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The impact of ageing, inequality and the evolution of morbidity on future health expenditure

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Abstract

Population ageing is associated with increasing healthcare expenditure. To guide policy and the adaptation of health systems, however, a more accurate understanding of the quantitative effect of different components of ageing and other factors that influence cost dynamics is needed. This study uses dynamic microsimulation modelling to project healthcare expenditure and disentangle the impact of changes in longevity, population age-structure, healthy life years and socioeconomic health inequalities in Austria. Combining price weights for healthcare services with information on healthcare consumption from the Austrian Health Interview Survey, we calculate average cost profiles by gender, age, and education consistent with the aggregate System of Health Accounts. These cost profiles are then combined with official population projections in the microsimulation model microDEMS to project different expenditure scenarios for the Austrian population up to the year 2060. We calculate total and per-capita cost trajectories and assess their economic impact by contrasting them with two different indicators for the size of the labour force. All our scenarios indicate that demographic ageing is likely to increase future healthcare costs, even if we assume a compression of morbidity over time. Reducing socioeconomic inequalities in health can contribute significantly to mitigate the cost dynamics resulting from demographic change. In economic terms, costs per person of working age increase by between 12% and 48%, depending on the scenario. When contrasted with changes in the number of economically active people, however, the increase is around 7 to 9 percentage points lower.

Keywords: healthcare expenditure, ageing, microsimulation, projections

INTRODUCTION

Over the last decades, healthcare expenditure (HCE) has outpaced economic growth in most advanced economies, and long-term projections typically forecast future health expenditures to continue to rise as a share of GDP (OECD, 2015; European Commission, 2021). These developments, which cause concern about the sustainability of public health spending among policy makers, have led to intensive research into the drivers of HCE. Assessing the role and relative importance of different drivers is crucial both to improve the accuracy of expenditure projections and to design and prioritize adequate policies. This paper investigates the long-term effects of aging on HCE, providing a detailed analysis of different impact channels and including in the analysis the role played by social inequality as driver of healthcare costs.

Broadly speaking, the literature distinguishes between demographic and non-demographic factors affecting HCE (Martins and de La Maisonneuve, 2013). There is some consensus that, in the past, rising incomes and innovations in health technology have been the main drivers behind the observed expansion in healthcare costs (Willemé and Dumont, 2015; Nghiem and Connelly, 2017). However, demographic factors can be expected to take full effect in the coming decades, at least in those countries and regions of the world where ageing is already well advanced. In the European Union for instance, the combination of low fertility rates, continuing gains in life expectancy and the ageing of the large cohorts born in the 1950s and 1960s will result in a significant increase in median population age and population growth will be limited to the group of people aged 70 and more (European Commission 2019, 2021).

Demographic change impacts HCE through various channels, which clearly include the different components of population age-structure, but also (changes in) the health and disability status of the ageing population as well as indirect effects related to the supply and utilization of healthcare services (De Meijers et al., 2013). This complexity explains why estimates of the relationship between ageing and healthcare costs vary considerably and why the debate on the correct methodology for measuring the impact of population ageing is still wide open (Howdon and Rice, 2018; Breyer and Lorenz, 2021). Moreover, recent findings highlight the role of social inequalities as determinants of HCE (Asaria et al., 2016; de Boer et al., 2019) and the potential savings resulting from policies that close the gap in morbidity and mortality between socio-economic groups.

Using a dynamic microsimulation model and a combination of micro and macro data for Austria, this paper contributes to clarifying and quantifying the relative importance of different effects associated with demographic change. We project public HCE and investigate different cost drivers up to the year 2060, including also differences in healthcare costs between educational groups to shed light on the role played by socioeconomic health inequality. We calculate total and per-capita healthcare costs and place these projections in an economic context by contrasting them with projections of the number of working age persons and the number of economically active persons.

Different scenarios are applied to disentangle and quantify the impact of changes in population age-structure, life expectancy, healthy life years and inequality. We align our model to official population projections and healthcare cost accounting, and apply stylized assumptions that allow us to highlight the key determinants of HCE and their relative importance. Our results provide a benchmark for the development of healthcare costs in a highly industrialised, ageing country with a well-developed public healthcare system. They also contribute to the literature by improving the understanding of cost projections and increasing the transparency of the associated assumptions, which are often only made implicitly.

METHODS

We build on previous work (Horvath et al., 2023) and use a dynamic microsimulation model to project healthcare costs for Austria up to the year 2060. The model is based on a cross-sectional data derived from the Austrian Microcensus data (2020), which is representative of the population in the base year. It simulates the further individual life courses over time, whereby the various processes (such as partnerships, fertility, educational pathways, labour force participation, changes in health status or death) are informed by empirical estimates from various data sources. Microsimulation allows for analysing and testing different "what-if" scenarios that can provide valuable insights that go beyond what is available from retrospective population studies (Astolfi et al., 2012).

