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# European inequalities in Healthy Life Years at age 50 in 2010 and the factors that explain them

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**Abstract**

**Background** The first estimates of Healthy Life Years at age 50 (HLY50) across the EU25 countries in 2005 showed substantial variation in healthy ageing. We investigate whether factors contributing to HLY50 inequalities have changed between 2005 and 2010.

**Methods** HLY50 for each country and year were calculated using Sullivan's method, applying the age-specific prevalence of activity limitation from the EU-SILC survey to life tables. Inequalities in life expectancy at age 50 (LE50) and HLY50 between countries were defined as the difference between the maximum and minimum LE50 or HLY50. Relationships between HLY50 and the macro-level socio-economic indicators were investigated using meta-regression. Men and women were analysed separately.

**Results** In 2005 and 2010 HLY50 inequalities exceeded LE50 inequalities, particularly in the EU15 in 2010 where HLY50 inequalities (men: 10.7 years; women: 12.5 years) were four times greater for men and three times for women than LE50 inequalities (men: 2.4 years; women: 4.1 years). Only material deprivation significantly explained variation in EU25 HLY50 in both years with, additionally, long-term unemployment in 2010. By 2010 average duration of life free of activity limitation after age 50 was below 65, the average State Retirement Age (SRA), in eight (men) and six (women) countries.

**Conclusions** Our results suggest not all EU countries are ageing healthily, the variation in HLY50 across the EU being linked to country level material deprivation and long-term unemployment. The prospect of further increasing the SRA in some countries is questionable without greater accommodation for older workers with disability and functional limitations.

**Keywords** Healthy life years, life expectancy, health expectancy, meta-regression, activity limitation

**Introduction**

Life expectancy (LE) in the European Union continues to steadily rise (1), but differently between Member States (MS) (2). However LE is no longer sufficient as the sole measure of population health and is increasingly being supplemented by health expectancies which combine mortality and morbidity in the same indicator. The European Commission has thus selected Healthy Life Years (HLY), a disability-free life expectancy (DFLE), to monitor healthy ageing in MS (3, 4). The first estimates of HLY at age 50 (HLY50) in 2005 showed large inequalities across Europe (5) which exceeded inequalities in LE at age 50 (LE50). Some of this variation may have been the result of differences in the wording of the underlying health measure, the Global Activity Limitation Indicator (GALI) after translation (6, 7). In 2005 the GALI was a new indicator and in subsequent years several MS changed the wording of their GALI seeking to better conform to the English standard. Most change took place in 2008 when Eurostat coordinated a joint harmonisation exercise which significantly improved the comparability of translations (8).

The Lisbon Strategy (2000-2010) was a knowledge based strategy monitored through a few key indicators known as Structural Indicators, including HLY which was added to the list in 2005. The key feature of these indicators was their availability for all 25 MS. In the current strategy, Europe 2020, more emphasis is put on sustainable and inclusive growth. Accordingly, the structural indicators have been replaced by Sustainable Development Indicators (SDIs) comprising more than 100 indicators, 12 of which have been identified as headline indicators, including HLY for public health. One new SDI is material deprivation, known to be linked to ill health (9). Indeed in England LE at birth in the most deprived area quintiles (compared to the least deprived) is 8.2 years lower for men and 5.8 years lower for women whilst DFLE is 14.7 years lower for men and 5.8 years lower for women (10). In addition the UK has been shown recently to have the highest share of materially deprived households in Europe (11), based on a new measure of material deprivation derived by Eurostat from the EU-SILC survey (12).

Meta-regression allows simultaneous examination of multiple predictors of the relationship between two variables (5). Potential macro (country level) structural indicators explaining inequalities in HLY50 in 2005 were found to be Gross Domestic Product (GDP) and expenditure on elderly care (both positively associated with the number of HLY50 for men and women), long term unemployment rate (negatively associated), and both life-long learning and low education attainment (positively associated with HLY50 for men only) (5). Since 2005 the levels of many of these factors have not only changed but changed differentially between countries, not least because of the economic crisis.

The aim of this paper is threefold. First we repeated the same study as previously (5) but five years later with more comparable survey data, to assess how inequalities in HLY50 and LE50 for men and women across EU countries have changed between 2005 and 2010. Secondly, we investigated the extent to which the macro-level indicators that were associated with inequalities in HLY50 in 2005 are still major explanatory factors for the variation in HLY50 in 2010. Lastly we explore whether the new SDI of material deprivation, is also associated with inequalities in HLY50 in 2010.

