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## Mind the gap—reaching the European target of a 2-year increase in healthy life years in the next decade

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**Background:** The European Innovation Partnership on Active and Healthy Ageing seeks an increase of two healthy life years (HLY) at birth in the EU27 for the next 10 years. We assess the feasibility of doing so between 2010 and 2020 and the differential impact among countries by applying different scenarios to current trends in HLY. **Methods:** Data comprised HLY and life expectancy (LE) at birth 2004–09 from Eurostat. We estimated HLY in 2010 in each country by multiplying the Eurostat projections of LE in 2010 by the ratio HLY/LE obtained either from country and sex-specific linear regression models of HLY/LE on year (seven countries retaining same HLY question) or extrapolating the average of HLY/LE in 2008 and 2009 to 2010 (20 countries and EU27). The first scenario continued these trends with three other scenarios exploring different HLY gap reductions between 2010 and 2020. **Results:** The estimated gap in HLY in 2010 was 17.5 years (men) and 18.9 years (women). Assuming current trends continue, EU27 HLY increased by 1.4 years (men) and 0.9 years (women), below the European Innovation Partnership on Active and Healthy Ageing target, with the HLY gap between countries increasing to 18.3 years (men) and 19.5 years (women). To eliminate the HLY gap in 20 years, the EU27 must gain 4.4 HLY (men) and 4.8 HLY (women) in the next decade, which, for some countries, is substantially more than what the current trends suggest. **Conclusion:** Global targets for HLY move attention from inter-country differences and, alongside the current economic crisis, may contribute to increase health inequalities.  
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### Introduction

The European Union (EU) is committed to improving the health of its ageing population, with growing initiatives to promote active and healthy ageing (Supplementary figure S1). Its preferred measure is Healthy Life Years (HLY), the average remaining years spent free of activity limitation. Health expectancies, of which HLY is one, were developed to assess whether increases in life expectancy (LE) are due to improvements in medical technology, which keep the old and frail alive (resulting in an expansion of morbidity),<sup>1</sup> or because the onset and progression of disabling diseases are being postponed (compression of morbidity).<sup>2</sup> As well as assessing the relationship between LE and HLY historically, the compression of morbidity concept can be used prospectively to set HLY targets, e.g. the European Innovation Partnership on Active and Healthy Ageing (EIPon-AHA) target, which seeks to increase HLY at birth by 2 years during the next 10 years, averaging 2.4 months per year. If achieved, disability would be compressed at the EU level, as projected LE increases, at 1.9 years (men) and 1.5 years (women) (Supplementary table S1),<sup>3</sup> are less than the EIPon-AHA target of 2 years.

Although the EIPon-AHA target is generally supported, especially among those fearing that broader welfare may be sacrificed for

economic growth, there are concerns that an EU-wide target ignores disparities between member states. These are large—in 2005, the gaps in HLY at age 50 years were a remarkable 14.5 years for men and 13.7 years for women, exceeding gaps in LE at age 50 years (men: 9.1 years; women: 6.1 years).<sup>4</sup> Eurostat projections assume a ‘convergence hypothesis’<sup>5</sup> that envisages the LE gap across the EU27 reducing between 2010 and 2020, by 1.6 years for men and 1 year for women (Supplementary table S1), though this is a stronger assumption than the 0.9 years (men) and 0.2 years (women) projected during the same period by the United Nations.<sup>6</sup> Nevertheless, though the EU, as a whole, is currently projected to reach the target, male LE is projected to exceed 2 years for nine countries and female LE for four countries (Supplementary table S1).

We assess whether the EIPon-AHA target is attainable for the EU27 as a whole and what effect this will have on individual countries and the health gaps between them. First, we examine how LE and HLY has changed during the past 5 years in the EU27 countries. Then we project the changes in HLY forward from 2010–20 under various scenarios to investigate (i) the scope to achieve the target for the EU27 as a whole and in its constituent countries and (ii) the impact on disparities in HLY between countries.

