Future trends in the prevalence of severe activity limitations among older adults in Europe: a cross-national population study using EU-SILC

Scherbov, Sergei; Weber, Daniela

Veröffentlichungsversion / Published Version
Zeitschriftenartikel / journal article

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BMJ Open

Future trends in the prevalence of severe activity limitations among older adults in Europe: a cross-national population study using EU-SILC

Sergei Scherbov,[1,3,4] Daniela Weber[1,2]

ABSTRACT

Objective To project the proportion of population 65+ years with severe long-term activity limitations from 2017 to 2047.

Design Large population study.

Setting Population living in private households of the European Union (EU) and neighbouring countries.

Participants Participants from the EU Statistics on Income and Living Conditions aged 55 years and older and living in one of 26 EU and neighbouring countries, who answered the health section of the questionnaire.

Outcome measures Prevalence of severe long-term activity limitations of particular subpopulations (ie, 55+, 65+, 75+ and 85+ years) by sex and country.

Results We find a huge variation in the prevalence of self-reported severe long-term limitations across Europe for both sexes. However, in 2017, about 20% of the female population aged 65 years and above and about 16% of their male counterparts are expected to report severe long-term activity limitations after accounting for differences in reporting. Accounting for cultural differences in reporting, we expect that European countries will have about 21% (decile 1: 19.5%; decile 9: 22.9%) of female and about 16.8% (decile 1: 15.4%; decile 9: 18.1%) of male 65+ years population with severe long-term activity limitations by 2047.

Conclusions Overall, despite the expected increase of life expectancy in European countries, our results suggest almost constant shares of older adults with severe long-term activity limitations within the next 30 years.

Strengths and limitations of this study

► We used data on 26 European countries collected annually between 2008 and 2014.
► Applying the Sullivan method, we computed life expectancy without severe long-term activity limitations (healthy life years (HLYs)) by sex and 5-year age groups.
► We model the ratio of HLYs and life expectancy to predict prevalence of severe activity limitations among older adults.
► Cultural differences in self-reports are acknowledged, so we used a random intercept approach to consider those properly.

¹Wittgenstein Centre (IIASA, VID/ÖAW, WU), International Institute for Applied Systems Analysis, Laxenburg, Austria
²Health Economics and Policy Division, Vienna University of Economics and Business, Vienna, Austria
³Russian Presidential Academy of National Economy and Public Administration (RANEPA), Moscow, Russian Federation
⁴Vienna Institute of Demography, Austrian Academy of Science, Vienna, Austria

Correspondence to
Dr Daniela Weber;
weberd@iiasa.ac.at

INTRODUCTION

Worldwide populations are growing older. In upper middle-income and high-income countries, life expectancy is increasing and fertility rates are declining, leading to an increase of older populations. However, there is a lack of evidence whether these demographic changes are accompanied by an increase of frail or morbid people. The health status of older population is of raising public interest and a broadly discussed issue since many countries fear a rise in economic costs caused by ageing.

During the last decades, a large body of literature focused on health trends, which were often analysed with indicators using health-specific life expectancies.[1–3] Research on trends in healthy life years (HLYs) and disability-free life expectancy showed an inconsistent pattern. For instance, in the early 2000s, healthy life expectancy showed only little change for European men and women in contrast to their life expectancy,[4] whereas it increased significantly between the early 1980s and 2000s in Austria.[5] Other studies showed that in the USA, higher educated population experienced some compression of morbidity, whereas their lower educated counterparts showed an expansion.[6]

There are inequalities in health expectancies at older ages across the European Union (EU) and even within countries, and there are discrepancies between men and women.[1] Even though women benefit from their mortality advantage over men when it comes to HLYs, the situation is sometimes the opposite. Women in general report higher prevalence of disabilities and frailty.[7] Some research already explored this health-survival paradox.[8 9]

Less research was focused on the impact of possible future trends in healthy and disability-free life expectancy on the socioeconomic development of a country. For instance, are European health systems prepared for higher shares of older adults? Should we expect higher proportions of unhealthy older population?

The objective of this study is to provide an outlook on the future health status of older population measured by living with severe long-term limitations in daily activities. Based on the EU Statistics on Income and Living Conditions (SILC) survey, we project the share of the 65+ years population living with severe long-term activity limitations for 26 European countries by 2047.