Estimation of healtcare cost profiles by gender, age, and education

In the first step, we combine survey data on healthcare use and administrative information on HCE to calculate average cost profiles by gender, age, and education consistent with aggregate public expenditure according to the System of Health Accounts (SHA). These cost profiles are combined with official population projections in the microsimulation model microDEMS to project different HCE scenarios isolating the effects of changes in crucial cost parameters.

The use of healthcare services is analysed using microdata from the representative Austrian Health Survey (ATHIS) for 2014. The data contain information on the number of in-patient hospital stays (excluding stays related to childbirth), daycare stays, and visits to general practitioners (GPs) and specialist doctors (including hospital outpatient visits). The distribution of service consumption was calculated by gender, age, and education. Using the International Standard Classification of Education (ISCED), we distinguish between low educational attainment (at most compulsory schooling, ISCED 0-2), medium educational attainment (lower and upper secondary education and apprenticeship, ISCED 3-4), and high educational attainment (tertiary education, ISCED 5+).

In the second step, aggregate healthcare spending by gender and age-group is derived from official statistics provided by Statistics Austria (2014). Following the SHA methodology, current public expenditure on health is defined as spending on the core functions of healthcare (HC.1-HC.9). This approach distinguishes current healthcare expenditure from long-term care (LTC) expenditure (European Commission, 2021). The data used in this analysis covers healthcare functions HC.1 to HC.5, as defined by the SHA methodology. It represents the total cost of healthcare services and goods, excluding investments. Our analysis focused on inpatient, outpatient, and daycare services, which account for 90% of personal healthcare service costs and 71% of total expenditure, according to SHA healthcare functions HC.1 to HC.5.

Using information provided by the Austrian Ministry for Work, Social Affairs, Health, and Consumer Protection and the Austrian National Public Health Institute, we have determined price weights for different healthcare service categories under scrutiny. Inpatient hospitalisations have the highest average unit cost (856 Euro per day) and are the most significant factor in cost estimation. The cost of a GP visit was assigned a price weight of 57 Euro, while a specialist doctor visit was assigned a price weight of 76 Euro. As for daycare, which is not frequently used and for which no price reference was available, we assumed a unit cost of 600 Euro.

The resulting cost profiles by gender, age, and education are shown in Figure A1 in the Appendix. With increasing age, the cost profiles tend to rise notably, yet individuals with higher levels of education typically incur lower costs compared to individuals in other educational groups across all age groups. Although women demonstrate more pronounced variations based on education after the age of 40, men exhibit greater variation at younger ages. Projections based on these cost profiles have shown that, even after accounting for the social gradient in mortality and thus the higher life expectancy of better-educated groups, the lifetime healthcare costs of men and women with higher education are respectively around 40% and 10% lower than for men and women with lower education (Horvath et al., 2023).

Microsimulation of total healthcare expenditure

In the next step, we use the healthcare cost profiles as input in the dynamic microsimulation model microDEMS to calculate the future evolution of HCE. Based on a representative cross-section database of the Austrian population, microDEMS simulates individual life courses over time. The model is fully consistent with official population projections. However, it can also take into account education-specific differences in mortality by linking the actuarial mortality tables provided by Statistics Austria, which are incorporated in the model, with OECD data on remaining life expectancy by education for 25- and 65-year-olds (Murtin et al., 2017). microDEMS therefore reproduces changing age- and education-specific mortality rates and accounts for the overall increase in life expectancy according to official population projections.

Applying the average healthcare costs by gender, age and education, to each individual in the population, microDEMS allows us to simulate how future HCE evolves over time.

Scenario description

To quantify and disentangle how different channels impact on the future HCE dynamics, we run a set of scenarios highlighting how different assumptions with respect to mortality, healthy life years and socio-economic differences in healthcare cost affect total HCE (HCE_{tot}) and per-capita HCE (HCE_{pc}) over time. Table 1 provides an overview of the seven scenarios that we apply in our analyses, indicating the assumptions in the relevant dimensions of change.

[Table 1 around here]

In our first scenario (S0), we assume that mortality rates, the distribution of health status and healthcare cost profiles remain constant by age and gender (discarding differences by education), reflecting the levels observed in 2020. This scenario is suitable for showing the effects of ageing on HCE that would result solely from demographic shifts in the population structure by gender and age. In our next scenario (S1), we introduce differences in healthcare costs by education. We assume that age-, gender- and education-specific health status, mortality and healthcare costs remain constant. The healthcare cost dynamics are influenced by demographic change, but also by the educational expansion in the population. This educational expansion is driven by the extrapolation of existing trends in combination with modelling intergenerational transmission of education, whereby higher education of parents further increases the probability of children to attain higher education (Böheim et al., 2023).

