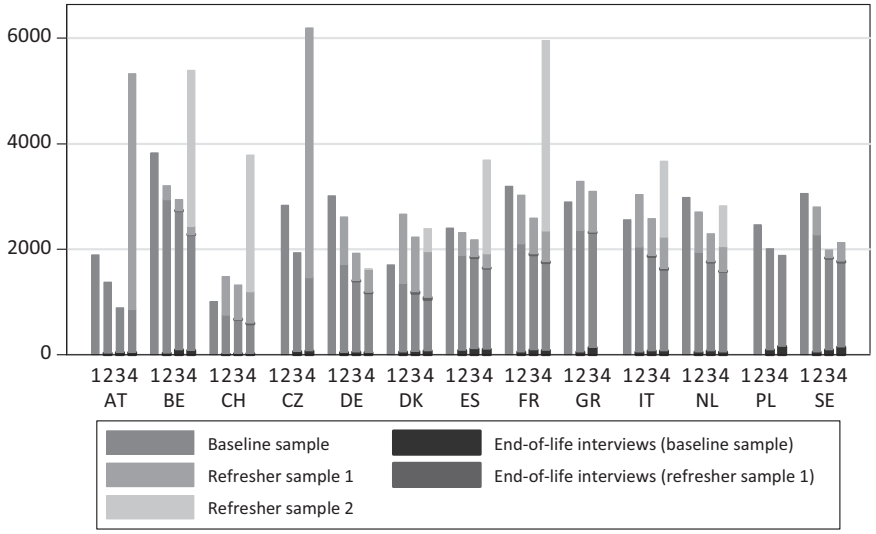


Figure 2 Country wave field time overview



In addition the baseline samples of the first data collections in Israel ($N = 2598$), Estonia ($N = 6828$), Hungary ($N = 3076$), Portugal ($N = 2080$), and Slovenia ($N = 2756$) are released.
AT: Austria, BE: Belgium, CH: Switzerland, CZ: Czechia, DE: Germany, DK: Denmark, ES: Spain, GR: Greece, IT: Italy, NL: Netherlands, PL: Poland, SE: Sweden

Figure 3 Overview of released samples

respect SHARE is no exception to the general decline in response rates in face-to-face surveys in Europe and worldwide.[7] The average retention rate was 81%. Figure 3 gives an overview of the released interviews by country, wave and sample. It shows the currently available data. Some more interviews were conducted in each country, which have not yet been successfully matched and are therefore not included. The bars in Figure 3 also distinguish between the regular SHARE interview and the EOL interviews.

Measures

SHARE panel

Covering the key areas of life, namely health, socio-economics and social networks, SHARE includes a great variety of information: health variables, physical measures and biomarkers, psychological variables, economic variables and social support variables as well as social network information. Whereas the regular waves of SHARE, including Waves 1, 2 and 4, deal with the respondents' current living conditions, Wave 3 (SHARELIFE) was conducted as a retrospective survey in order to collect information about the respondents' life histories.

The interviewers used computer-assisted personal interviewing (CAPI) to collect most of the data in all waves. In addition, self-administered questionnaires (drop-off) were handed out in Waves 1, 2 and 4 after completion of the CAPI. If a respondent died, EOL interviews were conducted face-to-face (CAPI) or by telephone (CATI) with a proxy, collecting the information regarding the respondent's last year of life. Proxy interviews were also used when respondents were not able to do an interview, for example for health reasons.

Even though SHARE is a panel survey with a core questionnaire stable over time, innovative research questions, physical measurements or modules have been incorporated in each wave. For example, in Wave 2, two physical measurements—peak flow and chair stand—were added (see next section for details). In Wave 4 a completely new module—the social networks module based on a name-generator approach—has been implemented to learn more about the social connectedness of respondents. Table 1 gives a short summary of panel questionnaire topics.

To assure an easy and fast entry into cross-national data and high convenience while working with the data, it is necessary that certain variables are readily provided, especially those that allow a valid comparison between countries, such as for example, the International Standard Classification of Education (ISCED). Besides internationally standardized variables, SHARE data sets provide further generated variables that ease or enhance working with SHARE data as well as different kinds of weights and multiple imputations (see the documentation at www.share-project.org/data-access-documentation/).