## Methods

To document previous trends in LE and HLY, we obtained values of HLY and LE at birth from the eurohex website ([www.eurohex.eu](http://www.eurohex.eu)), these being identical to values from Eurostat. HLY are calculated by Sullivan's method<sup>7</sup> in which the age- and sex-specific prevalence of the health state is applied to a standard life table. For HLY, the underlying health state question is the Global Activity Limitation Indicator (GALI), included in the EU Statistics of Income and Living Conditions survey (see Supplementary material for the exact form of the GALI). Although some countries began data collection in 2004, HLY were only available for all 25 pre-2007 EU countries (EU25) since 2005.<sup>4</sup> Hence, for comparability, we focussed on the data from 2005.

Overall HLY trends are complicated because some countries made substantial changes to the GALI question used to calculate HLY, particularly between 2007 and 2008. Consequently, to explore preliminary trends further, we concentrated on the six countries (Belgium, France, Greece, Ireland, Slovenia and UK) where the GALI question was essentially unchanged between 2005 and 2009, but also included Romania, which had retained the same question since EU accession in 2007. Values were also included for countries involved in the pilot phase in 2004 (Belgium, France, Greece and Ireland) to provide longer time series. To assess trends, we estimated annual change in HLY, LE and the proportion of remaining life spent healthy (HLY/LE) and 95% confidence intervals from the country and sex-specific linear regression models. Further details of methods, including sample size and non-response rates for the EU Statistics of Income and Living Conditions 2009, are given in Supplementary material.

We then estimated HLY in 2010 in each country by multiplying Eurostat projections of LE in 2010 by the ratio HLY/LE obtained either from country- and sex-specific linear regression models of HLY/LE on year (seven countries retaining same HLY question) or extrapolating the average of HLY/LE in 2008 and 2009 to 2010 (20 countries and EU27). Full details of methods are in the online Supplementary material. Projecting HLY/LE rather than HLY ensured that HLY could not exceed LE. To assess the validity of these assumptions, we compared projected 2010 HLY with preliminary true values for 20 countries and found close agreement. The mean difference (men and women) between the predicted and actual 2010 HLY was 0.2 years, and 84% of the values were within 1.5 years, although the limits of agreement<sup>8</sup> (−3.4 to 3.7 years) were somewhat wider. HLY values for EU27 were the average of HLY values for the individual countries weighted according to population size.

Reducing inequalities is a key concern for the EU<sup>9</sup>; therefore, the other three scenarios explored relevant implications, first alone (Scenario 2), then in combination with the EIPon-AHA target for each country (Scenario 3) and finally in combination with the requirement that each country's gain in HLY was at least at the level of LE gains during the period, thus avoiding expansion of disability (Scenario 4). In all three inequality scenarios, we considered two reductions: a 50% gap reduction between countries with the highest and lowest values for 10 years, equating to eliminating the HLY gap in 20 years (A), and a 30% reduction for the 10 years, thus eliminating the HLY gap in around 33 years (B).

## Results

### *Past trends in LE and HLY 2005–09*

In 2005, male LE in the EU25 was 75.9 years, and female LE was 81.9 years (Supplementary figure S2). Between 2005–09, LE for the EU25 increased steadily, by just over 1 year or 3.0 months per year for men, and by 1.0 years or 2.4 months per year for women. Although all countries showed increases in LE at birth, the gains varied. LE increased least in Denmark (0.6 years for women) and Ireland (0.1

years for men) and most in Cyprus (2.7 years for women) and Latvia (2.8 years for men). Differential gains in LE narrowed the gap in LE from 13.2 years in 2005 to 11.9 years in 2009 for men but a small increase for women from 7.3 years in 2005 to 7.6 years in 2009.

In 2005, male HLY at birth for the pre-2007 EU25 was 61.0 years, 80% of remaining life. Female HLY was greater, at 62.3 years, though women could expect to live less of their remaining life healthy (76%). Similar levels of HLY for men and women contrast with women's higher overall LE and therefore co-occur with a greater number of years with disability [unhealthy life years (UHLY)] (Supplementary figure S2). In contrast to the increase in LE for men and women between 2005 and 2009, HLY showed little change: for men an increase of 0.3 years or ~0.8 months per year and for women a decrease of 0.4 years or ~1.0 months per year. As the EIPon-AHA target equates to 2.4 months increase per year, it was not reached for the EU25 overall during the period 2005–09.