DATA AND METHOD
Data

We used the EU-SILC data, which are conducted annually within EU member states and a few additional European states.[10] This cross-sectional and longitudinal microdata provide information on income, poverty, social exclusion and living conditions. Eurostat has coordinated the EU-SILC data since 2003, whereas national statistical institutes have collected the information, first in 6 countries and by 2014 in 31 countries.[11] Although the sampling procedure varies across countries, the samples are considered nationally representative of individuals aged at least 16 years living in private households.[10 11] In our study, we focus on the global activity limitation indicator (GALI), which was designed for monitoring HLYs (ie, life expectancy without long-term activity limitations) within the EU.[12] This measure of general activity limitations was shown to be significantly associated with other health measures such as functional limitations, activities of daily living and instrumental activity of daily living.[13] Since 2008, GALI addresses the long-term activity limitations with the question 'For at least the past 6 months, to what extent have you been limited because of a health problem in activities people usually do?'. There are some minor variations in the wording for the kind of activities across some countries ranging from usual, normal to daily activities (see ref 14). Therefore, we recoded the response categories 'limited, but not severely' and 'not limited at all' as having *no severe difficulties* and 'severely limited' as with *severe limitations*. Moreover, there might be variations in self-reports across cultures due to the uncertainty in defining 'limited, but not severely', so our recoding additionally addresses this potential bias.

We investigated the EU-SILC data provided by Eurostat restricting on the population aged at least 55 years from 2008 to 2014 on an aggregated level by country, sex and 5-year age groups. We also used sex-specific life tables provided by Eurostat for each country and each of our corresponding survey years.[15] In addition, we used sex-specific life tables and age-specific and sex-specific population projections from 2015 to 2050 provided by the United Nations following the medium projection variant assumptions.[16]

Methods

Prevalences of bad general health status are proxied by self-reported presence of long-term activity limitations (ie, the GALI). Sample weights are considered to account for non-response, so that the data are nationally representative for the non-institutionalised population. Using the sex-specific and age group-specific prevalence rates and Eurostat life tables, we applied the Sullivan method to compute health-specific life expectancy, that is, remaining life expectancy without severe long-term activity limitations (also called healthy life years) for each country by 5-year age groups between 2008 to 2014.[17] We determined sex-specific and age-specific HLY for each survey year and computed r, the ratio of HLY and life expectancy.[4 18]

Since our estimation of HLY is based on the self-reported activity limitation status, country-specific cultural norms may play a crucial role in explaining big difference in the prevalence of severe long-term activity limitations. The generosity of social security systems may also play an important role in differences between countries. In this study, we tried to minimise this bias due to reporting style with regressing the ratio of HLY to life expectancy by sex for 26 upper middle-income and high-income countries across Europe using random intercept model.[19] The significant group effect was identified with likelihood ratio tests for men and women. The between country variance explained more than 80% of the variance in r, the ratio of HLY to life expectancy, which supported our motivation to extinguish the potential cultural differences in self-reports.

Furthermore, we tested the importance of time, hence if there is a change in the proportion of remaining life years spent without severe long-term activity limitations (HLY/LE) over the years. While women showed no significant change across time, we identified a small significant increase of r among men. Nevertheless, this increase was on average <0.025 units per year, which can be read as a prevalence increase of <0.5% points per year. Therefore, we decided to ignore this time effect for simplicity reasons and run the following model separately by sex

$$logit(r_{ic}) = \beta_0 + \sum_{i=2}^{8} \beta_i D_{ic} + u_{0c} + \varepsilon_{ic} \qquad (1)$$

with D_{ic} a dummy variable for the 5-year age groups, indicating the first level aggregated by age group and year and c indicates the country group (second level).