SHARELIFE retrospective life histories

In SHARELIFE, retrospective data with respect to childhood living circumstances, partners, children, accommodation, employment, socio-economic and health conditions as explicated in Table 2 were collected with the help of a 'Life History Calendar' similar to the one applied in ELSA.[8] The combination of the SHARELIFE with SHARE and ELSA data thus

Table 1 Information collected in SHARE (Wave 1, Wave 2 & Wave 4; for health measures see Table 3)

Questionnaire modules	Examples
Cover Screen	Year and month of birth, sex, household composition
Demographics	Education, marital status, country of birth & citizenship, parents & siblings
Physical Health	Self-rated health, diseases, weight & height, (I)ADL limitations [(instrumental) activities of daily living]
Behavioural Risks	Smoking & alcohol, nutrition, physical activity
Cognitive Function	Self- rated reading & writing skills, orientation, word list learning immediate & delayed recall, verbal fluency & numeracy
Mental Health	Depression scales (Euro-D & CES-D), quality of life (CASP-12)
Health Care	Doctor visits, hospital stays, surgeries, foregone care, out-of-pocket payments
Employment and Pensions	Employment status, individual income sources (public benefits, pensions), job, work quality
Children	Number & demographics of children
Social Support	Help and care given and received
Financial Transfers	Money/gifts given and received
Housing	Owner (mortgages, loans & value), tenant (payments), type and features of building
Household Income	Income sources all household members
Consumption	Expenditures for food, goods, services, ability to make ends meet
Assets	Bank and pension accounts, bonds, stocks and funds, savings
Activities	Voluntary work, clubs, religious organizations, motivations
Expectations	Expected inheritances, life expectancy, future prospects
Interviewer Observations	Willingness to answer, understanding of questions, type of building, neighbourhood
New modules after Wave 1	
Since Wave 2: End-of-Life	Death reasons and circumstances
In Wave 4: Social Networks	Ego-centred network, contact, emotional closeness, geographical distance, satisfaction with network

gives a detailed picture of the current status of individuals in Europe with a view across their entire life courses.[9]

Physical measurements and biomarkers

Until today, physical measurements and biomarkers were mostly taken in smaller, non-representative clinical studies. In the past 2 years more and more large-scale surveys added physical measurements and biomarkers to their programme since standard health questions in surveys are often subject to the respondents' own interpretation (of the question), own evaluation or perception (of health status) and own knowledge (of health status). The value of subjective health measurements is undeniable, but some research questions require objective measurements. Biomarkers enable researchers to validate respondents' self-reports and therefore to study the amount and determinants of under-, over-, and misreporting in large-scale population surveys.[10] Biomarkers can help to understand the complex relationships between social status and health, and allow the identification of pre-disease pathways, since physiological processes are often below the individual's threshold of perception. From the first wave on, SHARE combined self-reports on health with physical performance measurements.

Dried blood spots have been collected in Germany during Wave 4. A full-scale collection of dried blood spots in all countries is planned for Wave 6. An overview over the health measures in SHARE can be found in Table 3.

Linking survey and administrative data

Survey data can cover a wide range of topics. However, the information provided by respondents is often incomplete or inaccurate. Administrative data, on the other hand, are much more complete and accurate since they are process-generated. The disadvantage of administrative data is that the information is limited to certain topics only. Linking survey data with administrative data is a way to combine the best of both worlds. SHARE thus cooperates with the German Pension Fund (DRV) and has linked the German survey data with administrative data held by the DRV in a pilot study in the third wave of SHARE. The administrative data consist of two parts: The first part is longitudinal and

Table 2 Retrospective information collected in SHARELIFE (Wave 3)

Questionnaire modules	Examples
Start of the Interview	Year and month of birth, sex
Children History	Pregnancies, births, children characteristics, maternity leave
Partner History	Living arrangements, marriages, divorces
Accommodation History	Residences (country, region), moves, types of accommodation, ownership
Childhood Circumstances (age 10)	Accommodation features, number of books, school performance
Work History	Employment status, job characteristics, income
Work Quality	Effort, demand, control, job circumstances
Disability Benefits	Disability leaves, work reduction, disability pension
Financial History	Investments in stocks, funds, insurance uptake, retirement savings
Health History	Hospital stays, illnesses, diseases, current self-rated health
Health Care History	Vaccinations, doctor visits, preventive check-ups, health behaviours
General Life	Periods of happiness, stress, financial hardship, hunger, persecution, oppression
Interviewer Observations	Willingness to answer, understanding of questions, type of building, neighbourhood