Turning to the restricted set of countries with consistent wording of the GALI question, even here, real increases in LE at birth from 2004–09 were not universal (Supplementary table S2). During this period, Romania (both sexes) and Ireland (men) had no significant increase in LE, and Romanian men had a significant decrease in HLY. Significant increases in HLY were observed in Belgium (both sexes), and for men in Ireland, Slovenia and the UK, all were equating to increases of at least 2 HLY for 10 years. In Slovenia, the HLY increase was also accompanied by a significant increase in the proportion of remaining life spent healthy.

### *Projections of HLY 2010–20*

Projections of HLY at birth are presented in table 1 (men) and table 2 (women). In 2010, the gap between countries in male HLY was estimated to be 17.5 years (from Slovakia 52.6 years to Sweden 70.1 years) and in female HLY 18.9 years (from Slovakia 52.7 years to Malta 71.5 years). HLY projections between 2010 and 2020 were explored under four main scenarios (tables 1 and 2). Scenario 1 assumed that recent annual changes in HLY (previously calculated) would continue for the whole period. EU27 HLY at birth then increases by 1.4 years (men) and 0.5 years (women), failing to reach the 2-year EIPon-AHA target, although it would be reached in nine countries for male HLY but only one country (Belgium) for female HLY. Crucially, the HLY gap between countries would increase further to 18.3 years (men) and 19.5 years (women) by 2020.

Under Scenario 2A, eliminating the HLY gap in 20 years would result in gains for the next decade of 4.4 HLY for EU27 men (table 1) and 4.8 HLY for EU27 women (table 2), more than double the EIPon-AHA target. For Slovakia, which currently has the lowest HLY at birth for men and women, this means an increase of ~9 HLY (male HLY: 8.8, female HLY: 9.4) during the decade, substantially more than the increase of under 2 HLY (male HLY: 1.8, female HLY: 1.3) expected if recent annual changes continue (Scenario 1). If the goal of eliminating the HLY gap in a 20-year period was relaxed, then the EIPon-AHA target could be achieved by a 21–23% reduction in the gap over the next 10 years, in women and men, respectively, with more realistic increases for Slovakia (male HLY: 4.0, female HLY: 3.3; data not shown), although now the gap would only be closed in ~45 years. Moreover, with this reduction, the EIPon-AHA target would be achieved by under half of the countries (male: 13 countries, female: 5 countries). Scenario 3 therefore added the constraint that each country also had to achieve the EIPon-AHA target of an increase in 2 HLY during the decade resulting in Slovakia needing to achieve even greater increases of ~11 HLY (male HLY: 10.8, female HLY: 11.4) or more than one HLY per year.

For scenario 4, in addition to closing the gap for the same periods as Scenarios 2 and 3, projected increases in LE were included by requiring that the number of remaining years spent unhealthy

**Table 1** HLY at birth in 2010, current annual increase in HLY and projected increase in HLY between 2010 and 2020 under various scenarios for EU27 countries, males