Scenario S2 relies on the same assumptions as scenario S1, while also incorporating expected increases in life-expectancy in line with official population projections. By keeping health status constant by age, gender and education, this scenario implicitly assumes that the Austrian population attains a higher life expectancy, without increasing the proportion of healthy people at a given age. While this scenario is pessimistic, it is consistent with the "expansion of morbidity" hypothesis, according to which longer life expectancy does not lead to an equal increase in the number of years spent in good health, but to a constant or even increasing proportion of years spent in ill health. Some of the empirical evidence in the literature does indeed highlight how increasing longevity was accompanied by an increase in the number of years with morbidity (Beard et al., 2016; van Oostrom et al., 2016; Tetzlaff et al., 2017; Jivraj et al., 2020). Consequently, recent scholarship has called for the inclusion of scenarios with a steepening expenditure profile by age group in all HCE forecasts (Kollerup, Kjellberg and Ibsen, 2022).

However, the evidence for the development of morbidity is by no means uniform and numerous studies show a decline in morbidity or more nuanced findings, depending on the health indicator, the country and the population (sub)groups studied (Jeune et al., 2015; Lagergren et al., 2016; Payne, 2022). Following OECD (2023), where the impact of population ageing on the demand for long-term care is estimated using a pessimistic, an optimistic and an average scenario for the extent of health ageing, we thus complement our “pessimistic” scenario S2 with two additional scenarios where increasing life expectancy is accompanied by a compression of morbidity.

Scenario S3 assumes that the number of life years with lower healthcare use (i.e. the number healthy life years) increases in line with the increase in longevity (by about 5 years), thus neutralizing the effect of longer lives on healthcare demand. In our modelling approach, we concentrate the increase in healthy life years on the over-50 age group. For example, when life expectancy at age 50 improves by one year, the distribution of people’s health status at age 51 is assumed to be as it was at age 50. The choice to concentrate the gains in healthy life years on those aged over 50 is motivated by the fact that the healthcare cost profiles become steeper above that age (particularly for women, cfr. Figure A1) and that a large share of the projected gains in life expectancy at birth will be due to lower mortality at later stages in life (Kontis et al., 2017). As in the OECD study, the “pessimistic” and “optimistic” scenarios are complemented with a scenario where healthy ageing develops along a path averaging the other two scenarios. In our “average” scenarios S4, we assume that only half of the gain in longevity (i.e. about 2.5 years) from population projections translates in additional healthy life years.

Finally, scenarios S5 and S6 complement scenarios S3 and S4 by projecting how, in addition to a compression in morbidity, removing social inequality in health could affect HCE by closing the gap in the healthcare cost profiles between education groups over time. In both scenarios, all education groups converge to the healthcare cost profile of the high education group. Scenario S5 includes the “optimistic” assumption that healthy life years keep pace with increasing life expectancy, while scenario S6 includes the “average” assumption that half of the gains in longevity translate in healthy life years.

Assessing the economic relevance of HCE developments

The future development of absolute HCE is a relevant policy parameter, but it does not in itself say much about the resulting impact on public finances and the sustainability of the social protection system. Austria's public health system provides nearly universal coverage and mandatory social security contributions linked to employment are its main financing source. For this reason, we assess the impact that changes in HCE will have in economic terms by contrasting cost projections with two different indicators for the size of the labour force.

First, we use a ratio (DEP_{pop}) defined as total costs (HCE_{tot}) divided by the number of working age people (i.e. persons aged 20 to 64 years). Although the size of the working age population is widely used to calculate dependency ratios, it is a purely demographic indicator that does not necessarily reflect accurately the number of economically active persons in a society. In this respect, it is important to go beyond age and consider also economic characteristics of the population, such as length of schooling, retirement age, and labour supply behaviour (Sanderson and Scherbov, 2015; Loichinger et al., 2017). Looking into the future, we can expect the continuing educational expansion to reduce labour force participation at younger ages, while later retirement will extend working careers and a combination of higher education and shifting gender roles will continue to increase the labour force participation rates of women. In addition, participation rates will also be affected by the health status of the population. To capture these factors and changes, we use a second indicator (DEP_{lfs}), defined as HCE_{tot} divided by the number of economically active people (i.e. labour force participants, irrespective of age).

While the size of the working age population is pre-determined by demographic projections and thus exogenous to our model, we model the Austrian labour supply up to the year 2060 accounting for the impact of personal, family and job characteristics on labour force participation as well as for cohort-specific retirement regulations. Labour force participation and changes between different labour market states are determined by estimations based on Austrian Microcensus data as well as longitudinal administrative data (Horvath et al., 2024). The projections of future changes in the labour supply in Austria are thus consistent with external demographic forecasts but also account for the effect of compositional changes (such as education expansion or increasing labour force attachment of women) on labour supply. Detailed pension modelling in microDEMS also allows us to account for the impact of the ongoing harmonization of retirement age in Austria, increasing regular retirement age for women by 5 years over the next decade. For a more detailed description of the underlying methodology, please refer to Bittschi et al. (2024).

To allow for a consistent comparison between scenarios, we project the working age population and the labour supply using the population characteristics underlying our scenarios S2 to S6, which correspond to official population projections, and use them together with HCE_{tot} from scenarios S0 to S6 to calculate the ratios DEP_{pop} and DEP_{lfs} for each scenario.

