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Is there a Wealth Dividend of Aging Societies?

Marc Suhrcke,[1,2]
Elena Fumagalli,[1]
Ruth Hancock[1]

ABSTRACT

Apocalyptic views on the social, economic and health consequences of aging abound. This review examines the potential upside of aging, in particular from a public health perspective. First, we review the evidence on whether there is healthy aging in the sense of a compression of morbidity: people spending fewer of the life years gained in poor health. The evidence turns out to be decidedly mixed, depending on the country, the data and perhaps most critically on the definition of "health" considered. Second, we explore the potential and actual labour market impact a healthy elderly population could make. We find considerable support for the notion that if only effective retirement age was raised to reflect past and future increases in life expectancy, then the result could be a significant increase in elderly labour force participation rates. Moreover, a significant share of the already retired elderly population is in good health, indicating a potential unused capacity for the labour market. Third, we turn to the impact of improved health (especially among the elderly) on healthcare expenditures. In general, evidence does not support the optimistic expectation that improved health will mitigate or even reverse the trend of increasing health expenditures. Even if better health may, in some circumstances, lead to lower healthcare spending, other cost drivers, in particular technological advances, will more than outweigh any such expenditure-reducing effect. On the other hand, there is not much support for the hypothesis that better health by itself is a major cost driver. Policy can make a difference in facilitating the realisation of the potential benefits of a healthy aging scenario. This does, however, require a coordinated approach between social, economic and health policy and will enter into policy arenas in which the political costs of reform, despite their expected societal benefits, may become a bottleneck that is hard to overcome.

Key Words: Aging, retirement, wealth, labour, healthcare

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[1] Norwich Medical School, University of East Anglia, United Kingdom.

[2] UKCRC Centre for Diet and Activity Research.

Corresponding Author Contact Information: Marc Suhrcke at M.Suhrcke@uea.ac.uk; Elizabeth Fry Building 2.07, Norwich Medical School, University of East Anglia, Norwich, NR4 7TJ, UK.

INTRODUCTION

Aging, defined by the United Nations as "the process whereby older individuals become a proportionately larger share of the total population,"[1] is a global phenomenon, if to varying degrees across countries. In high-income countries (but increasingly also in some fast developing low- and middle-income countries) this is often seen as a problem: a greater share of older people is seen to impose a drag on economic dynamism and hence growth; and it allegedly adds even greater and possibly "unsustainable" financial burden onto already hard pressed healthcare and more generally social security budgets. Back in 1994, the World Bank stated in their influential report, "Averting the Old Age Crisis": "The world is approaching an old age crisis…. The proportion of the population that is old is expanding rapidly, swelling the potential economic burden on the young."[2]

In the public health arena, some researchers are less pessimistic, and point to the possibility of "healthy aging"[3] or even "successful aging",[4] implying that there may also be an upside to aging societies. It is also suggested that under some circumstances rather tangible economic benefits could even be reaped from such a healthy aging scenario. First, it would allow people to remain employed longer (contributing to the labour force) and second, it would at least mitigate if not prevent the otherwise expected rising cost pressures on the health and social care system. If this holds true, there may be an economic or "wealth dividend" associated with aging societies.

In this review we explore whether such expectations can be supported by the existing evidence. In particular, we examine the following hypotheses in successive sections:

(1) As societies age, people not only live longer, they also live longer in better health.
(2) By living longer and – maybe – healthier, individuals and countries can make a positive contribution to the labour market.
(3) If people live longer and in particular healthier, this will save healthcare expenditures.

These questions matter as the answers, if affirmative, could alter the hitherto predominantly negative perception of the phenomenon of aging, allowing us to appreciate its resulting opportunities, while mindful of the inescapable downsides it may entail. The final section of the article summarises the findings and draws modest research and policy implications.

HYPOTHESIS (1): "AS SOCIETIES AGE, PEOPLE NOT ONLY LIVE LONGER, THEY ALSO LIVE LONGER IN BETTER HEALTH"

Life expectancy has increased steadily and often linearly in developed countries over the past 30 years, suggesting the absence of a biological limit.[5] Since this trend – in combination with low fertility rates and modest migration – will increase the old age dependency ratio, a key parameter for the sustainability of social security systems, some expect serious fiscal challenges as a result, for healthcare budgets and beyond.[6] There is, however, the hope that the rising fiscal cost burden of people living longer (which in itself represents an enormous benefit in a broader welfare economic sense)[7] may, at least partly, be mitigated, if the longevity increase is accompanied by a reduction in morbidity or disability. Three scenarios could emerge:

(1) "Compression of morbidity": an optimistic theory suggested by Fries (1980, 1989, 2003), which describes an increase in both the absolute expectation and the proportion of the life span free of serious disease and disability.[8-10] The similar "relative compression of morbidity" scenario asserts only that the proportion of additional life years free of disease increases.[11]