Country	HLY 2010	Projected increase in HLY at birth between 2010 and 2020						
		Scenario 1: current trends prevail	Scenario 2: reduction of HLY gaps by		Scenario 3: HLY increase $\geq 2$ years for country and reduction in HLY gaps by		Scenario 4: no increase in UHLY for country and reduction in the HLY gaps by	
			A:50%	B:30%	A:50%	B:30%		A:50%
Slovakia <sup>a</sup>	52.6	1.8	8.8	5.3	10.8	7.3	10.2	6.7
Latvia <sup>a</sup>	52.9	2.2	8.6	5.2	10.6	7.2	10.0	6.6
Estonia <sup>a</sup>	54.5	2.1	7.8	4.7	9.8	6.7	9.2	6.1
Hungary <sup>a</sup>	55.5	2.1	7.3	4.4	9.3	6.4	8.7	5.8
Germany <sup>a</sup>	56.7	1.2	6.7	4.0	8.7	6.0	8.1	5.4
Lithuania <sup>a</sup>	56.7	2.5	6.7	4.0	8.7	6.0	8.1	5.4
Finland <sup>a</sup>	58.4	1.4	5.9	3.5	7.9	5.5	7.3	4.9
Poland <sup>a</sup>	58.7	2.1	5.7	3.4	7.7	5.4	7.1	4.8
Portugal <sup>a</sup>	58.8	1.4	5.7	3.4	7.7	5.4	7.1	4.8
Austria <sup>a</sup>	58.9	1.2	5.6	3.4	7.6	5.4	7.0	4.8
Romania <sup>b</sup>	59.5	-2.2	5.3	3.2	7.3	5.2	6.7	4.6
Slovenia <sup>b</sup>	61.1	8.1	4.5	2.7	6.5	4.7	5.9	4.1
Czech Republic <sup>a</sup>	61.3	1.7	4.4	2.6	6.4	4.6	5.8	4.0
Denmark <sup>a</sup>	61.9	1.3	4.1	2.5	6.1	4.5	5.5	3.9
Netherlands <sup>a</sup>	62.2	1.1	4.0	2.4	6.0	4.4	5.4	3.8
Bulgaria <sup>a</sup>	62.4	2.3	3.8	2.3	5.8	4.3	5.2	3.7
France <sup>b</sup>	62.6	1.2	3.8	2.3	5.8	4.3	5.2	3.7
Italy <sup>a</sup>	62.9	1.2	3.6	2.2	5.6	4.2	5.0	3.6
Ireland <sup>b</sup>	63.4	1.9	3.4	2.0	5.4	4.0	4.8	3.4
Spain <sup>a</sup>	63.6	1.3	3.3	2.0	5.3	4.0	4.7	3.4
Cyprus <sup>a</sup>	64.6	1.3	2.7	1.6	4.7	3.6	4.1	3.0
Belgium <sup>b</sup>	64.7	8.0	2.7	1.6	4.7	3.6	4.1	3.0
Luxembourg <sup>a</sup>	64.9	1.3	2.6	1.6	4.6	3.6	4.0	3.0
UK <sup>b</sup>	65.0	1.0	2.6	1.5	4.6	3.5	4.0	2.9
Greece <sup>b</sup>	66.1	2.2	2.0	1.2	4.0	3.2	3.4	2.6
Malta <sup>a</sup>	69.4	1.5	0.3	0.2	2.3	2.2	1.7	1.6
Sweden <sup>a</sup>	70.1	1.2	0.0	0.0	2.0	2.0	1.4	1.4
EU27 <sup>a</sup>	61.3	1.4	4.4	2.6	6.4	4.6	5.8	4.0

a: HLY2010 values based on 2008–09 values.

b: HLY2010 values based on 2004/2005–09 values.

(LE-HLY) did not increase. Overall, this slightly attenuated the increases in HLY required.

## Discussion

We have previously reported large inequalities in health across the EU in 2005 when the HLY indicator was first introduced.<sup>4</sup> We have examined trends between 2005 and 2009 both within countries and overall, and we are the first to show that, far from diminishing, inequalities have persisted. Indeed, although LE at birth for the EU increased by  $\sim 1$  year for men and women between 2005 and 2009, HLY increased by less than half a year for men and decreased by almost half a year for women. By applying projections of current trends in different scenarios, we explored the extent to which individual countries and the EU27 as a whole might reach the EIPon-AHA target of increasing HLY at birth by 2 years by 2020. We found that if recent trends continue, the EIPon-AHA target could be met by several countries, predominantly Eastern European ones including Estonia, Latvia, Lithuania and Hungary, despite LE in these countries being projected to increase more than in Western European countries. On the other hand, France (women) and Romania (both sexes) are unlikely to meet the target, as, extrapolating recent trends, they will lose rather than gain HLY in the next decade. Overall, the EIPon-AHA target would not be reached by the EU27 as a whole, and more critically, HLY inequalities would increase further.

As LE at birth is expected to increase by 2–2.5 years every decade in low mortality countries,<sup>10,11</sup> increasing HLY at birth by 2 years is a minimum to avoid expansion of UHLY at the European level.

Nevertheless, this strategy will not automatically reduce the existing HLY gaps between countries; therefore, this ‘average’ target should be accompanied by a second one, focussed on reducing the HLY disparities. Our other scenarios looked at the impact of reducing the gaps alone, alongside an increase of 2 HLY for each country and finally together with no increase in UHLY. The large gains in HLY, of between 0.5 and one HLY per year during the decade, required by the Baltic and Eastern European countries for ultimate elimination of HLY gaps in 20 or 30 years would only be reached by one country, i.e. Slovenia.