RESULTS

Figure 1 and Figure 2 show the evolution of healthcare costs, expressed by total and per-capita costs (HCE_{tot} and HCE_{pc}). The left-side panels highlight the cost trajectories resulting from the purely demographic scenarios S2, S3 and S4, while the right-side panels focus on scenarios S5 and S6, which include the assumption on closing the socioeconomic gap in healthcare profiles. Scenarios S0 and S1, which are the benchmarks for quantifying the impact that changes in specific cost-drivers and assumptions are expected to have on HCE, are included in both panels.

According to official projections, the Austrian population is expected to grow by about 13.5% between 2020 and 2060. For this reason, total healthcare costs as shown in Figure 1 experience a stronger dynamic than per-capita costs shown in Figure 2. Scenarios S0 and S1 must be considered separately in this respect, however, because the assumption that life expectancy will not increase any further means that population growth would only amount to 4.9% instead of 13.5% between 2020 and 2060. This also explains why the percentage changes in HCE_{tot} and HCE_{pc} are more similar in these scenarios than in the other scenarios.

As the projections for scenario S0 in Figure 1 show, without further changes in mortality rates, and keeping gender-, age- and education-specific healthcare expenditures at their respective 2020 levels, total HCE would be about 20% higher in the late 2040s than in 2020. In the following years the costs would decrease slightly, leading to a difference of 18% between 2060 and 2020. The ageing of the baby boomers is the main driver behind this pattern. Accounting for the educational expansion and for the related health gains (scenario S1) leads to a slightly more favourable development, with a cost increase of 15% in 2060 compared to 2020. In a per-capita perspective (Figure 2), the cost curves for scenarios S0 and S1 show the same pattern, with a slightly lower increase until the end of the 2040s and a flatter development thereafter. HCE_{pc} are respectively 13% (S0) and 10% (S1) higher in 2060 than in 2020. Together these scenarios highlight that, without increases in life expectancy, population ageing would have a comparatively modest impact on long-term cost dynamics, especially when factoring in positive health effects associated with the educational expansion.

[Figure 1 around here]

Scenario S2, which incorporates expected increases in life-expectancy while again keeping health-care cost profiles constant, would lead to a much stronger increase in HCE_{tot}, exceeding 2020 levels by more than 41%. Per capita, the scenario results in a 26% increase in costs. In other words, incorporating increasing life expectancy in the projection more than doubles the per-capita cost dynamics that we can expect for the coming decades as a result of demographic change. This scenario, however, implicitly assumes that increases in longevity will be associated with an equivalent expansion of morbidity.

[Figure 2 around here]

Scenarios S3 and S4 show how improvements in healthy life years could cushion the cost pressure resulting from demographic aging. While scenario S3 basically assumes that increasing life expectancy fully translates into an increase in healthy life years, scenario S4 attributes only half of overall life expectancy gains towards health life years. As Figure 1 shows, the assumptions about changes in morbidity strongly affect HCE over time. Scenario S4 results in an increase in HCE_{tot} of 33% compared to 2020, while in scenario S3 the increase amounts to 26%. In a per-capita perspective, healthcare costs would increase by 19% in scenario S4 and only by about 13% in scenario S3.

Scenarios S5 and S6 finally show how, additionally to a compression in morbidity, removing social inequality in health could affect costs by closing the gap in the healthcare cost profiles between education groups over time. Assuming that all education groups converge to the high education group would strongly reduce HCE over time. Assuming strong morbidity compression in scenario S5 (the "optimistic" assumption used also in scenario S3) would result in HCE_{pc} even lower than in 2020, by -5%. Due to population growth, HCE_{tot} would still increase over the projection period, by about 7%. In the intermediate scenario S6 (including the "average" morbidity assumption used also in scenario S4), overall HCE_{tot} would increase by 15% compared to 2020 and HCE_{pc} would remain roughly constant over the projection scenario.

[Figure 3 around here]

Figure 3 and Figure 4 present the results for the dependency indicators DEP_{pop} and DEP_{lfs}, helping to assess the impact that changes in costs will have on the financing base of the healthcare system. Projections for the working age population and also those for the labour supply lead us to expect a decrease in the number of economically active people in Austria in the coming decades. Although the total population will increase by 13.5% between

2020 and 2060, the number of people in working age (20 to 64 years) will decrease by 5%. Our projections for the number of economically active people (15+ years) are more favourable, with a modest increase by 2% over the period 2020 to 2060.

Both the DEP_{pop} and the DEP_{lfs} indicators highlight that rising HCE will represent a challenge for public finances. However, as expected, the assessment varies depending on the scenario but also on the dependency indicator chosen, with the indicator based on the projection of labour supply (DEP_{lfs}) resulting in more favourable developments than the indicator based on the projection of the working age population (DEP_{pop}).