(2) "Expansion of morbidity", which is the opposite extreme, posits that mortality gains are being achieved mainly through improvements in medical care and secondary prevention strategies acting so as to extend the life of people with underlying illness or disability.[12,13]

(3) "Dynamic equilibrium" represents the intermediate scenario, in which case the gains in longevity translate one-to-one into gains of years in good health.[14]

The evidence on the empirical validity of the three scenarios is inconclusive. The evolution of years characterized by morbidity in late ages, measured by indicators such as health adjusted life expectancy (HALE) and the disability free life expectancy (DFLE), varies between and within countries.[15,16]

Figure 1 illustrates the variation between European countries, using data on the ratio between healthy life expectancy and life expectancy at age 50, produced by the European Health Expectancy Monitoring Unit (EHEMU).[17] Taking the data at face value, the ratio has increased in eight out of the thirteen countries and decreased in five. There is evidence that compression of morbidity may be occurring over time in some low-mortality countries as death rates at older ages continue to decline (e.g., France, Switzerland, and the United States).[18,19] By contrast, in Taiwan

overall disability rates are declining more slowly than mortality rates, while in the United Kingdom, there appears to be an equilibrium between falling mortality and increasing disability.[20]

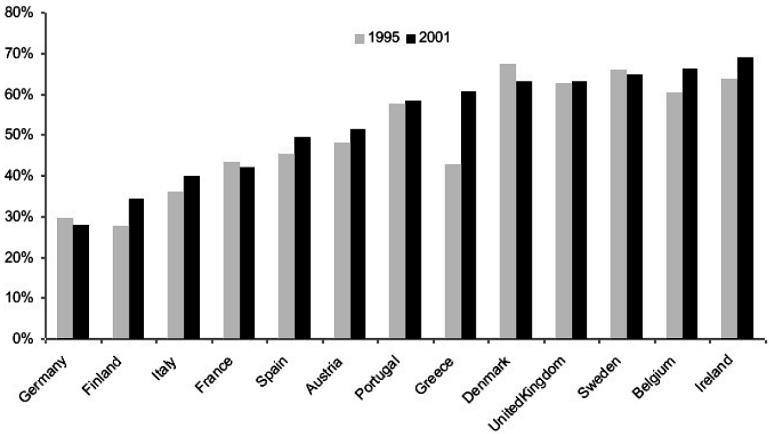


Fig. 1. Healthy life expectancy as a share of life expectancy (at age 50, men). Note: The initial year is 1996 for Finland and Greece and 1997 for Sweden.

Source: European health expectancy monitoring unit. Trends in disability-free life expectancy at age 65 in the European Union 1995-2001: A comparison of 13 EU countries. Ehemu Technical Report 2009_5.1. Ehemu; 2009. Available at URL: http://www.ehemu.eu/ (accessed 10 March 2011).[17]

Increases in longevity have accrued to men rather than women, but healthy life expectancy has tended to increase for both genders,[5,21] implying a lower sex ratio (women/men) and a reduction in the number of widows. It has been shown that in the US an increase of time spent living as a couple due to relatively increased male life expectancy could lead to a greater supply of informal care and a decrease of health and long-term care expenditure due to a decreased number of individuals living in nursing homes.[22,23]

Changes in healthy life expectancy differ between the young old (< age 85) and the oldest old (age 85+). As for the former, the evidence is again mixed. According to the review conducted by Christensen et al., both the number of years lived with morbidity and the number of years in good self-perceived health have generally increased.[5] Meanwhile, part of the increase in the incidence of chronic diseases seems to result from the growing obesity epidemic.[24,25] In addition, for the younger old, the quantity of individuals reporting non-severe and severe disabilities has grown. By contrast, no major changes have occurred in the oldest old. Freedman et al. (2008)

studied the trends in prevalence of disability in the US from 1995 to 2004 using different waves of the Health and Retirement Study.[26,27] They found a decrease in difficulties with activities of daily living (ADL) while no effect was found when instrumental activities of daily living (IADL) were analyzed.[26] (See Freedman et al. (2002) for a systematic review of the decrease in disability in the US.)[28] Similarly, Manton et al. (1997) and Manton et al. (2001) claim that not only has disability declined during both the 1980s and the 1990s, but in more recent years the decline has been sharper.[29,30] The reasons for the partial decline in disability have been attributed to better medical technologies, better education and reduced smoking.[31]

In sum, the mixed evidence suggests that while a scenario of healthy aging, defined as a compression of morbidity, is possible and has been observed in several countries, this is by no means guaranteed. In a theoretical contribution, Michel & Robine suggest that aging follows a cyclical pattern, according to which, first, sicker people survive into old age and disability rises; then the number of years lived with disability decreases as new cohorts of healthier people enter old age; but, finally, the number of years lived with disability rises again when the average age at death rises so much that many people spend their last years at an advanced age burdened by multiple chronic illnesses and frailty.[20] If this is the case, then today's low – and middle-income countries face a future with periods of both expanding and compressing morbidity.