Next, we used the sex-specific United Nations life tables for the years 2015–2050 to project HLY by age for those years using estimated $\bar{r}_i$, which represents the age group-specific ratio averaged across all countries. In order to perform comparative analysis, we used a sex-specific and age group-specific overall $\bar{r}_i$ for all countries, rather than applying the country-specific estimated $\bar{r}_{ic}$ because of the huge variation in country effects, which might be defined by cultural and norm differences in countries under consideration.[20]
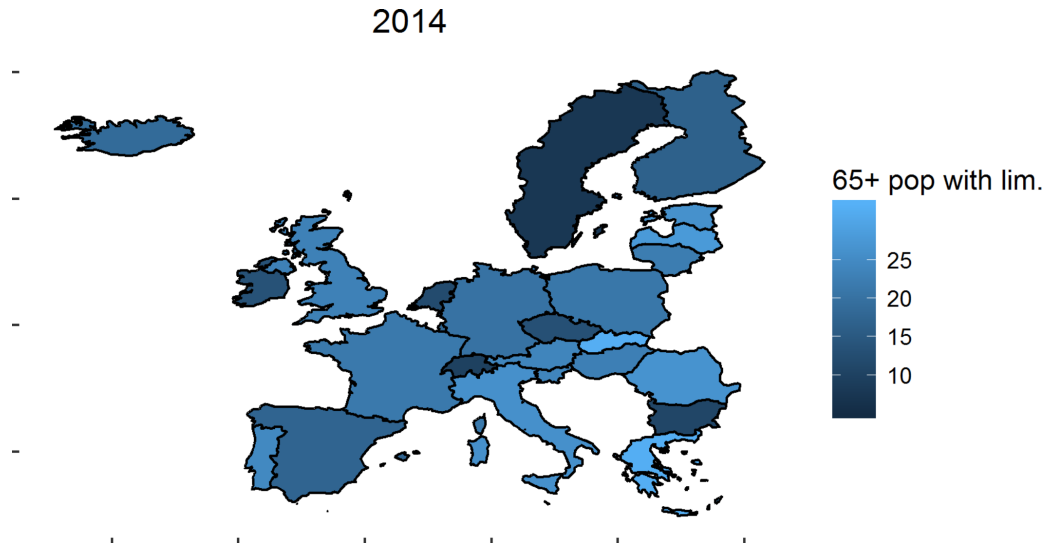
Figure 1 Self-reported severe activity limitations among at least 65 years old women across 26 European countries in 2014.

Having $\bar{r}_i$ and the sex-specific projected life expectancy by age, we were able to calculate sex-specific HLY by age and to estimate the prevalence rate of people with severe long-term activity limitations, subsequently. Moreover, we projected the prevalence rate of people with severe long-term activity limitations and the proportion of older adults with severe long-term activity limitations from 2017 to 2047 using age-specific and sex-specific United Nations population projections.

Since we applied the overall $\bar{r}_i$ for all countries, the differences emerging in projected trends of prevalence of severe long-term activity limitations depend only on population age composition and projected life expectancies. Moreover, while life expectancy is increasing and the ratio of HLY and life expectancy remains constant over time, HLY has to increase and it can decrease only with higher age. Hence, overall sex-specific and age group-specific good general health increases as well, which implies a decline in severe long-term activity limitations.

In addition, we performed some sensitivity analysis considering uncertainty in the estimates and provided a prediction interval around projected prevalences.

RESULTS

Comparing observed prevalence rates of severe long-term activity limitations of older adults (ie, 65+ years population) across Europe, we identified huge disparities in the health of older adults across the investigated upper middle-income and high-income countries for both men and women (figures 1 and 2). For instance, in 2012 in Sweden, only 9.99% of the female 65+ years population reported severe long-term limitations, whereas about 34.15% of their counterparts in Slovakia reported bad health (table 1). The range is a bit narrower for the male 65+ years population, the prevalence rates were between 6.44% and 27.6% in Malta and Slovakia, subsequently (table 1). In all countries, more women than men
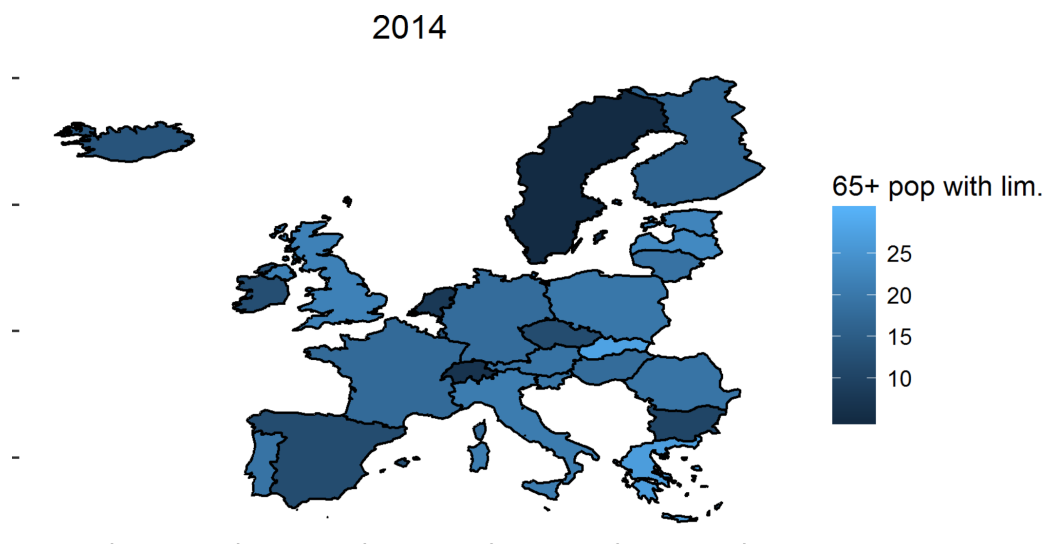
Figure 2 Self-reported severe activity limitations among at least 65 years old men across 26 European countries in 2014.