[Figure 4 around here]

In the most challenging scenario (S2), where we achieve higher life expectancy but no gains in health life years, the ratio of healthcare costs per working-age person (20 to 64 years) increases by close to 50% over the next decades. With respect to the economically active population, the picture is slightly more favourable, with an increase by about 40%. According to scenarios in which population health improves and the number of life years with high healthcare use increases by less than life expectancy (S4) or even remains constant (S3), costs per working-age person rise by 33% (S3) to 40% (S4), while those per economically active person rise by slightly over 24% and over 31%, respectively. In the most ambitious scenarios, in which positive health developments are coupled with reducing socioeconomic health inequalities, we can still expect HCE to grow more dynamically than the labour force. The trajectories of DEP_{pop} and DEP_{lfs} would however be much flatter. The former would increase between 2020 and 2060 by about 20% according to S6 and by about 12% according to S5, while the latter would increase by about 12% (S6) and 5% (S5).

[Table 2 around here]

Table 2 synthesizes the main results of the projections, showing how healthcare cost levels change according to the different scenarios and indicators between 2020 and 2060.

CONCLUSIONS

In this study we used dynamic microsimulation to disentangle the impact of changes in longevity, population age structure, morbidity and socioeconomic health inequalities on public healthcare expenditure (HCE) in Austria. If current age-specific HCE were to remain constant, demographic changes would lead to a 41% increase in total HCE by 2060, almost two-thirds attributable to decreasing mortality and one-third to the changing age composition of the population. Disregarding price changes in healthcare services, which represent a further uncertainty factor, this scenario is pessimistic, as it implicitly assumes an expansion of morbidity. We run two types of alternative scenarios in which morbidity is affected by two mechanisms, the first mechanically translating increases in life expectancy into increases in healthy life years, the other by closing the considerable gap in HCE currently observed between education groups.

Both mechanisms significantly mitigate - and together even offset - the impact of demographic change. While the evidence on the impact of increasing longevity on morbidity is inconclusive in the literature, leading to very high uncertainty in cost projections, the observed socioeconomic gradient in health and health expenditure suggests considerable policy scope to influence health outcomes. The first mechanism addresses changes in morbidity that are entirely due to changes in longevity and simulates the effects on HCE of full, partial or no compensation for increasing life expectancy in terms of healthy life years; closing the education gap additionally addresses changes in morbidity as a consequence of changes in population health that are unrelated to longevity and driven, for example, by the increasing diffusion of healthy lifestyles or the reduction of work-related health risks.

Our projections do not directly address the price dimension of healthcare services, such as shifts in relative prices resulting from technological innovation combined with shifts in supply and demand. To facilitate the economic interpretation of changes in HCE, we relate projected total costs to changes in the projected labour force. It is noteworthy that the anticipated rise in total HCE until 2060, spanning between +7% and +41% depending on the scenario, closely aligns with the projected increments in costs per economically active person. In contrast, increases in costs per capita are lower (as the population size increases), while increases in costs per working age person (20-64) are higher (as it is the dependent age population which increases over-proportionally). Combining HCE with labour force projections on one hand enables the quantification of the beneficial impact of increases in labour force participation (mitigating projected cost escalations by about 7 to 9 percentage points comparing active age to economically active persons, see Table 2). Moreover, cost increases can be related to average wages, i.e. the increase in projected costs provides a robust measure from the perspective of an average worker, assuming increases of unit-prices of health services in the range of increases in average wages.

All our scenarios indicate that demographic ageing is likely to increase future healthcare costs, even after taking into account a marked compression of morbidity over time. In addition to the high uncertainty about future cost dynamics, reflected in a wide range of outcomes across the scenarios, the observed socioeconomic gradient in health and health expenditure suggests considerable policy scope for influencing outcomes.

Our results help to shed light on the relevance of different cost determinants and can provide guidance to policy-makers when seeking to adapt healthcare systems to demographic change. While being specific to Austria, our findings can be of interest for other advanced economies with a comprehensive public healthcare system. They also underscore the advantages of using dynamic microsimulation in combination with official demographic projections and health systems accounts to provide consistent what-if scenarios and long-term projections.

At the same time, our study suffers from limitations that will have to be addressed in future work and provide scope for further research. In the absence of better data, we used cross-sectional data and had to make the simplifying assumption that age profiles of healthcare costs can be used to project life-course cost trajectories. The validity of this assumption depends on the extent to which the positive relationship between HCE and age is determined by time-to-death, a question that has to be answered empirically (Breyer and Lorenz, 2021). While providing different what-if scenarios to estimate outcomes depending on the relationship between changes in mortality and in morbidity, in this study we did not explicitly model the relationship between healthcare consumption and time-to-death. The availability of longitudinal data will be crucial to enable future research to investigate in greater detail and with more accuracy the relationship between ageing and healthcare expenditure, particularly towards the end of life. This research should include long-term care (LTC) and the resulting costs in the analysis, as population ageing is likely to have a different impact on LTC than on other healthcare services (Kollerup et al., 2022).