HYPOTHESIS (2): "BY LIVING LONGER AND – MAYBE – HEALTHIER, INDIVIDUALS AND COUNTRIES CAN MAKE A POSITIVE CONTRIBUTION TO THE LABOUR MARKET"

Longer life means longer and more potential labour market attachment

If people live longer, it is at least plausible to consider the potential for them to work longer. Increasing the effective retirement age (which has stalled or even declined in past decades) in developed countries is an obvious means of averting at least part of the predicted future labour force decline. According to the Organisation for Economic Co-operation and Development (OECD) estimates, with unchanged labour market and immigration conditions, the labour force in the countries belonging to the European Union before May 2004 (EU15) could decline by around 14 percent (25 million workers) by 2050 compared to the 2010 peak. This is more favourable than in Japan, where the labour force has already started this decline, but it is still far from the US benchmark where the labour force

is projected to continue increasing, by about 26 percent (37 million workers) between 2005 and 2050.[32]

But what difference would it make to the labour force and to the old age dependency ratio, if indeed the retirement age was allowed to increase in accordance with longevity gains? Another OECD study tried to answer this question by examining the effect of having the "working age" – commonly assumed to range from 15 to 64 – increase along with longevity gains. The authors conservatively set an average increase of 1.2 years per decade in both longevity and retirement age over the years 2005 to 2050.[33] Figure 2 shows what would happen to the size of the EU15 working-age population with those increases: the fairly modest adjustment would almost stabilize its size, contrasting markedly with what would happen without such adjustment.

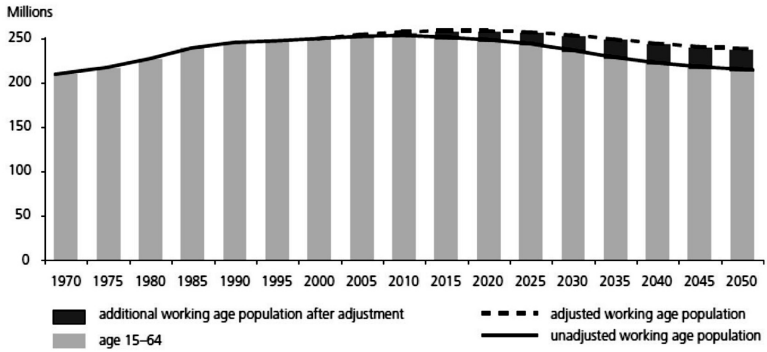


Fig. 2. Predicted size of the EU15 working-age population with and without adjustment of upper working-age limit.

Source: Oliveira Martins J, et al. The impact of ageing on demand, factor markets and growth. Economics Working Paper No. 420. Organisation for Economic Co-operation and Development (OECD): Paris; 2005; and Suhrcke M, et al. The economic costs of ill health in the European Region. WHO Regional Office for Europe: Copenhagen;2008.[33,34]

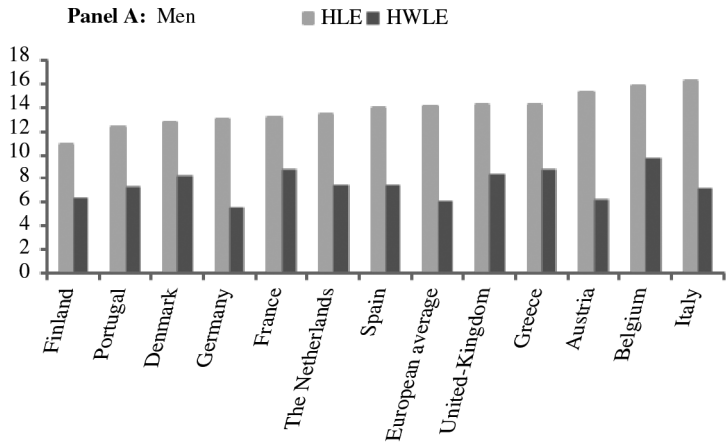
Increasing the working-age population (and thus reducing the dependency ratio) should mitigate some of the pressures on health and social expenditures. It also has the potential to contribute positively to the economy at large, although this effect will depend crucially on whether the larger working-age population also participates actively in the labour market and whether employers demand the extra labour. (This already illustrates the importance of complementarities in reform, some of them clearly beyond the influence of health ministries.)

