Deliverable Number: D1.2

Deliverable Title: Midterm report of project achievements until month 36

Work Package: WP1

Deliverable type: R

Dissemination status: PU

Submitted by: Axel Börsch-Supan

Author: Axel Börsch-Supan

Date Submitted: 16 Dec 2025

This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under project ID 101093849.

www.bb-future.eu

In the mid2030s, the health of the baby boomers will have deteriorated and many in these large cohorts will be in need of formal and/or informal long-term care.

This "**care wave**" will transform two generations: the baby boomers in need of care and their children who may supply care. It will have significant implications for labour supply, especially for women, saving behaviour, and therefore for productivity, economic growth and its inclusiveness.

The overarching objective of BB-Future is to understand the size and the implications of the care wave on economic and social outcomes, to appreciate the quality of this second ageing-related transformation and to develop policy recommendations for advance planning on the EU and Memberstate levels.

This deliverable is a report of the scientific achievements that have been obtained until Month 36 of the project. It is structured by the nine specific objectives laid down in the Grant Agreement: 1: Estimate the care gap; 2: Add health projections; 3: Model interaction between labour force participation and caregiving; 4: Explain which child will give care; 5: Model interaction between locational choice and caregiving; 6: Predict unmet care needs; 7: Model the effects of different LTC insurance provisions; 8: Derive policy recommendations; and 9: Disseminate analytical results and policy recommendations.

Please cite this deliverable as: Deliverable 1.2 of the BB-Future project funded under the European Union's Horizon 2020 research and innovation programme GA No: 101093849.

Available at: www.bb-future.eu

The baby boomers are in the process of retiring. Most are between 60 and 65 when they retire and almost 80% self-assess their health as good. A huge number of research projects has analyzed retirement decisions and the impact of this "pension wave" on the transformation of pension systems in the ageing societies in Europe and elsewhere. There is no lack of pension finance projections and policy advice for pension reforms and their socio-economic effects, including active ageing and the role of elder citizens in transforming our economies into "silver economies".

Much less is known about the second great transformation that will follow the pension wave. In the mid2030s, the health of the baby boomers will have deteriorated and many in these large cohorts will be in need of formal and/or informal long-term care. This "care wave" will transform two generations: the baby boomers in need of care and their children who may supply care. It will have significant implications for labour supply, especially for women, saving behaviour, and therefore for productivity, economic growth and its inclusiveness. The overarching objective of BB-Future is to make a concerted effort to understand the size and the implications of the care wave on economic and social outcomes, to appreciate the quality of this second ageing-related transformation and to develop policy recommendations for advance planning on the EU and MS levels.

From this overarching objective follow nine specific objectives to which this midterm report relates the project achievements of BB-Future until month 36.

Objective #1: Estimate the care gap

Demographic trends imply that the population share of individuals aged 85 and older in the EU27 will sharply rise over the next decades. Hence, more older people will demand long-term care (LTC) while fewer younger people can supply it. This imbalance ("care gap") between demand for, and supply of, long-term care is likely to be especially strong in Southern European countries such as Italy, Greece, Spain and Portugal. Specific objective #1 is to provide projections for the "care gap", i.e., the gap between demand for, and supply of, long-term care for all EU Member States.

Deliverable 5.2 provides first estimates of the care gap. Most European countries have to expect an absolute decline in their labour force, and all European countries will see a decline in the number of workers relative to the population size. This includes care workers, defined as individuals who provide formal care in households and institutions. At the same time, all countries have to deal with a rising demand for care since the share of very old individuals in the population will increase. This will result in a gap between the supply of, and the demand for, formal care workers. Deliverable 5.2 uses a "shift-share" methodology combined with a scenario approach to provide first estimates of this gap, abstracting from behavioral adaptations and conditional on strong assumptions regarding the provision of informal care. This methodology is applied to eight EU member states: Denmark, France, Germany, the Netherlands, Italy, Poland, Spain and Sweden.

Our main result is that under current behavioral assumptions – especially current labour force participation, part-time rates and retirement age – this gap will grow much larger in all eight

countries than it is already today. On the other hand, supply and demand could be balanced if so far untapped labour potential is brought into the labour market, mainly among women and early retirees. Untapped labour potential is defined as the difference between today's labour force participation rate and a hypothetical rate that is considerably higher but realistically achievable insofar as it has been already realized in Europe. We have chosen Sweden as such a benchmark. We show that this helps to close the care gap in all countries except Denmark, Sweden and the Netherlands, where labour force participation is already high and therefore the untapped potential small. France, on the other hand, has such a low labour force participation rate, that exploiting the untapped labour potential barely suffices to close the gap until 2060 but not in the far future.