Table 1 Prevalence rates of women and men aged at least 55, 65, 75 and 85 years with severe long-term activity limitations for 26 European countries in 2012

Country	Women				Men			
	55+	65+	75+	85+	55+	65+	75+	85+
Austria	19.1	23.3	32.6	46.4	17.3	19.9	28.5	40.6
Bulgaria	8.6	11.5	16.3	19.8	7.0	9.9	15.4	26.5
Czech Republic	12.6	15.9	25.4	33.6	10.1	11.6	19.4	27.9
Estonia	22.0	27.8	36.7	54.8	19.5	23.2	31.2	36.5
Finland	12.7	15.3	21.8	24.9	11.4	14.6	21.3	29.3
France	19.3	24.6	32.5	44.7	14.8	18.6	27.3	35.6
Germany	22.8	27.0	38.4	53.3	19.3	21.1	25.2	39.8
Greece	24.9	30.8	39.8	47.0	18.3	23.4	30.9	38.9
Hungary	17.3	22.9	32.4	42.5	14.8	18.6	25.0	38.9
Iceland	21.7	22.1	23.1	22.9	12.8	15.1	18.6	33.3
Ireland	9.3	11.6	15.0	27.6	11.2	14.4	18.5	27.4
Italy	20.8	27.2	37.6	49.3	15.0	19.8	27.5	34.4
Latvia	15.6	20.6	28.0	33.9	13.4	18.9	21.8	35.9
Lithuania	19.0	25.0	33.8	61.4	15.1	18.8	25.1	40.3
Luxembourg	13.0	17.0	21.0	20.0	11.1	13.2	18.7	27.2
Malta	8.5	12.2	23.0	36.9	5.2	6.4	12.4	15.1
Netherlands	9.6	11.6	16.6	17.6	9.4	10.4	15.5	16.4
Poland	15.8	21.4	30.5	43.9	14.8	19.1	26.0	39.9
Portugal	19.8	25.5	33.3	44.6	14.5	18.9	25.6	33.0
Romania	21.7	28.3	39.7	55.6	15.1	20.5	31.4	42.4
Slovakia	24.9	34.1	47.8	59.1	20.5	27.6	45.0	78.4
Slovenia	23.5	30.2	41.0	47.0	18.4	21.3	19.6	38.5
Spain	13.3	17.8	26.0	37.4	9.9	12.3	18.0	27.6
Sweden	10.2	10.0	12.7	15.3	7.2	8.0	14.0	22.5
Switzerland	10.2	11.3	14.7	18.9	8.1	8.7	10.7	15.3
UK	21.8	26.4	35.1	44.8	17.1	19.8	27.4	37.4

reported severe long-term activity limitations, although women tend to have higher life expectancy than men.

However, we observed a very pronounced difference in the prevalence of severe long-term activity limitations also among the countries where remaining life expectancy at age 65 years often differs very little. Considering these variations between countries, our random intercept regression showed a decline in the ratio of HLY to life expectancy by age, as expected. Moreover, the clear decline by age was of almost the same magnitude for both sexes (see online supplementary tables S1 and S2). Hence, men and women experienced the same speed of health deterioration.

We showed that the so-called burden of unhealthy population is very similar across European countries (see table 2), if we exclude cultural differences in reporting and consider only differences in age structure and life expectancy.

Controlling for cultural bias in self-reports, we noticed some changes over time in the ranking of countries with the highest and lowest level of older adults with severe activity limitations. For instance, Lithuania followed by Latvia had the highest shares of unhealthy 65 years and older adults in 2017. In 2047, Germany and the Netherlands can be expected to have the highest proportion of men above age 65 years with severe long-term activity limitations.

Furthermore, our results demonstrate almost no increase of the proportion of people with severe long-term activity limitations for most European countries participating in EU-SILC. These results are valid both for men and women (see table 2). Within 30 years, the magnitude of change in the proportion of people 65+ years is less than 2.5% points among the female population and even smaller among men (2% points).