## Methods

### *Healthy Life Years*

Estimates of LE50 and HLY50 for each EU country for 2005 and 2010 and for men and women separately were obtained from the Eurohex database (13). HLY for each of the EU countries were calculated by Sullivan's method (14) which applies the age-specific prevalence of disability to a standard life table for the same period as the survey providing disability data. The prevalence of disability was estimated from the GALI question in the EU-SILC survey. Each country translated the standard GALI question into their own languages for their respective surveys. The standard GALI question in English has the form: *'For at least the past 6 months, to what extent have you been limited because of a health problem in activities people usually do? Would you say you have been; 1. severely limited, 2. limited but not severely, or 3. not limited at all?* To calculate HLY we define disability as any limitation. The HLY indicator derived from the GALI question reflects the consequences of health conditions on the individual's usual activities.

### *Explanatory variables*

To investigate factors associated with inequalities in HLY and for comparability with the previous analysis (5), we used structural and/or sustainable indicators for each country obtained from the Eurostat database (15). These indicators represent various aspects of a country's socio-economic status and difficulties which may be linked to the general level of health of the country's population. Globally they belong to three broad domains, well known for their impact on health: wealth, work and education. The following indicators were included: Gross Domestic Product (GDP); poverty risk for those aged over 65 years; inequality of income distribution; employment rate of older workers; long-term unemployment rate; life-long learning; low education attainment; and material deprivation. We omitted two indicators that had been included previously: expenditure on elderly care as this was not available after 2008; and mean exit age from the labour force which had problems with quality (16). Material deprivation was included for 2010 and relates to households

having an enforced lack of at least 3 out of 9 economic and durable items. Definitions of the indicators along with their quality grade (which assesses comparability across countries) are given in the supplementary material (table S1).

***Statistical analysis***

Level of inequality for LE50 and HLY50 was defined as the difference between the maximum and minimum LE50 or HLY50 among MS. Relationships between HLY50 and the indicators were investigated using meta-regression (17), employing permutation tests to adjust the p-values for multiplicity (18). All analyses were performed separately for men and women.

In 2005 the EU was made up of 25 countries, Romania and Bulgaria becoming members in 2007. All analyses were therefore first performed on the EU25 countries, for comparability between 2005 and 2010, with sub-analyses for the established EU15 and newer joined EU10 countries for comparison with previous results (5). We also performed separate analyses for all EU27 countries for 2010 to compare estimates with those from the EU25 in 2010.

**Results**

First we document how inequalities in HLY50 and LE50, explained by the range of values for the countries, have changed between 2005 and 2010. Inequality in LE50 between the EU25 countries grew slightly for women (from 6.1 years to 6.4 years) but remained relatively unchanged for men (from 9.0 years to 8.9 years) (Table 1). Inequalities in LE50 were larger in the EU10 than in the EU15 in both years and increased further between 2005 and 2010 in both the EU15 (women: 0.6 years, men: 0.2 years) and in the EU10 (women: 1.0 years, men: 0.6 years) (Table 1).

In both 2005 and 2010 HLY50 inequalities exceeded those in LE50 for men and women; HLY50 inequalities were more than twice those of LE50 for EU25 women, more than three times for EU10 and EU15 women, 1.5 times for EU25 and EU10 men and more than four times for EU15 men (Table 1). Between 2005 and 2010 HLY50 inequalities for men and women increased further and by more than the increases in LE50 inequalities. In the EU25, inequalities in HLY50 increased by 2.8 years for women and 1.0 year for men. HLY50 inequalities for women increased more in the EU10 (2.0 years) than the EU15 (1.2 years) as they did for men since HLY inequalities increased by 0.7 years in the EU10 but remained unchanged in the EU15 (Table 1). Inequalities in LE50 and HLY50 for the EU27 in 2010 were identical to those for the EU25 except for LE50 for men (EU25: 6.4 years, EU27: 7.0 years).

**Table 1 here**

HLY50 is the average duration of life free from activity limitation at age 50, and by adding 50 years to HLY50 it can be used to approximate the average duration of life free from activity limitation (HLY50+50). Comparing this to the value of 65 years which is the state retirement age (SRA) in over half EU countries, we can assess the chances of reaching retirement age without disability for people aged 50 years (Figure 1). In 2005 nine EU25 countries had an average duration of life free of activity

limitation for men lower than 65 years of age of which three belonged to the EU15 (Austria, Finland, Germany) and six to the EU10 (Czech Republic, Estonia, Hungary, Latvia, Lithuania, Slovakia) (Figure 1). By 2010 this had reduced to eight with only Germany remaining from the EU15 and seven from the EU10 (Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, Slovenia) and additionally Romania. For women again nine countries had an average duration of life free of activity limitation lower than 65 years of age in 2005, of which three belonged to the EU15 (Finland, Germany, Portugal) and six EU10 (Cyprus, Estonia, Hungary, Latvia, Lithuania, Slovakia), reducing to six by 2010, one from the EU15 (Portugal) and five from the EU10 (Estonia, Hungary, Latvia, Slovakia, Slovenia) with additionally Romania. A further seven countries had an average duration of life free of activity limitation between 65 and 68 years in 2010 and are therefore 'at risk' as the SRA rises (Austria: men and women; Czech Republic: men; Finland: men and women; Germany: women; Lithuania: women; Poland: women; Portugal: men).