Objective #2: Add health projections

There are indications that the trend towards better health is stalling or even reversing, although with great heterogeneity within the European population. Specific objective #2 is to refine the demographic care gap projections by cohort-based health projections based on the SHARE data for all EU Member States.

We have created projections of morbidity based on the activities of daily living (ADL) and the instrumental activities of daily living (IADL) provided in the SHARE data. We computed "disability-free life tables" with associated "disability-free life expectancies" where disability-free is defined as having at most one ADL or IADL. The disability-free life table provides for each age and year the probabilitity of being disabled and thus in need of care, defined as having two ADL+IADLs. More specifically, we computed 240 Excel sheets containing for each of the five core countries in BB-Future (France, Germany, Italy, Poland and Sweden):

- Population n by year, age and sex, age=60:100, year=2023:2070
- Conditional mortality q by year, age and sex, age=60:100, year=2023:2070
- Share of disabled individuals p by year, age and sex, age=60:100, year=2023:2070
- Number of disabled individuals n*p by year, age and sex, age=60:100, year=2023:2070

Population and mortality have been calculated based on three scenarios (baseline, old and young population), the latter two referring to a quickly or less quickly aging population. The underlying demographic assumptions are described in Deliverable 5.2.

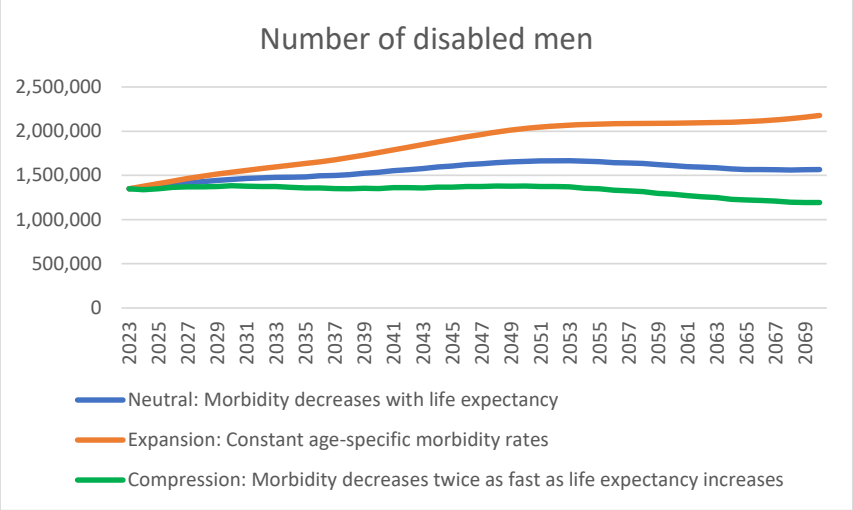
The current and projected shares of disabled individuals are based on three steps: Step1 establishes a cross-sectional age-disability profile based on all SHARE countries in Wave 9. Step 2 makes these profiles country-specific using the EHIS data (European Health Interview Survey). Step3 shifts these country-specific age-disability profiles over time according to whether morbidity is expanding, compressed and neutral relative to mortality.