To obtain HLY in 2010, we assumed that the proportion of remaining life spent healthy in most countries would remain at the average of 2008 and 2009 values. This is an obvious limitation but a standard approach,<sup>12</sup> not unrealistic when compared with preliminary 2010 HLY values for 20 countries. When time series are available for these countries, we can replace this assumption by the empirical trends, as we have already done for the seven countries with available data. A further limitation is that, for these seven countries, the time series were too short to adequately estimate anything other than a linear trend, but again longer time series will enable the linear trend assumption to be tested. We concentrated on the effect of reducing the overall gap, which will depend strongly on outliers. Nevertheless, our findings appear relatively robust, as, at least with the scenario of continued current trends, the interquartile range for predicted HLY in 2010 for men is 16.2 years, 1.3 years less than the overall gap, and would still increase, to 16.8 years, by 2020.

An inevitable limitation of analyses such as these is that they must predict the future on the basis of past knowledge; although the future will be different, it is difficult to know in what way.

**Table 2** HLY at birth in 2010, current annual increase in HLY and projected increase in HLY between 2010 and 2020 under various scenarios for EU27 countries, females

Country	HLY 2010	Projected increase in HLY at birth between 2010 and 2020						
		Scenario 1: current trends prevail	Scenario 2: reduction of HLY gaps by		Scenario 3: HLY increase $\geq 2$ years for country and reduction in HLY gaps by		Scenario 4: no increase in UHLY for country and reduction in the HLY gaps by	
			A:50%	B:30%	A:50%	B:30%	A:50%	B:30%
Slovakia <sup>a</sup>	52.7	1.3	9.4	5.7	11.4	7.7	10.9	7.2
Latvia <sup>a</sup>	55.4	1.5	8.1	4.8	10.1	6.8	9.6	6.3
Portugal <sup>a</sup>	56.9	1.0	7.3	4.4	9.3	6.4	8.8	5.9
Germany <sup>a</sup>	57.8	1.0	6.9	4.1	8.9	6.1	8.4	5.6
Hungary <sup>a</sup>	58.3	1.6	6.6	4.0	8.6	6.0	8.1	5.5
Estonia <sup>a</sup>	58.5	1.3	6.5	3.9	8.5	5.9	8.0	5.4
Finland <sup>a</sup>	58.8	1.0	6.4	3.8	8.4	5.8	7.9	5.3
Austria <sup>a</sup>	60.0	1.0	5.8	3.5	7.8	5.5	7.3	5.0
Netherlands <sup>a</sup>	60.1	1.0	5.7	3.4	7.7	5.4	7.2	4.9
Denmark <sup>a</sup>	60.7	1.3	5.4	3.3	7.4	5.3	6.9	4.8
Lithuania <sup>a</sup>	61.0	1.5	5.3	3.2	7.3	5.2	6.8	4.7
Slovenia <sup>b</sup>	61.0	0.3	5.3	3.2	7.3	5.2	6.8	4.7
Romania <sup>b</sup>	61.1	-5.2	5.2	3.1	7.2	5.1	6.7	4.6
Italy <sup>a</sup>	61.9	0.9	4.8	2.9	6.8	4.9	6.3	4.4
France <sup>b</sup>	62.6	-2.7	4.5	2.7	6.5	4.7	6.0	4.2
Poland <sup>a</sup>	62.8	1.4	4.4	2.6	6.4	4.6	5.9	4.1
CzechRepublic <sup>a</sup>	63.0	1.3	4.3	2.6	6.3	4.6	5.8	4.1
Spain <sup>a</sup>	63.0	0.8	4.3	2.6	6.3	4.6	5.8	4.1
Belgium <sup>b</sup>	64.3	9.1	3.6	2.2	5.6	4.2	5.1	3.7
Ireland <sup>b</sup>	64.8	1.7	3.4	2.0	5.4	4.0	4.9	3.5
Luxembourg <sup>a</sup>	65.0	1.2	3.3	2.0	5.3	4.0	4.8	3.5
Cyprus <sup>a</sup>	65.5	1.1	3.0	1.8	5.0	3.8	4.5	3.3
UnitedKingdom <sup>b</sup>	66.0	1.6	2.8	1.7	4.8	3.7	4.3	3.2
Bulgaria <sup>a</sup>	66.0	1.8	2.8	1.7	4.8	3.7	4.3	3.2
Greece <sup>b</sup>	66.7	-0.5	2.4	1.5	4.4	3.5	3.9	3.0
Sweden <sup>a</sup>	69.3	1.2	1.1	0.7	3.1	2.7	2.6	2.2
Malta <sup>a</sup>	71.5	1.3	0.0	0.0	2.0	2.0	1.5	1.5
EU27 <sup>a</sup>	61.9	0.5	4.8	2.9	6.8	4.9	6.3	4.4

a: HLY2010 values based on 2008–09 values.

b: HLY2010 values based on 2004/2005–09 values.