It is not, however, sufficient that additional older workers be in demand. It is also necessary that the additional years of life be spent in reasonably good health, and that a significant share of those who are retired (within a realistic age range of, say, up to 70 years), would be in good enough health to be able to work, in case retirement age would be revised upwards.[34]

There is a great deal of "unused capacity" among the elderly

Put differently, the first challenge is to establish that there is significant "unused capacity" for the labour market: people that are currently in good health but have already retired. One novel approach of assessing such unused capacity has recently been proposed by Lievre et al.,[35] on the basis of European Community Household Panel (ECHP) data[36] covering 12 EU countries. The authors break down the number of years lived between age 50 and 70 years into those lived in good health, those lived in work and those lived in good health and in work (Healthy working life expectancy (HLWE)). Their results indicate that on average in the 12 EU countries, out of the 20 years between 50 and 70 years of age, men spend 14.1 years in good health, of which about one half are spent at work, and women 13.5 years in good health, of which about one third are spent at work.[35] Figure 3 provides the country-specific details for healthy life expectancy (HLE) and HWLE. There are hence significant gaps between the two, especially in Italy, Belgium and Austria, suggesting that at least in principle there would be the opportunity to increase labour force participation among the elderly aged between 50 and 70 years, without obliging unhealthy people to work longer.

Figure 3 also implies that it must be factors other than health itself that affect a large part of the cross-national variation of elderly labour force participation rates of healthy individuals: if health did play a role, one would observe a positive relationship between HLE and HWLE. By contrast, there is seemingly no relation at all between the two for men, and even an inverse relationship for women.



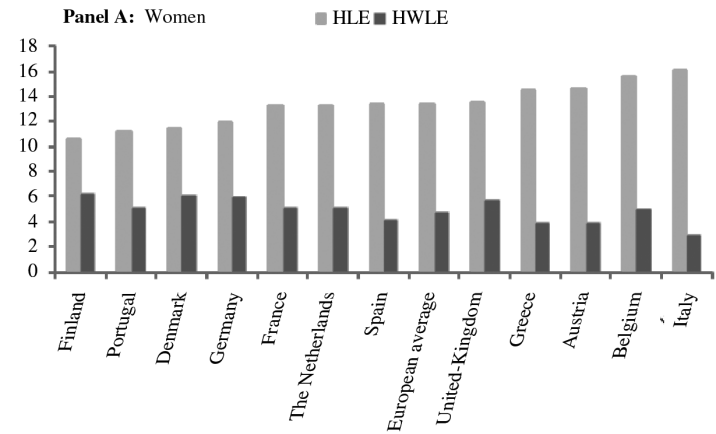


Fig. 3. Healthy life expectancy and healthy working life expectancy between age 50-70, based on ECHP data.

Source: Lievre A, et al. Healthy working life expectancies at age 50 in Europe: A new indicator. J Nutr Health Aging. 2007;11:508-14.[35]

Similar conclusions emerge from other European research[37] that relied on a more recent multi-country survey specifically designed to capture health and retirement patterns among the elderly – the Survey on Health, Ageing and Retirement (SHARE).[38] Using data for 13 European countries, the authors found again a sizeable share out of those in good health

(measured by self reports and by functioning indicators) in the age group 50 to 69 that is already retired, ranging from about 18 percent in Switzerland to approximately 50 percent in Austria).[37]

Boersch-Supan et al. also support the idea that factors other than health – in particular incentives set by the social security system – play a relevant role in affecting people's retirement decisions in Europe.[37] Boersch-Supan et al. go, however, one step further than Lievre et al.[35] by specifying the relative contribution of both health and social security systems. In their multivariate analysis of individual retirement decisions they are able to control for a large variety of factors, including a range of high quality health variables, and a proxy for the generosity of the social security and pension system of each country. It turns out that even after controlling for country dummies, the coefficient on the "generosity" variable remained significant.[37] This clearly testifies to the importance of institutions in explaining the variation in retirement decisions between countries. Health also is found to matter significantly, but as a determinant of the variation in retirement within countries, a conclusion also confirmed by Angelini et al.[37,39]

We turn next to the literature that has examined the (important) role of health in explaining within-country variation in activity rates.

Health matters for retirement (at the individual level)

There is now a wealth of evidence supporting the idea that healthier elderly workers are significantly less likely to retire than less healthy ones, and that this relationship is likely to reflect a causal relationship. Several reviews have concluded that the evidence is sufficient to state that poor health and negative health shocks increase the probability of retiring in high-income countries.[40-43] Health status even emerges as the main – but of course not the sole[*] – determinant of labour supply by older workers in several studies.