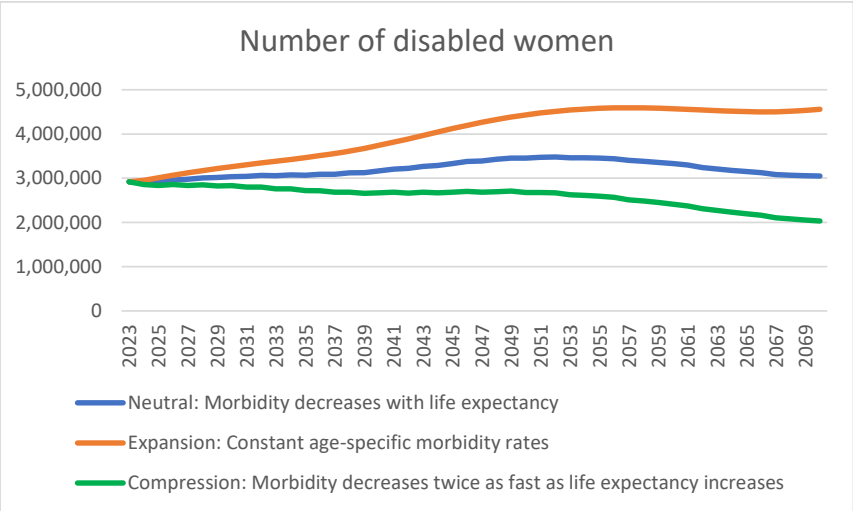
EHIS provides the share of disabled individuals (defined as at least one ADL or IADL) in the age intervals 55-64, 65-74, and 75+. These shares are helpful because they are based on relatively large country samples but the age granularity is insufficient and we may not associate at least one ADL or IADL with severely disabled. In turn, SHARE has rather small country and age-specific cell sizes with people who have at least two ADL or IADL which is closer to a disability status that requires care.

In Step 1, we took the SHARE data aggregated over all SHARE countries. This provides reasonable cell sizes. Below around age 65, the share of the so defined disabled individuals is approximately constant. Between 65 and 100, the aging process slowly kicks in and a quadratic polynomial approximates the cross-sectional age-disability relation fairy well:

Step2 calculates such quadratic polynomials for each country and sex using the EHIS data. These polynomials have a minimum in the age range 62-67, varying by country and sex. Below this minimum the disability share is set to the minimum, and values larger 1 are set to one. This results in cross-sectional age-disability profiles for each country, separately for men and women.

Step 3 is to project these age-disability profiles over time in three scenarios. In the "Neutral" scenario, the profile is shifted in line with life expectancy at age 65. That is, if life expectancy increases by a year, the age-specific disability share of a 70 year old individual is equal to what was the disability share of a 69 year old individual. In the "Expansion" scenario, we hold the age-disability profile constant. Hence, with life expectancy increasing, we add life years at the end of life that have very high shares of disables individuals. In the "Compression" scenario, we do the opposite: we shift the age-disability profile by twice the increase of life expectancy, such that the age-specific disability share of the 70 year olds is equal to what was the disability share of 68 year olds. For Germany, the resulting number of disabled individuals looks like:





The scenarios produce very different developments from a long-run decline ("Compression") to a pronounced peak ("Neutral") to a steady increase ("Expansion"). At this point (December 2025) the newest data indicate a more pessimistic outlook which makes the Compression scenario unrealistic. We therefore computed another scenario ("Strong expansion"). In the next meeting, the consortium will decide whether we will base our work on more pessimistic assumptions.

Objective #3: Model interaction between labour force participation and caregiving

Female labour supply is still rising in all major European countries and the gender pay gap is decreasing. Pressures to supply more care may endanger this progress as there is a stable gender gap in care provision in Europe with daughters being more likely to provide care than sons. Specific objective #3 is to model the interaction between labour supply and caregiving and its implications on the gender pay gap.

Deliverable 5.3 assesses the fiscal effects of mobilizing underutilized labour market potential of women and part-time workers on pay-as-you-go social insurance systems in times of demographic aging. Aging implies a decreasing working-age population relative to the number of beneficiaries of social insurance, especially pensions, healthcare and long-term care. Hence, increasing labour force participation of women and hours of labour supply by part-timers in countries, where female labour force participation is low and part-time employment high are obvious candidates to compensate for this loss. However, matters are not that simple. Beneficial effects on the contribution rate to social insurance are different between adding workers and adding hours and depend on the link between wages and benefits.

Deliverable 5.3 focuses on the case in which social insurance benefits are indexed to the growth of annual wages as is the case for Germany. It shows that increasing female labour force participation has only a modest impact, as the gender gap in participation rates has largely closed. Even between extreme scenarios, the difference in contribution rates across all insurance schemes would not exceed one percentage point. Reducing Germany's high share of part-time employment has greater potential to relieve financial pressures, but primarily in health and long-term care insurance. If part-time work in Germany were lowered to the Swedish level, the combined contribution rate for these schemes would rise by about 1.2 percentage points less, assuming no adverse effects on health or informal care. In contrast, the pension contribution rate remains largely unaffected. That is because the shift from part-time to full-time work raises annual earnings and therefore overall wage growth, which under Germany's pension adjustment mechanism translates almost one-to-one into higher pension benefits. The gains from additional labour therefore primarily accrue to pension recipients rather than reducing the financial burden on all contributors.