Table 3 Overview of physical measurements and biomarkers in SHARE

Performance measures	Wave 1 (2004/05)	Wave 2 (2006/07)	Wave 3 (2008/09)	Wave 4 (2010/11)
Grip strength	Yes	Yes	Yes	Yes
Lung strength (peak flow)	-	Yes	-	Yes
Walking speed	Yes	Yes	-	-
Chair stand	-	Yes	-	-
Biomarkers (Germany only)				
Height	-	-	-	Yes
Waist circumference	-	-	-	Yes
Blood pressure (seated)	-	-	-	Yes
Dried blood spots				
HbA1c	-	-	-	Yes
C-reactive protein	-	-	-	Yes
Total cholesterol	-	-	-	Yes

includes socio-demographic characteristics (such as age, sex, number and age of children and education) and detailed information about work history as well as all activities which generate public pension entitlements. Those data are implemented as a panel database beginning at age 14 years, which provides that information on a monthly basis. The second part is cross sectional and only available for retirees. Included is information on the calculation of pension benefits. The two data sets are updated every year.[11] The project of linking SHARE surveys with administrative data continues in Wave 5 and will be expanded to four additional SHARE countries, namely Austria, Estonia, The Netherlands and Sweden.

Data resource use

The unique key design features of SHARE—combining multidisciplinary and ex-ante harmonized cross-national comparability in a longitudinal setting—have sparked a vast range of multidisciplinary comparative research projects, with findings published in more than 800 articles to date (see www.share-project.org for a full list of publications and findings).

One very prominent topic of interest to epidemiologists is health inequalities which are more pronounced in the USA than across Europe, in terms of different health measures as well as all kinds of socio-economic distinctions.[12–16] However, the odds of successful ageing also vary considerably within and

across European countries,[17] depending, for example, on the level of social inequality.[18]

Cognitive ageing is one specific aspect studied intensely here,[19] which seems to be closely linked to (early) retirement: People who leave the labour force experience higher cognitive decline than their counterparts[20,21]—a fact that has been called 'mental retirement'[22] and appears to be related to the stimulation at the workplace and its anchoring function for social exchange.[23] Furthermore, family care and support are important indicators for active and healthy ageing. Even though family members seem to be close all over Europe,[24,25] there are distinct differences between the countries. The more employees in social services and the higher social expenditures (percentage of the Gross Domestic Product), the more likely parents and children support each other on a day-to-day basis.[26,27]

The 'historical laboratory' character of the SHARE is exploited in many studies on the effects of welfare state policies on health, socio-economic status and well-being after the age 50 years, partially explaining the stunning North-South gradients in many dimensions. Examples of policies range from health insurance coverage to maternity leave and early retirement and disability insurance. Density of medical doctors appears to improve health across European regions;[28] generous maternity leave appears to be a two-sided sword, often reducing mothers' retirement income;[29] the uptake of early retirement and disability benefits appears to be related to incentives created by the national insurance systems much more than to individual health and age.[30]

A recent strand of publications looks into the influences of early life conditions and life-course events on well-being in old age, based on the SHARELIFE data. Early life circumstances such as childhood health and socio-economic status matter until old age—in terms of socio-economics, health and life satisfaction.[31] Examples are spells of unemployment which leave scars even decades later,[32,33] and—particularly striking—the tremendously negative effects of World War II and its associated persecutions on health, well-being and income of today's survivors.[34–36] New Wave 4 data are now used to disentangle the influences of the economic crisis on healthy ageing and intergenerational solidarity in different European countries, showing negative effects of the crisis on old age well-being as well as the pronounced links between personal social networks and all different aspects of life in old age.[37]

Strengths and weaknesses

Until now, SHARE has constantly added countries and (refresher) respondents. Due to generally decreasing survey participation rates and the economic crisis, new challenges have emerged: concerns about SHARE are the relatively low response rates and moderate levels of attrition, though in comparison with other European and recent US survey studies, the overall response rate of SHARE is quite high.[38] Still, the magnitude of unit nonresponse and panel attrition may potentially generate sample selection bias, limiting the representativeness of the database and the generalizability of results. This is particularly a problem when using SHARE to inform public health and social policy. SHARE's main strategy to cope with potential selection bias generated by unit nonresponse and panel attrition is the provision of ex-post calibrated weights following the procedure of Deville and Särndal.[39] Under certain assumptions about the missing data process, these weights may help reduce the potential selectivity bias. However, depending on the purpose of the analysis, users have to decide whether calibrated weights provided in the public release of the SHARE data are enough to compensate for potential bias.[40] Subgroup analyses of response behaviour by sex and age (i.e. information known from the sampling frame) have revealed only small differences in the patterns of initial survey participation[41] as well as panel retention.[42] Additionally, analyses of data obtained from a doorstep questionnaire survey, administered on refusing respondents from the German Wave 4 sample, have also shown little evidence for nonresponse bias with regard to health status, occupational status or household composition.[43] Acquiring central funding and enforcing a strictly harmonized schedule and procedures as well as extensive panel care measures (such as interviewer and respondent incentives) are of ever-increasing importance to ensure the sustainability of the survey all over Continental Europe.