Hagan et al. found that health exerted a significant and strong impact on the probability of retiring, all else being equal.[45] They used data from nine countries (Belgium, Denmark, France, Greece, Ireland, Italy, Portugal, Spain and the UK) covered by the ECHP for 1994 through 2001, with a sample of individuals aged 50 to 64 and either employed or self-employed in 1994. They used alternative definitions of retirement (self-reported or

[*] An important factor in the decision to retire is an individual's financial incentives, determined largely by the characteristics of the country's pension and social protection system.[44]

based on the transition from activity to inactivity[**] and alternative measures of health (self-assessed health, limitations due to ill health, a constructed health status measure and a measure of health shocks) and found a consistent effect of health status on retirement decisions. Acute health shocks were more important than poor health per se. Pooling data from all countries revealed that a medium health shock would, all else being equal, increase the probability of retiring by 50 percent, while a large one would increase it by 106 percent (Table 1).

Table 1

Change in the probability of retiring due to a one-unit change in the health measure (pooled results), in percentages

Health measures contributing to the decision to retire	Effect on two indicators of retirement (%)	
	Self-reported retirement	Transition to inactivity
Self-assessed health	–15[a]	–18[a]
No limitation due to ill health	–25[a]	–30[a]
Health stock	–13[a]	–17[a]
Health shock:		
small	0	+14
medium	+44[a]	+50[a]
large	+47[a]	+106[a]

Note: [a] Significance at 1% level. The normalized variable "health stock" has a mean of 0 and a standard variation of 1.

Source: Hagan R, et al. Health and retirement in Europe. J Environ Res Public Health. 2009;6:2676-95.[45]

Hagan et al. also looked at how the impact of health shocks and health stocks varied among countries, variation that may be associated with the incentives for retirement embedded in a country's social security and tax systems. Despite the cross-country variation, the fundamental results from the pooled analysis presented above did hold through.[45]

[**] The self-reported version was based on the self-classification of respondents as "retired", as 1 out of 12 options for their activity status. The second, broader variable used the transition between reported activity in the labour market and inactivity as a measure of retirement. This was chosen because of doubts raised about the accuracy of the self-reported "retired" and because transitions from activity to inactivity have been used frequently as outcome measures in analysing the effect of health on retirement. Retirement was taken as an absorbing or permanent state, so individuals were followed from work to when they first reported retirement, and any subsequent transition back to work was disregarded.[45]

Kalwij & Vermeulen produced a similar cross-country analysis, using data collected in 2004 for 11 countries in the European SHARE survey.[38,46] In contrast to the ECHP data used by Hagan and colleagues,[45] the SHARE data used in this study covered only one point in time.[*] On the other hand, SHARE focuses on those over 50 and has a more extensive collection of health indicators, many of them objective and not subject to the measurement bias commonly associated with the standard self-reported health variables. This makes SHARE particularly suitable for examining how health affects labour force participation by the elderly.

The research found that several health indicators were significantly associated with the probability that men and women aged 50 to 64 would participate in the labour force.[**] They estimated the decision of working/not working separately for each country and for men and women. They used five health variables: maximum grip strength and whether or not the individual ever had a severe or a mild condition, suffered from restrictions in activities of daily living or was obese. Only in France, Greece and Switzerland did none of the health variables significantly affect the probability that men would participate in the labour force, while this was only true for women in Austria.[*] To illustrate the statistically significant results: having ever suffered a severe condition significantly lowered the probability of women's participation in the labour force in four countries by 11 to 28 percentage points, while for men the range in five countries was 13 to 31 percentage points.[46]

A series of country-specific analyses also confirmed that health affects retirement decisions. Most of the evidence is from Western European countries, such as research by Kerkhofs et al. and Lindeboom & Kerkhofs,[47,48] who used panel data from the Netherlands. Roberts et al.,[49] using comparable longitudinal data sets for the period 1991 to 2002, found health to be the key determinant of whether someone would retire in Germany and the UK. Using the same British data, Disney et al. found robust evidence that health deteriorations increased the probability that older people would transition from economic activity to inactivity.[50] They

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[*] The second round of SHARE, fielded in 2006 and 2007, was released in early 2008.

[**] The countries covered were: Austria, Belgium, Denmark, France, Germany, Greece, Italy, the Netherlands, Spain, Sweden and Switzerland. Data for the first wave were collected in 2004, except in Belgium and France, where they were gathered in 2004–2005.