In the online supplementary figures S1 and S2, we show the prediction intervals of the proportion of men and women at ages 65+ years based on uncertainty in parameter estimations related to the age effects. Very little uncertainty in age effects is translated into relatively

Table 2 Prevalence rates of at least 65 years old women and men with severe long-term activity limitations for 26 European countries in 2017, 2027, 2037 and 2047; in parentheses change since 2017.

Country	Women				Men			
	2017	2027	2037	2047	2017	2027	2037	2047
Austria	20.68	20.21 (−0.47)	19.96 (−0.72)	21.40 (0.72)	16.17	15.93 (−0.24)	15.96 (−0.21)	17.25 (1.08)
Bulgaria	21.27	21.70 (0.43)	21.95 (0.68)	21.66 (0.39)	17.11	17.29 (0.18)	17.32 (0.21)	17.12 (0.01)
Czech Republic	20.02	20.89 (0.87)	21.49 (1.47)	20.63 (0.61)	15.83	16.46 (0.63)	16.7 (0.87)	16.16 (0.33)
Estonia	21.49	21.21 (−0.28)	21.73 (0.24)	21.86 (0.37)	16.85	16.48 (−0.37)	16.74 (−0.11)	16.80 (−0.05)
Finland	19.80	20.37 (0.57)	21.86 (2.06)	21.87 (2.07)	15.48	16.21 (0.73)	17.30 (1.82)	17.24 (1.76)
France	20.26	19.81 (−0.45)	20.71 (0.45)	21.52 (1.26)	15.94	16.08 (0.14)	16.76 (0.82)	17.20 (1.26)
Germany	21.22	20.61 (−0.61)	20.52 (−0.7)	22.28 (1.06)	16.56	16.20 (−0.36)	16.31 (−0.25)	17.79 (1.23)
Greece	21.01	20.72 (−0.29)	20.51 (−0.5)	21.06 (0.05)	17.11	16.74 (−0.37)	16.39 (−0.72)	16.58 (−0.53)
Hungary	21.05	21.34 (0.29)	21.87 (0.82)	21.01 (−0.04)	16.64	16.91 (0.27)	17.09 (0.45)	16.51 (−0.13)
Iceland	19.71	18.95 (−0.76)	20.06 (0.35)	21.01 (1.3)	15.43	15.15 (−0.28)	16.30 (0.87)	16.75 (1.32)
Ireland	19.25	19.37 (0.12)	19.78 (0.53)	19.86 (0.61)	15.43	15.57 (0.14)	15.82 (0.39)	15.97 (0.54)
Italy	20.62	20.36 (−0.26)	20.19 (−0.43)	21.51 (0.89)	16.27	16.20 (−0.07)	16.11 (−0.16)	17.07 (0.8)
Latvia	21.98	21.52 (−0.46)	21.74 (−0.24)	22.22 (0.24)	17.40	16.93 (−0.47)	17.05 (−0.35)	17.22 (−0.18)
Lithuania	22.21	21.24 (−0.97)	21.41 (−0.8)	22.61 (0.4)	18.27	16.92 (−1.35)	17.05 (−1.22)	17.57 (−0.7)
Luxembourg	20.51	19.26 (−1.25)	19.29 (−1.22)	20.24 (−0.27)	15.84	15.22 (−0.62)	15.45 (−0.39)	16.43 (0.59)
Malta	19.68	20.74 (1.06)	21.43 (1.75)	21.09 (1.41)	15.55	16.28 (0.73)	16.93 (1.38)	16.58 (1.03)
Netherlands	19.76	19.90 (0.14)	20.68 (0.92)	22.09 (2.33)	15.60	15.86 (0.26)	16.50 (0.9)	17.62 (2.02)
Poland	20.14	19.91 (−0.23)	21.77 (1.63)	21.03 (0.89)	15.98	15.85 (−0.13)	17.05 (1.07)	16.43 (0.45)
Portugal	20.73	20.45 (−0.28)	20.55 (−0.18)	21.12 (0.39)	16.53	16.33 (−0.2)	16.48 (−0.05)	16.88 (0.35)
Romania	21.24	21.15 (−0.09)	21.27 (0.03)	21.36 (0.12)	16.98	16.88 (−0.1)	16.88 (−0.1)	16.95 (−0.03)
Slovakia	20.29	20.21 (−0.08)	21.29 (1)	20.80 (0.51)	16.11	16.10 (−0.01)	16.86 (0.75)	16.38 (0.27)
Slovenia	20.76	20.14 (−0.62)	20.85 (0.09)	21.45 (0.69)	15.95	15.77 (−0.18)	16.56 (0.61)	16.91 (0.96)
Spain	20.69	19.86 (−0.83)	19.73 (−0.96)	20.64 (−0.05)	16.40	15.88 (−0.52)	15.81 (−0.59)	16.53 (0.13)
Sweden	20.05	20.71 (0.66)	20.95 (0.9)	21.18 (1.13)	15.68	16.49 (0.81)	16.67 (0.99)	16.94 (1.26)
Switzerland	20.12	19.74 (−0.38)	19.82 (−0.3)	21.04 (0.92)	15.71	15.69 (−0.02)	15.91 (0.2)	16.91 (1.2)
UK	20.37	20.25 (−0.12)	20.36 (−0.01)	21.25 (0.88)	16.07	16.13 (0.06)	16.20 (0.13)	16.87 (0.8)