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FIGURES AND TABLES

Table 1: Scenario definitions

	Differences by education	Increasing life expectancy	Morbidity compression	Healthcare cost profiles
S0	no	no	no („pessimistic“)	constant
S1	yes	no	no („pessimistic“)	constant
S2	yes	yes	no („pessimistic“)	constant
S3	yes	yes	yes (“optimistic”)	constant
S4	yes	yes	yes („average“)	constant
S5	yes	yes	yes („optimistic”)	closing gap
S6	yes	yes	yes („average“)	closing gap

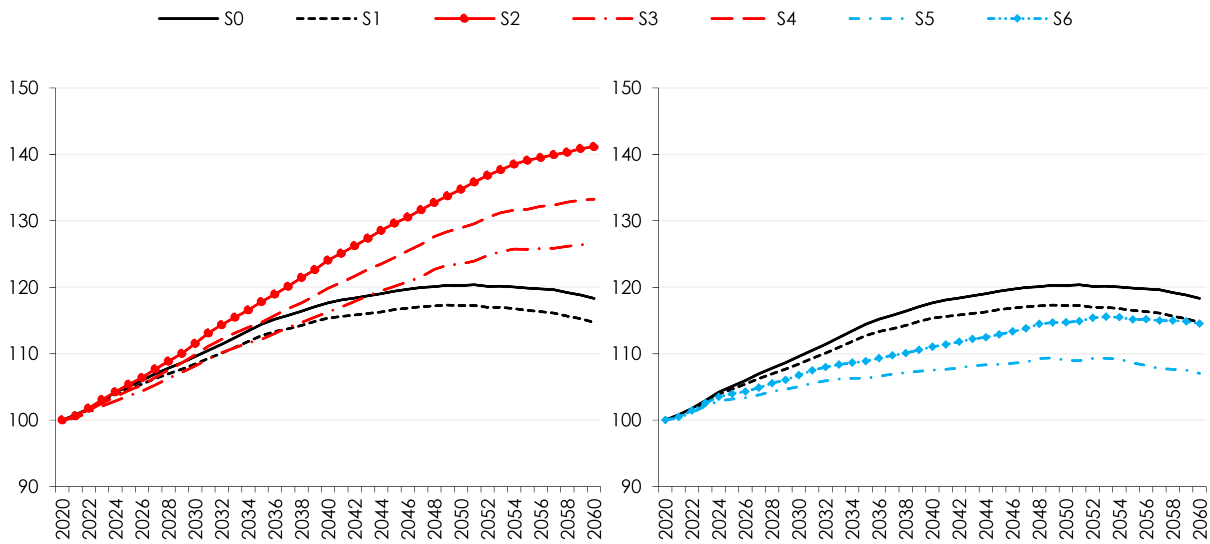
Notes: Scenarios of future healthcare expenditures accounting for cost differences by education attainment, increasing life expectancy (according to official population projections), morbidity compression (increasing healthy life years) and convergence in healthcare cost profiles between education groups. "Closing gap" refers to convergence of all education groups towards highest education level. "Pessimistic": no increase in healthy life years, "optimistic": healthy life years increase by 5 years, "average" healthy life years increased by 2.5 years.

Table 2: Total healthcare expenditure in 2060 and change to 2020

	HCE in 2060				**Change to 2020 (in %)**			
	Total	Per capita	Per person (age 20-64)	Per active person	Total	Per capita	Per person (age 20-64)	Per active person
	In mio. €		In €			In %		
S0	28,900	3,100	5,690	6,090	18%	13%	26%	18%
S1	27,800	2,990	5,470	5,860	15%	10%	22%	14%
S2	34,200	3,410	6,660	7,100	41%	26%	48%	39%
S3	30,400	3,040	5,920	6,310	26%	13%	33%	24%
S4	32,100	3,210	6,260	6,680	33%	19%	40%	31%
S5	25,700	2,570	5,020	5,350	7%	-5%	12%	5%
S6	27,600	2,760	5,380	5,740	15%	2%	20%	12%