[*] The authors do not address the potential endogeneity problem but rather assume that the health indicators they employed are exogenous to labour market participation, thereby justifying the single equation probit they used, a decision further justified by the more objective nature of the health indicators available in SHARE.

also found that the impact of deterioration and improvement in health was asymmetrical, with a deterioration in health having a larger negative effect than the positive effect associated with a health improvement of similar magnitude. Siddiqui used longitudinal data from West Germany to show that being disabled or suffering from a chronic disease significantly increased the probability of early retirement.[51] Using Spanish survey data from 1999, Jiménez-Martin et al. found that (self-reported) ill health and disability shocks significantly affected the probability that older workers would continue working.[52] Using a Danish Longitudinal Register database for the years 1991 to 2001 and medical data from the Danish National Patient Registry, Datta Gupta & Larsen found that men aged 50 to 69 were 8 percent more likely to retire two years after suffering an acute health shock (e.g., heart attack, stroke or incident cancer).[53]

HYPOTHESIS (3): "IF PEOPLE LIVE LONGER AND IN PARTICULAR HEALTHIER, THIS WILL SAVE HEALTHCARE EXPENDITURES"

Upward pressure on healthcare spending during the last two decades has captured policy-makers' attention. One suggestion for containing these costs is to improve population health, which certainly sounds plausible: healthier people need less healthcare, which would in turn reduce expenditure. This idea underpinned the influential Wanless report, commissioned by the UK Treasury.[54] However, some are sceptical, suggesting that better health status may even increase future healthcare spending.[55] This section sheds some light on the matter, reviewing relevant studies (see also Suhrcke et al. 2008 for a more comprehensive review).[34] We focus on the effect on health expenditures and not the effect on government expenditures in general.

The brief answer to the question, "Does better health lower future health expenditures?" can only be, "It depends". Different studies looking at different countries with different data for different health conditions find very different results. We examine some of the factors that influence the results obtained, but first, we remind readers that many other factors also affect health expenditures, as discussed elsewhere.[33] Most of these factors, especially technological progress, will most likely continue to contribute to sustained upward pressure on health expenditures. Thus, in terms of health expenditures, improvements in population health can, at best, be expected only to diminish their rate of increase.

We have identified several factors that affect health status and, acting in different directions, could affect healthcare expenditure:

- less disease and disability at a given point in time, for a given population or at a given age do lead to lower healthcare expenditure at that time;
- however, the longer life that often accompanies better health increases the number of the years over which healthcare costs will accumulate;
- on the other hand, acute healthcare costs are concentrated in the period just before death, and deaths at older ages actually incur fewer costs, as treatment intensity tends to decline with the age of death;
- however, the costs of long-term social care increase with age, even after controlling for proximity to death, so those costs will be higher for those dying at older ages.

Table 2 sets out these factors and shows their directionality more simply.

Table 2

How different health factors may affect healthcare expenditures

Factor	Impact on healthcare expenditure
Less disease and disability at a given point in time, for a given population or at a given age	Decrease
Additional years of life	Increase
Lower acute healthcare costs of dying at older ages	Decrease
Higher long-term care costs of dying at older ages	Increase
Overall effect	**Unknown**

Source: Suhrcke M, et al. The economic costs of ill health in the European Region. WHO Regional Office for Europe: Copenhagen;2008.[34]

We now elaborate on those different factors by reviewing the relevant research findings from within and beyond Europe.

If we limit consideration to an individual at a given point in time, then clearly worse (or better) health is associated with higher (or lower) healthcare use and thus expenditure. For instance, Chernichovsky & Markowitz found, using data from Israel in 2003, that the presence of chronic illness had a significant and strong positive impact on the number of visits to a doctor, a specialist and a nurse.[56] In the US, Fried et al., in a study of people aged 72 and older living in New Haven, Connecticut, in 1989, found that functional status was significantly associated with use of healthcare services (i.e., hospitalization, out patient and home healthcare, and nursing homes).[57] The authors estimated that, compared with people living independently, stable dependence or a decline to dependence increased per capita healthcare expenditure by about $10,000 USD over two years.

Meanwhile, at a population level, Manton et al. (2007), in an American study, calculated that reduced disability in the Medicare population between 1982 and 1999 accounted for a decline in total Medicare* costs of $25.9 billion USD (€16.5 billion) in 1999 from what they would have been.[58] Dormont, Grignon & Huber calculated that the improvement in health status of the French population between 1992 and 2000 reduced healthcare expenditure in 2000 by 8.6 percent of the country's 1992 health expenditure level.[56] However, other factors in the French study, in particular technological progress and intensity of clinical intervention among elderly people outweighed these health expenditure savings, such that the total expenditure increased by almost 50 percent. Also, in their model, the savings from health gains were greater than the costs of aging (which increased expenditure by 3.2%). This serves as a reminder of the need, in studies at population level, to distinguish between two sets of impacts: those that result from health trends and those that result from changes in the population's age structure.