Objective #4: Explain which child will give care

The change in marital and fertility patterns has created a substantially higher prevalence of childlessness, divorce and patchwork families. Divorced and stepfamilies may exhibit lower intergenerational solidarity. This will complicate the intra- and intergenerational bargaining processes within families – who cares for whom and how much. It may also lead to higher saving rates among parents in order to build up a buffer stock so as to be able to pay for formal care. In turn, higher savings will affect inter vivos transfers and bequests to the

younger generation. Specific objective #4 is therefore to model who will be designated to provide care and how this affects inter vivos gifts, bequests and thus saving behaviour.

This is a complex decision which we model in two extreme ways: the "designated child model" assumes that early in the life of the parent a single child among the siblings is designated to take care of the parent if the parent becomes disabled. The other children will not do any care but compensate the caring child. The other extreme is a continuing cooperation between the siblings. **Deliverable 3.1** describes the designated-child model of the long-term care provision. It explicitly models multiple children which can potentially provide care to the parent in need. In the beginning of the work-life, children with heterogeneous characteristics form expectations over the future, and decide which child will be "designated" as the potential care-giver. This child enters a game with the parent, potentially receives quid-pro-quo and altruistically motivated transfers. The non-designated children continue their life facing the labour market risks, but do not enter into bargaining with the parent regarding the long-term-care provision. Non-designated children still receive bequests once the parent dies. The model explains the decision of how the primary informal caregiver is selected among the children. Moreover, it also allows us to analyse how the family size and characteristics influence the dynamics of the informal care provision, location choice of the children, inter-vivo transfers and the size of bequests.

Deliverable 3.2 details the "cooperative siblings model" in order to explore the large variations in care arrangements both across families and countries, and the factors contributing to these variations. The cooperative siblings model is a relatively parsimonious structural model of the family that can be estimated using a discrete-choice model. Parents and children bargain over care arrangements, choosing between child-provided and formal care. Children, heterogeneous in attributes such as labour income and geographical proximity, collectively decide on the potential caregiver. We find that although economic incentives matter, unobserved preference heterogeneity substantially reduces the elasticity of informal care in response to policy changes compared to a model in which only economic motivations for the care choice are included. This suggests that including preference heterogeneity is essential when it comes to policy analysis.

Objective #5: Model interaction between locational choice and caregiving

While the share of parents who have children close by is still very large, differential productivity growth in Europe has led to more regional mobility, especially urban/rural, thereby increasing the geographical distance between children and parents. Specific objective #5 is to model the interaction between caregiving and locational choice and its implications for labour supply and labour productivity, thus economic growth and its inclusiveness. This is current work to be finished as **Deliverable 3.3** end of this year.

Objective #6: Predict unmet care needs

The COVID-19 pandemic highlights that societies in Europe have made little progress in tackling these issues. The pandemic has had a severe negative impact on elderly people in poor health, especially for those living in nursing homes. Even more concerning, recent data from SHARE show an alarming number of older people without adequate care. Specific objective #6 is to predict unmet care needs, building up on the outcomes of the previous objectives, to raise awareness of the urgency to invest in advance planning.

This work will substantially refine the work done by Deliverable 5.2 (Objective 1) and is due by late February 2026. First the estimation of unmet needs and the resulting need for more formal care will be based on an internally consistent accounting model of the demand and supply of care that takes account of crowding out effects, i.e., the decrease of informal care if formal labour force participation increases. We have set up this model and are currently in the process of calibrating it to a large array of EU-wide micro and macro data. Second, the estimation of unmet needs will be based on the morbidity projections described in Objective 2. They have been completed, including a more pessimistic variant.

Objective #7: Model the effects of different LTC insurance provisions

In addition, the state of financial preparation for the care wave is unsatisfactory. Public and private LTC insurance is only slowly emerging, with large variation across countries, which is concerning because a majority of individuals do not have sufficient resources to pay for LTC, e.g., no LTC insurance and not enough savings for LTC. Public LTC insurance exists in some European countries (e.g., Germany, the Netherlands), but it is generally insufficient to cover all care expenses. Specific objective #7 is to model the effects of different LTC insurance provisions on the financial status of parents and children, including the accumulation and decumulation of savings in old age.