Due to their cross-national and multidisciplinary nature, the SHARE data are much more complex than conventional survey data. This already holds for the first cross-section in 2004. With the start of the panel dimension and retrospective life histories collected in SHARELIFE, the complexity of the data increased substantially. Innovations such as biomarkers and linkage, harmonization with other data sets worldwide and different respondent types (e.g. financial, family, household, proxy respondents, see above) present a major challenge to users in terms of meaningful data preparation and analysis. The SHARE team minimizes these challenges by extensive data cleaning, provision of generated variables, a comprehensive documentation and intensive user support, by e-mail and in-person training (details see next section). As the number of registered users (more than 2900 to date) and publications are steadily increasing, training and documentation measures are essential tasks to which the SHARE team dedicates more and more resources (see below). Moreover, a special training data set for new users is in preparation and will be published soon.

Most of SHARE's weaknesses thus come from its actual strengths. If the complex interrelations between different life domains, between individual, family and social networks and state over time and

across the entire life-course are under study, the information needed to disentangle has to be complex by nature. The broad range of individual, household and social network information from vast ranges of contexts with different cultures, histories and policies over time makes the SHARE data extremely valuable and a stand-alone example in the world of social science surveys.

Data resource access

Data collected and generated in the SHARE projects are available free of charge for scientific research without any restrictions to specific research purposes. Following the completion of data cleaning, processing and the generation of weights, imputations and generated variable modules by the country and area teams and the coordination team at the Munich Center for the Economics of Aging, the scientific release versions of the data are most easily accessible from the CentERdata archive.

As of November 2012, data from the first three longitudinal Waves 1, 2 and 4 and the retrospective SHARELIFE life history data (Wave 3) are available. To obtain a login and password for the data download, researchers have to submit a short form that is available on the SHARE website (www.share-project.org/fileadmin/pdf_documentation/SHARE_Data_Statement.pdf). SHARE checks the scientific affiliation of the applicant and provides the login details within a few days. These stay valid for all further releases of SHARE data as long as the scientific affiliation indicated at registration does not change. Registered users are regularly informed about new releases and developments via user alerts and newsletters. To get access to the administrative data of the German Pension Fund which can be linked to the SHARE survey data, researchers have to submit an additional form that is also available at the SHARE website (www.share-project.org/data-access-documentation/record-linkage.html). After a successful registration the data will be provided on a CD free of charge.

For a general overview, the 'SHARE First Results' and 'Methodology' volumes are very helpful.[44–50] Recent methodological innovations and add-ons are presented in the SHARE working paper series on the website: http://www.share-project.org/publications/workingpapers0.html. The SHARE Release Guides to the SHARE panel waves and to SHARELIFE document the different data sets, including weights, imputations and generated variable modules. To document longitudinal and country specifics, a web-based item correspondence tool was developed: http://www.share-project.org/data-access-documentation/documentation0/country-wave-specifics.html. In addition, the central coordination team and the country teams allocate substantial resources to answer specific user questions directly and to organize user conferences. All mentioned publications, documents and further information can be accessed on the SHARE website via www.share-project.org, or through e-mail to info@share-project.org.

Funding

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Substantial additional funding comes from the US National Institute on Aging (U01 AG09740-13S2, P01 AG005842, P01 AG08291, P30 AG12815, Y1-AG-4553-01, OGHA 04-064, IAG BSR06-11, R21 AG025169). The German Federal Ministry of Education and Research is funding the Munich-based international coordination of SHARE (AZA 01UW0908) and the EU Commission finances all coordination elsewhere (SHARE-M4, 261982). We gratefully acknowledge these as well as all national funding sources (see www.share-project.org for a full list of funding institutions).

Conflict of interest: None declared.

KEY MESSAGES

- As a result of their harmonization, the SHARE data and their international sister studies encompass a worldwide 'historical laboratory' to assess the effects of different policies on health, socio-economic status and well-being after the age of 50 years.
- To date, more than 800 SHARE-based publications assess the chances and challenges of individual and societal ageing by exploiting the links between health, economic and social conditions over the life course observable in SHARE.

- Among the key findings is a European North-South gradient in many more dimensions than previously documented. In addition to the well-known income gradient, the health and well-being differences between North and South contradict mortality data and folklore about healthy Mediterranean life style.
- SHARE has sparked an entire new area of research by revealing a strong correlation between early retirement and the loss of cognitive abilities, social contacts and well-being.
- Equally impressive are findings that the large international differences in the uptake of early retirement and disability benefits are much more strongly correlated with economic incentives than with health and age.

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