Consequently, this article looks at the implications of achieving certain objectives while recognizing that there are many factors that cannot be taken into account to determine whether they can be achieved. An example is the economic crisis that has gripped Europe since 2008. Though short-term effects on mortality have been shown (increased suicides but reduced traffic deaths),<sup>13,14</sup> it is much more difficult to identify long-term effects on morbidity or mortality. One possibility that must be considered is whether the substantial gains in survival at older ages seen in recent decades, and thought to be driven largely by improvements in the management of chronic disorders, such as hypertension and its complications, particularly in older patients,<sup>15</sup> will continue given policies of austerity reducing access to health care in some countries.<sup>16</sup> However, this is beyond the scope of this article. Finally, particular caution must be exercised in relation to projections for two of the Baltic states, Latvia and Lithuania, which experienced transient declines in LE during the period 2004–07, followed by rapid increases, causing difficulties when calculating our baseline scenario.<sup>17</sup>

Increasing HLY by 2 years and reducing gaps will require action on many fronts as well as measures designed to address both the level and distribution of HLYs. There is growing recognition of the imperative to address socio-economic inequalities in health at both national and international levels,<sup>18,19</sup> which include housing quality, access to health care, unemployment, work conditions as well as education, perhaps the most often cited determinant of health<sup>20</sup> and one we have shown to account for some of the variation in HLY across the EU25.<sup>4</sup> Socio-economic inequalities in health across the EU25 have been estimated to account for 20% of the total cost of health care and 15% of the total costs of social security benefits.<sup>21</sup>

Policies must also address factors that predominantly cut lives short prematurely, such as deaths from injuries and violence or smoking and those that leave people alive but disabled, such as poor diet, obesity and inadequate physical activity. A particular priority will be to reduce exposure to risk factors in middle age, and especially smoking, coupled with policies that help people to remain confident and engaged with life, factors shown to correlate with successful ageing.<sup>22</sup> These considerations highlight the importance of comprehensive health improvement strategies, reaching from the underlying determinants of health to responses to established disease. Nevertheless, these strategies may not always have the desired effect on increasing HLY. Conditions such as cognitive impairment and cardiovascular disease impact on both disability and mortality, others (arthritis and visual impairment) affect disability only, whereas cancer predominantly affects mortality.<sup>23,24</sup> Countries need to consider the balance between investment in life-saving medical interventions, rehabilitation for disabling conditions or prevention (of both disabling and fatal conditions), as the former could result in increased LE but with a likelihood of increased disability prevalence.

An important barrier to reducing the health gaps across the EU is the lack of evidence of what works in narrowing inequalities. A recent systematic review found little evidence, apart from some, albeit not strong, in the areas of housing and work conditions.<sup>20</sup> The EU provides a ready 'population laboratory' for international comparative research, which should be fully exploited alongside the more systematic diffusion of successful national interventions to other countries as recently highlighted by Futurage.<sup>25</sup>

The prime concern for both the Lisbon Strategy<sup>26</sup> and its successor Europe 2020<sup>27</sup> is to create sustainable economic



growth in Europe. This 'global' target, like the EIPon-AHA target, moves attention from inter-country differences and, alongside the current economic crisis with its winners and losers, is likely to increase health inequalities.<sup>28</sup> The EU, in accordance with the goal of Health 2020 of reducing health inequalities,<sup>29</sup> should urgently invest in research to monitor, understand and close the unacceptable level of health inequalities across European countries.

## Supplementary Data

Supplementary data are available at *EURPUB* online.

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### Key points

- The EU is committed to active and healthy ageing, but its target for HLY applies to the EU as a whole and assumes convergence across countries.
- On the basis of recent trends, the EU target will not be achieved, and inter-country disparities will widen further.
- Achievement of the EU target will require action on many fronts but especially to reduce health inequalities.
- To be effective, policies must be based on evidence of what works, although that evidence is currently limited.

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