We first look at the general background of LTC insurance development. **Deliverable 4.1** summarizes the main stylised facts of the last decades in Europe, related to education, parental leave, and financial transfers from parents to children. These three key points has been identified as under-studied factors that might affect the long-term care arrangements later in life. We use the Survey on Health Ageing and Retirement in Europe (SHARE) from 2004 to 2018.

More specifally, **Deliverable 4.2** summarizes the public LTC policies of the last decades in Europe, and relates them to policies on education, parental leave and financial transfers parent-child. These three key points have been identified as under-studied factors that might affect LTC arrangement later in life. Thus, having a better understanding on the rich diversity of laws in Europe on these public policies, and how it evolves across time, is a prerequisite to have a better understanding on the differences in formal and informal care provision we observe in Europe.

Finally, we have set up a quantitative formulation of LTC insurance benefits and funding schemes for the five core countries in BB-Future (France, Germany, Italy, Poland and Sweden) that can be used in our various models. These are sets of equations and parameters which enter the micro and macro models. This permits counterfactual analyses of LTC policies that have been implemented in one country and their effects on other countries (“learning from other countries”) as well as the counterfactual analysis of yet unimplemented LTC insurance schemes (“innovation on LTC insurance”).

Objective #8: Derive policy recommendations

Policy aims voiced by the EU Commission and national governments -- such as: fewer unmet needs, less gender care gap, higher labour attachment of women, and more efficient and sustainable social insurance in the face of population ageing -- have not yet been achieved. There is an astounding variety of policy approaches, even in similar circumstances, indicating

that we are still in a phase of experimentation. Specific objective #8 is to offer more structure for this policy development by deriving policy recommendations from well-defined models that are based on the rich internationally comparable SHARE data and that can be applied to each country's specific circumstances.

BB-Future will develop policy recommendations in a rigorous three-step approach: Based on demographic projections and well-defined policy scenarios, a set of quantitative models will deliver key micro and macroeconomic outcomes which will be compared to derive policy recommendations. Since our ambition is to develop models far beyond the current state-of-the-art and to fit them to the rich internationally comparable data of the Survey of Health, Ageing and Retirement (SHARE), we have dedicated Years 1-3 to this academic work but will shift focus in Year 4 to apply these models to concrete "policy experiments", i.e., projections of the long-term effects of policies that have already been implemented as well as counterfactual analyses of policies that have not been implemented yet. In doing so, we will investigate different policies from different countries as well as contribute with our own novel policy ideas.

Key to derive policy recommendations is the "Policy Feedback Loop". It starts with the "theme catalogue" (**Deliverable 2.1)** in which we have defined a set of 22 policy experiments, offering a baseline and a set of alternative scenarios. They have been discussed within the consortium and during our two policy roundtables as part of Objective 9. The models are used to fine tune our scenarios and corresponding outcome variables (such as female LFP, unmet care needs, distribution of welfare across different age and socioeconomic groups, productivity, and other macroeconomic outcomes) and evaluate the investigated policies. In mid 2026, we will be in the position to provide actionable policy recommendations that (a) take into account numerous running cycles of our models and interactions with the policy network and (b) translate the results of multiple modelling applications into new ideas for better policies.

Objective #9: Disseminate analytical results and policy recommendations

Quantitative models and solid empirical analyses are needed to interpret the evidence correctly, which help to avoid drawing tautological and biased conclusions about cause and effect. In turn, this gives us credibility among scientists and policy makers who appreciate knowledge-based policy recommendations. Specific objective #9 is then to disseminate our analytical results and policy recommendations in order to counteract false beliefs about ageing societies and to promote the idea that early preparations for the care wave help us to reap the benefits of longer lives.

Deliverable 8.3 details our activities in terms of dissemination and the preparation of policy recommendations. We have arranged two "policy roundtables" in March 2024 and November 2025 with representatives of the Commission and other international organizations (e.g. OECD, WHO) which discussed topics from, and provided extensions to, our policy "theme catalogue" (Deliverable 2.1, a living document). We also delivered a large number of presentations at academic and policy seminars in Europe, the US, Canada, Japan, Taiwan and Australia.