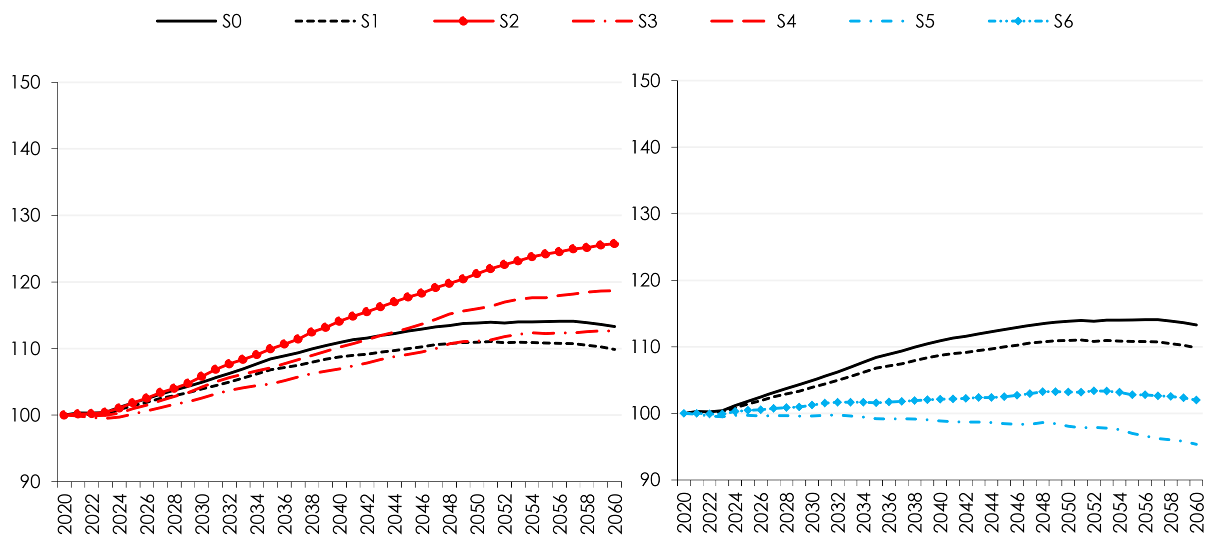
Notes: Total healthcare expenditure by scenario (Table 1).

Figure 1: Total Health care expenditure (*HCE$_{tot}$*)



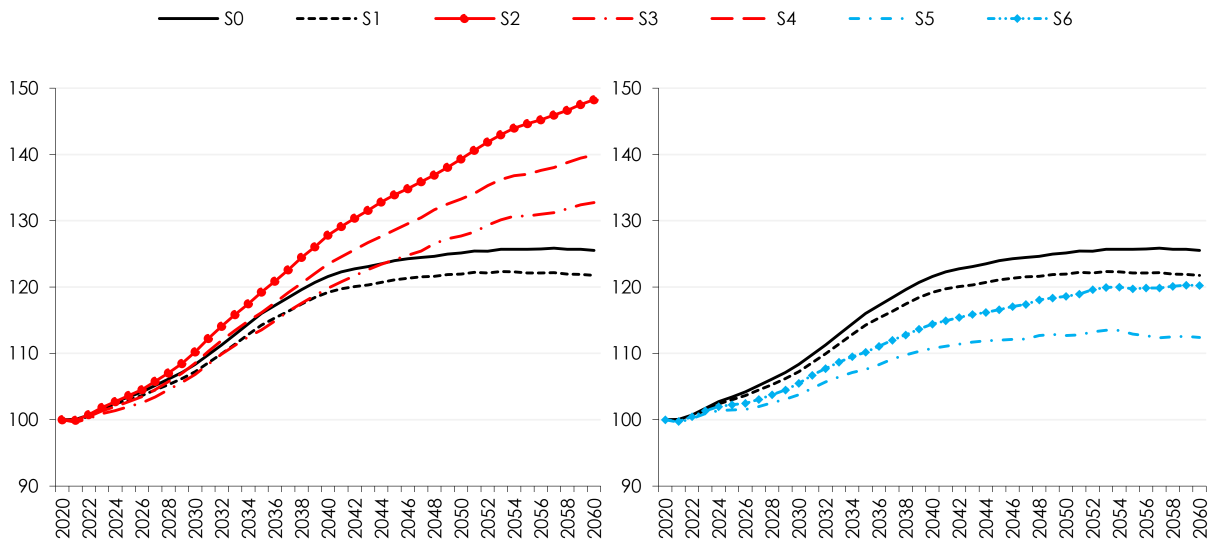
Notes/Source: *Projections of future healthcare cost expenditure by scenario (Table 1) based on microDEMS. Relative change to 2020. Left panel shows scenarios S0 to S4, right panel shows scenarios S5 and S6 in comparison to S0 and S1.*

Figure 2: Health care expenditure per capita (*HCE$_{pc}$*)