**Figure 1 here**

***Explaining inequalities in HLY50***

Values of the structural and sustainable indicators used in the meta-regression analyses for each country are shown in supplementary tables S2 (2005) and S3 (2010). In 2005 only material deprivation showed a significant (negative) association (p=0.018) with HLY50 for men in the EU25 with weaker evidence for women (p=0.089) (Table 2). This remained the case in 2010, although the association was strengthened, particularly for women (p=0.015). Thus a 10% increase in the proportion of the population classified as materially deprived was associated with a reduction of HLY50 for EU25 men in 2005 of 1.25 years (95%CI 0.68 to 2.36 years) and 2.19 years (95%CI 1.01 to 2.27 years) in 2010, whilst a 10% increase in the proportion materially deprived was associated with a reduction in HLY50 for women of 1.27 years (95%CI 0.41 to 2.13 years) in 2005 and 1.97 years (95%CI 0.85 to 3.09 years) in 2010. Additionally in 2010, long-term unemployment rate was

negatively associated with HLY50 for men (p=0.033), with again a weaker association for women (p=0.052).

**Table 2 here**

For the EU10, we found associations between HLY50 and long-term unemployment rate only for women in 2010 (Table 3). For the EU15, none of the indicators showed evidence of associations with HLY50 for men or women in 2005 or 2010 (Table 3). When Bulgaria and Romania were included in the analyses for 2010, results differed to those for the EU25, with weaker associations with HLY50 for men and no associations for women (Table S4 in the supplementary material).

**Table 3 here**

**Discussion**

Between 2005 and 2010 LE50 continued the relentless rise we have seen over the past decades of around two years each decade. However these rises were not enjoyed over the whole EU and inequalities in LE50 in the EU25 increased slightly for women but remained unchanged for men, with similar patterns in the EU15 though larger increases in the EU10. In contrast, inequalities in HLY50 exceeded those in LE50 in both 2005 and 2010 and, moreover, increased further between 2005 and 2010 and by more than the increases in LE50 inequalities, despite greater harmonisation of the underlying health question.

Country level material deprivation was significantly associated with HLY50 variation in both 2005 and 2010, as was long-term unemployment in 2010. This is notable since long-term unemployment rates have risen in a number of countries due to the economic crisis (19-21). Additionally, although our findings show that the average duration of life free from activity limitation is 68.6 years for women and 67.9 years for men in the EU25 overall in 2010, in nine countries (seven in Eastern Europe), this duration did not extend to the age of 65, the average age of retirement. These results question the prospect of a universal increase in the SRA, or at least suggest that measures to accommodate older workers with limitations will need to be put into place.

There are strengths and limitations to our study. We had previously identified more factors associated with the variation in HLY50 in 2005, notably GDP, life-long learning and low education attainment (5). A strength of our current study is that we use a more conservative meta-regression approach than previously, as now recommended (18), since standard meta-regression analyses are subject to increased Type 1 error rates, i.e. false positives, or detecting an association when none exists. However the subgroup analyses of the EU10 countries may have low power to detect associations, due to the smaller sample size. Although our analyses are cross-sectional, so that causality of the associated factors cannot be inferred, we included only indicators that were

measured in the same way across countries. The main limitation is that, despite a major improvement in 2008, the GALI instrument which underlies the HLY indicator is still not totally harmonised as, by 2010, only 14 countries including Romania and Bulgaria were fully comparable and a further seven partially comparable (8). This may be less of a problem in the future as by 2012 only two countries will still not be fully comparable, although even when all countries are fully comparable, part of the HLY50 inequalities may also result from cultural variation in reporting health and limitation. Research surveys such as Survey of Health, Ageing and Retirement in Europe (SHARE) (22) may be better placed to address harmonization because they are centrally developed and translated by a research group. Thus they may produce more comparability but may not be so sustainable. Regular European surveys coordinated by Eurostat are much more sustainable but the legal framework under which the surveys are performed gives much freedom and responsibility to the MS and it is this freedom that can lead to comparability issues. However, we are not implying that the GALI is a poorly comparable indicator for two reasons. Presently the GALI is the optimal pan-European health measure since it is one of the most validated pan-European survey instruments, including translation cards and protocols. Moreover further improvement and harmonization of the GALI is planned to tie in with the current roadmap on modernisation of social surveys with a report and final recommendations expected at the end of 2015.