narrow prediction intervals. The trends in proportion of people with severe long-term activity limitations are almost constant for most countries (eg, Estonia, Greece and Hungary). However, Germany and some other countries showed a slight increase and only a few countries such as Poland showed a slight decline in the proportion of people with severe long-term activity limitations (see online supplementary figures S1 and S2).

DISCUSSION
In this analysis of EU-SILC data, we investigated self-reports in severe activity limitations of older adults in 26 upper middle-income and high-income countries across Europe. Our results showed that HLY differ considerably, which might be explained by self-reports. Countries with relatively similar levels of mortality, life expectancies and health systems are not expected to differ much in HLY apart from cultural differences in self-reports. For

instance, Germany and the Netherlands are very similar in their remaining life expectancy at age 65 years (21 years for females and about 18 years for men), but they differ in terms of remaining life years without severe activity limitations; there is a gap of 3 years for women and about 2 years for men (women: 15 years Germany, 18.4 years Netherlands; men: 13.8 years Germany, 18.4 years Netherlands). Moreover, these potential cultural differences in self-reports are supported by our investigations in the ratio of HLY and life expectancy. Country differences explained 80% of the difference in the ratio. Another issue that may lead to the differences in self-reporting is the generosity of the welfare system. In more generous systems, higher reports of severe long-term activity limitations might go together with the easier access to disability benefits. There might be also 'true' differences in self-reported health attributed to different life styles in European countries or differences in genetics. However, one

would expect that morbidity and disability are also relatively close, if the levels of mortality are very close.

We also showed that the ratio of remaining life expectancy without severe long-term activity limitations to the total remaining life expectancy does not change with time for women and only little for men and that the so-called burden of unhealthy population is very similar across European countries once potential cultural differences in self-reports are excluded. Furthermore, the general concern that ageing is accompanied by an increase of disability may occur in the absolute level only, but more importantly, the proportion of adults aged 65+ years with severe long-term activity limitations will remain almost constant in the upcoming years, although total life expectancy is expected to increase. A recent study on disabilities (ie, difficulties with activities of daily living) suggests similar trends of no increase in the prevalence for England and Wales by 2025, but an increase of older people with care needs in absolute numbers.[21] Interestingly, research on trends between 1991 and 2011 using different English data showed that while more life years are spent healthy, less severe disabilities are increasing.[22] This increase in less severe disabilities might be in consequence of variations in self-reports as also identified in our study or an increase in obesity.

However, there may be important policy implications derived from our results on trends in severe long-term activity limitations. Even though the trends in proportion of people with limitations will remain constant, the absolute number of people with severe long-term activity limitations will definitely increase since the number of people at older ages is expected to increase in most European countries. It might require several measures to accommodate the needs of an increasing number of people with activity limitations such as expanding infrastructure for disabled people in the public as well as private area, training of medical specialists and care professionals.

Some limitations of this study should be noted. First of all, EU-SILC survey does not cover the institutionalised population. Even though we have included sample weights to control for non-response, there was nothing we could do to include the institutionalised population within our projections. Another limitation is the application of Sullivan method to compute HLY rather than using panel data, and calculating multistate life tables, but this is more a data limitation. Nevertheless, our study on future trends in the prevalence of severe long-term activity limitations confirms a recent comment by Kenneth Rockwood. He stated that we should not expect to spend our whole life in good health,[23] rather European countries might expect more older adults with severe long-term activity limitations but, in relative terms, the number stays constant.

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