The likely very important role played by technological progress in driving healthcare costs, as emphasised by the Dormont et al. paper, cannot be given full account in the limited space of this article. Clearly it would be overly simplifying and incorrect to assume that all technological progress in medicine was per se a cost driver. So-called "halfway technologies" that do not prevent or cure disease, but simply treat the symptoms or aim at saving life while not improving health status would be expected to extend life, but should also entail longer and more costly treatment. On the other hand, "high technologies" offering prevention or complete cure could decrease or even eliminate the burden of disease and could help reduce costs.[60] Arguably, the biggest share of the medical technological innovation has been of the former kind in the second half of the past century.[61] It is impossible to predict what the nature of the contribution from innovations in biomedicine will be over the coming decades. For a more elaborate discussion of the role of technological progress as a healthcare cost driver see Dybczak & Przywara.[62]

The above studies looked at expenditure between two points in time; other studies try to measure whether avoiding disease and disability at earlier ages might not reduce cumulative health costs over the span of a lifetime: living longer might exhaust the savings gained by healthier earlier years. In fact, the evidence on lifetime health costs is mixed. Some studies do suggest that better health reduces lifetime healthcare expenditure; others say it makes little difference; and others suggest it would lead to higher healthcare expenditures.

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* Medicare, the US' publicly funded health insurance programme, provides coverage to people who are aged 65 and over or meet other criteria.

On the positive side, Liu, Daviglus & Yan found that Americans without cardiovascular disease (CVD) risk factors in middle age had lower cumulative Medicare expenditure from age 65 until death (or advanced ages) than those with one or more adverse risk factors, even though the former lived longer.[63] Shang & Goldman compared projections of total healthcare expenditure based on changes in age distribution and on changes in health (derived from life expectancy). They found that ignoring the health effect would overestimate total expenditures by 9 percent in 2040, by 19 percent in 2070 and by 22 percent in 2080.[64]

On the negative side, van Baal et al. predicted that obese people and smokers in the Netherlands would incur lower healthcare costs over their lifetime than healthy people. They estimated lifetime costs from age 20 for three hypothetical cohorts: one of "healthy-living" people (neither obese nor having smoked), one of obese people and one of smokers (Table 3). Although annual health expenditure until age 56 was highest for the obese cohort, lifetime health expenditure was highest for the healthy-living cohort, due to longer life expectancy.[65]

However, while this may be true[*] for the Netherlands, it does not appear to have universal applicability. Recent findings from the US, where the issue has been far more researched, suggest that the additional lifetime medical cost associated with obesity will be substantial. According to Yang & Hall elderly men who were overweight or obese at age 65 had 6 to 13 percent more lifetime healthcare expenditures than the same age cohort within normal weight range at age 65. Elderly women who were overweight or obese at age 65 spent 11 to 17 percent more than those in a normal weight range.[67] Other studies, again using data from the US, also had different results from the Dutch, finding somewhat higher lifetime medical expenditures for smokers.[68-70] Moreover, a major recent UK report forecasts a significant increase in obesity-related healthcare expenditures in its "business-as-usual" scenario up to the year 2050.[71] The main reason why many of these studies found high lifetime healthcare costs for obesity is that it incurs high healthcare costs, which – unlike other health behaviour-related risk factors, such as smoking – are not as highly compensated for by the expenditure-reducing effect of earlier death.

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[*] Some responses to this study have expressed concern about certain underlying assumptions. Mittendorf, for instance, criticized the use of average healthcare in the model, instead of distinguishing costs incurred by those who die versus those who survive in the respective year.[66] With such distinction, one would see that dying later due to a healthier life reduces the costs of dying. A detailed methodological discussion would also call for scrutiny of other studies with more "optimistic" results.

Table 3

Expected remaining life expectancy and lifetime healthcare costs for cohorts with different health-related behaviours

Outcome measure	Healthy living	Obese	Smokers
Life expectancy at age 20 (years)	64.4	59.9	57.4
Expected remaining lifetime heathcare costs per capita at age 20 (€)	281 000	250 000	220 000

Source: van Baal PH, et al. Lifetime medical costs of obesity: Prevention no cure for increasing health expenditure. PLoS Med. 2008;5:e29.[65]

Other studies have found that individuals in good health might have only slightly lower lifelong healthcare costs than those in worse health. Among them, Lubitz et al. showed that improved functional status at age 70 led to a longer total and active life expectancy, without increasing an individual's cumulative healthcare expenditure. For example, the estimated cumulative healthcare expenditure of a person with no functional limitations at age 70 would be $9000 USD (in 1998 dollars) lower than that of a person who experienced limitation in at least one "activity of daily living", even though their life expectancy would be 2.7 years longer.[72] Joyce et al. also found cumulative health spending to be modestly higher for those who are chronically ill at age 65. A 65-year-old person with a chronic condition would expect to live 0.3 to 3.1 years less than someone who was "free of chronic conditions", but lifetime medical spending would be $4000 to 14,000 USD higher.[73] Both these studies used data from the Medicare Current Beneficiary Survey from the 1990s.[74]

Using data from the same survey for 1992 through 1999 and the 1982 to 1996 National Health Interview Surveys, Goldman et al. (2005) showed how an improvement in the disability status of people over 65 might substantially reduce future per capita annual healthcare spending, even though it would not have a great impact on overall healthcare spending among this age cohort.[75]

Another predictor of healthcare expenditure is proximity to death. However, the age at which one dies influences the healthcare cost of doing so, as older people tend to be treated less intensively.[76,77] Thus, Gandjour & Lauterbach suggest that prevention (and consequently longer life) might actually decrease lifetime costs if one considers the fact that the costs of the last year of life decrease with age.[78]

An intriguing insight in this respect was provided by Daviglus et al., who found that being healthier in earlier life reduced the cost of dying.