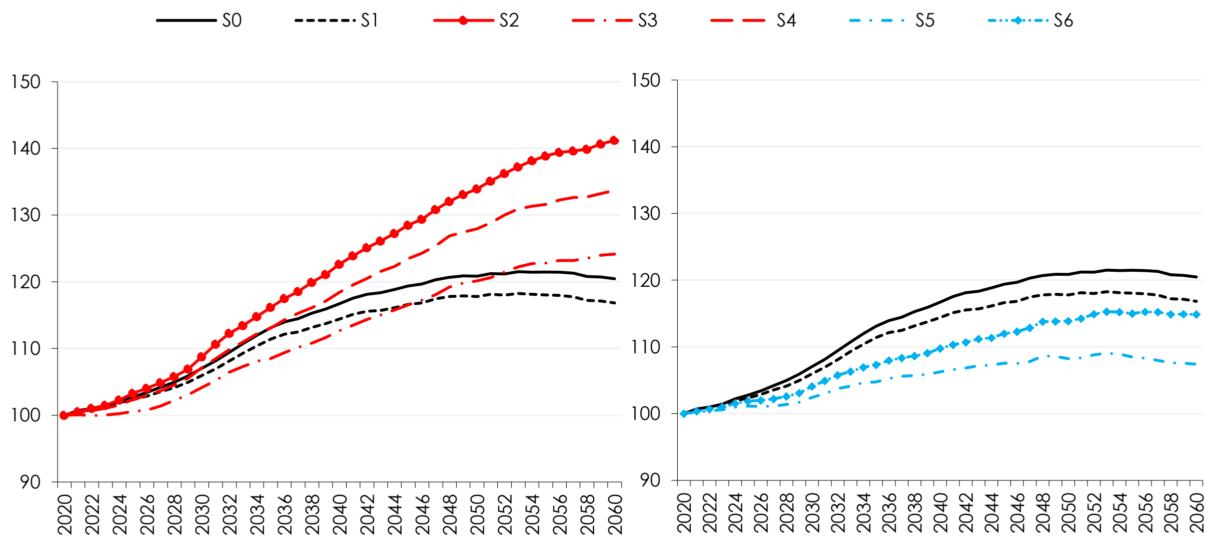
Notes/Source: *Projections of future per capita healthcare cost expenditure by scenario (Table 1) based on microDEMS. Relative change to 2020. Left panel shows scenarios S0 to S4, right panel shows scenarios S5 and S6 in comparison to S0 and S1.*

Figure 3: Health care expenditure divided by working age population (20-64) (*DEP*$_{pop}$)



Notes/Source: *Projections of future healthcare cost expenditure per working age population by scenario (Table 1) based on microDEMS. Relative change to 2020. Left panel shows scenarios S0 to S4, right panel shows scenarios S5 and S6 in comparison to S0 and S1.*

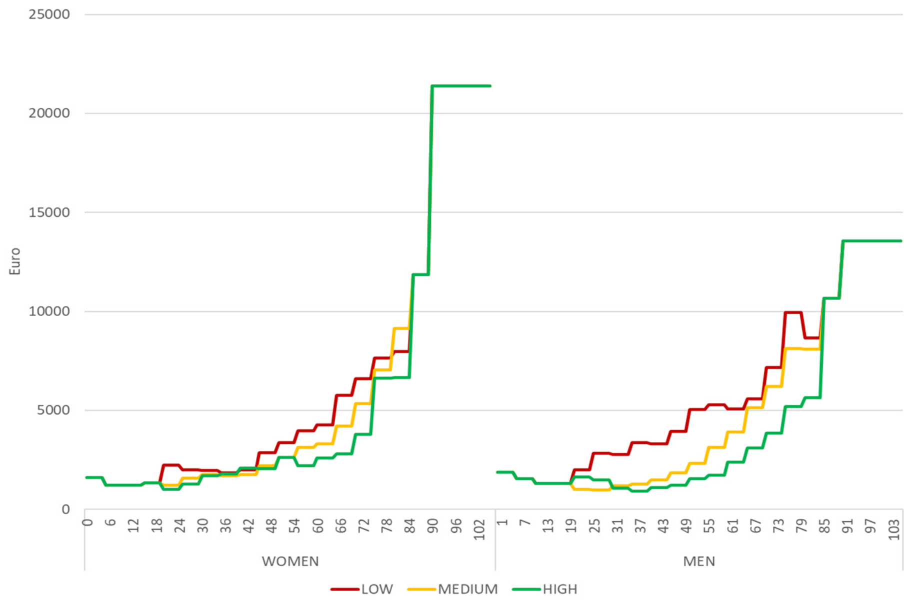
Figure 4: Health care expenditure per active person (*DEP*$_{lfs}$)



Notes/Source: Projections of future healthcare cost expenditure per active person by scenario (Table 1) based on microDEMS. Relative change to 2020. Left panel shows scenarios S0 to S4, right panel shows scenarios S5 and S6 in comparison to S0 and S1.

APPENDIX - TABLES AND FIGURES

Figure A1: Age profile of public health expenditures by gender and education



Source: Horvath et al. (2023). On average, the expenditure levels correspond to official statistics for public healthcare spending in 2014 covering inpatient, outpatient and services daycare services, provided by Statistics Austria by gender and age (in 5-year groups) following the System of Health Accounts (SHA) classification. 2019 prices.

Data availability statement

Microdata used for this research cannot be made available due to legal restrictions: Microdata from the Austrian Health Survey (ATHIS) and the European Union Statistics on Income and Living Conditions (EU-SILC) can be requested free of charge from Statistics Austria for scientific analysis by members of a university or a relevant scientific institution (email: forschungundlehre@statistik.gv.at). Users are not allowed to pass on the data to third parties (http://www.statistik.at/web_de/services/mikrodaten_fuer_forschung_und_lehre/datenzugang/antrag_fuer_sds/index.html). All codes and the model can be downloaded from https://www.microwelt.eu/Model/Model-Index.html.

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Ethical Approval Statement

No ethical approval was applicable. This study did not involve human participants or animal subjects. The manuscript does not contain personal and/or medical information about an identifiable individual and/or a case report/case history.