In their study, individuals with fewer risk factors* for CVD in young adulthood or middle age (ages 33–64) incurred lower hospital expenditures in their last year of life. For example, the total charges (which included costs for inpatient care, skilled-nursing facility and outpatient hospital-related care) in the last year of life in the period 1984 to 2002 for individuals without any risk factor at younger ages were $15,318 USD lower than for those who had four or more risk factors. This was not solely a result of lower costs associated with CVD, which accounted for $10,267 USD of the total.[79] The combined effects of these observations do suggest that improvements in the health of those alive today will, all else being equal, reduce costs when they die. On the other hand, expenditure on long-term care does seem to increase with both age and proximity to death,[80,81] so the longer people live, the higher that part of the overall health expenditures will be.

CONCLUSIONS

The purpose of this review was to discuss three main hypotheses that, if true, would imply a more positive perspective on aging than otherwise held, sometimes apocalyptic views.

First we reviewed the evidence on whether there is healthy aging in the sense of a compression of morbidity: people spending fewer of the life years gained in poor health. While healthy life years also tended to increase according to most of the research, it was less clear whether the increase in healthy years matched or even exceeded the increase in longevity. The evidence turned out to be decidedly mixed, depending on the country, the data and perhaps most critically on the definition of "health" considered.

Second, we looked more specifically at the potential and actual labour market impact a healthy elderly population could make. There is obvious appeal to and support for the notion that if only effective retirement age was raised to reflect the historical and likely future increase in life expectancy, then the result could be a significant increase in elderly labour force participation rates. We also saw that a significant share of the elderly population between 50 and 70 years of age that had already retired find themselves in good health, indicating a potential unused capacity for the labour market.

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* The authors controlled for six risk factors for CVD at younger ages (blood pressure, serum cholesterol, body mass index, current smoker or not, diagnosed diabetes, minor electrocardiogram abnormalities) as well as for age at death, race, sex and education.

Last, we turned to the impact of improved health (especially among the elderly) on healthcare expenditures. On the whole – we could not unambiguously support the optimistic expectation that improved health will significantly mitigate or even reverse the trend of increasing health expenditures. Even if better health may, in some circumstances, lead to lower healthcare spending, other cost drivers, in particular technological advances, will more than outweigh any such expenditure-reducing effect. On the other hand, there is not much support either for the hypothesis that better health by itself would be a major cost driver.

Research on healthy aging is, relatively speaking, in its infancy. Hence, there is no shortage of research gaps. For instance, there is a need to further investigate the extent to which the assessment of healthy life expectancy (and any judgement on the healthy aging hypothesis) depends on the precise health indicator selected. Moreover – and this is an issue we could not even begin to address in this review – there is an urgent need to move from describing different healthy (or unhealthy) aging scenarios to explaining them. Doing so would lay the ground for policies to achieve the ideal of healthy aging.

Despite the mixed nature of the evidence we reviewed, relevant policy implications do emerge. In light of the evident unused capacity on the labour market in many developed countries, it would be the responsibility of social and economic (rather than healthcare) policy authorities to try to exploit this capacity by reducing the current generosity of early retirement options in many countries, to more closely align increases in (healthy) life expectancy with effective retirement age. However obvious this recommendation, its implementation hinges on at least two challenges. First, it may be against (many) people's preferences to revise retirement and social policy legislation accordingly. Evidence from opinion surveys indicates considerable opposition to pension reform of whatever kind, despite people's awareness of the financial unsustainability of the status quo.[82] Second, even if reforms could be implemented and the labour supply of the elderly increased, it would by no means be guaranteed that this additional supply would also be met by a demand of roughly equal size. Increased participation would need to be combined with appropriate labour market reforms, further highlighting the need for complementarity of a range of policies.[15] To the extent that health policy can contribute to promoting and maintaining health of the elderly, it also becomes an integral part of the set of policies that need to be considered when it comes to reaping whatever "wealth dividend of aging" may exist.

Acronyms list:
HALE = Healthy adjusted life expectancy
HWLE = Healthy working life expectancy
HLE = Healthy life expectancy
SHARE = The Survey on Health Ageing and Retirement

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