Our findings on health inequalities across the EU confirm and update others, though mostly these are based on different health measures, or mortality rather than health expectancy. Here we highlighted a possible association of these inequalities with long-term unemployment rates and material deprivation. Other studies indicated substantial inequalities in LE and DFLE between socioeconomic groups defined by education (23-28), occupation (29-32) or income (33, 34) within European countries. Comparisons between European countries in DFLE show that differences between educational groups vary by country, being largest in Eastern and Northern Europe and smallest in southern Europe (23). It has been suggested that socioeconomic status as a determinant

of health is manifested through its influence on behaviours and habits and by determining access to healthcare (35) and that housing (36) and working conditions also contribute substantially to health inequalities across Europe (37). Our findings suggest that when material deprivation is known, standard socio-economic factors, as found above, have less effect. Moreover levels of material deprivation were highest in the EU10 countries. Greece, Italy, Portugal and Ireland had the highest levels of material deprivation in the EU15, these being the countries most affected by the economic crisis.

We found that higher country level long-term unemployment is associated with lower HLY50. So while our findings offer potential warnings about raising the SRA, there is conflicting evidence that participation in the labour market to older ages can help to delay the onset of disability. At the individual level, poor health, chronic diseases, and lifestyle factors have been shown to be associated with being out of the labour market (38), and this study and ours suggest that social policies to encourage employment among older persons need to take account of ill-health and activity limitation that increase with age. On the other hand changes in lifestyle encouraged within the workplace may contribute to development of the health differentials between the employed and unemployed (39). In order to prevent widening of employment-related health inequalities, passages into employment should be facilitated and opportunities for health promotion should be improved among those trapped in or moving towards the labour market periphery. Pre-retirement is a time when older people are contemplating change and health promotion during this time may be beneficial for maintaining health post retirement. Moreover labour market programmes that keep and reintegrate workers in jobs could mitigate some adverse health effects of economic downturns (40).

**Conclusions**

Our results show that inequalities in HLY50 for the EU25 over the period 2005 to 2010 have widened further, particularly in the EU10 countries. Notably a number of countries, again mostly EU10

countries, remain with an average duration of life free of activity limitation lower than 65 years corresponding to the SRA, casting doubt on the ability of these countries to further extend retirement age to fund public pension systems. Country level material deprivation (most evident in EU10 countries) and long term unemployment were factors contributing to inequalities in HLY50 across the EU25. Monitoring and analysis of inequalities in HLY at peri-retirement ages must continue if we are to maximise healthy ageing for all European citizens. Nevertheless beyond the positive cross-sectional association between healthy life years and material wellbeing confirmed by this study, it is important in the current European economical context to better understand the pathways and causality strongly linking material deprivation and ill-health.

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**Conflicts of interest**

None declared.

**Key points**

- In 2005 and 2010, HLY50 inequalities exceeded LE50 inequalities
- HLY50 inequalities increased further between 2005 to 2010 and by more than increases in LE50 inequalities.
- Only material deprivation significantly explained variation in EU25 HLY50 in both years along with long-term unemployment in 2010.
- Between 2005 and 2010 the number of countries whose average duration of life free from activity limitation falls below age 65 (State Retirement Age) reduced from nine to eight (men) and from nine to six (women).

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**Table 1: Values and inequalities (range) of life expectancy (LE50) and healthy life years (HLY50) at age 50 for men and women in 2005 and 2010, EU25, EU15 and EU10**

| | Country grouping | Measure | Men 2005 | Men 2010 | Change men 2005-2010 | Women 2005 | Women 2010 | Change women 2005-2010 |
|---|---|---|---|---|---|---|---|---|
| LE50 | EU25 | Value | 28.6 | 29.8 | 1.2 | 33.5 | 34.6 | 1.1 |
| | | Range | 9.0 (21.3, 30.3) | 8.9 (22.6, 31.5) | -0.1 | 6.1 (29.3, 35.4) | 6.4 (30.4, 36.8) | 0.3 |
| LE50 | EU15 | Value | 29.4 | 30.6 | 1.2 | 34.0 | 35.1 | 1.1 |
| | | Range | 2.2 (28.1, 30.3) | 2.4 (29.1, 31.5) | 0.2 | 3.5 (31.9, 35.4) | 4.1 (32.7, 36.8) | 0.6 |
| LE50 | EU10 | Value | 24.3 | 25.5 | 1.2 | 30.7 | 31.8 | 1.1 |
| | | Range | 8.2 (21.3, 29.5) | 8.8 (22.6, 31.4) | 0.6 | 3.6 (29.3, 32.9) | 4.6 (30.4, 35.0) | 1.0 |
| LE50 | EU27 | Value | N/A | 29.4 | N/A | N/A | 34.3 | N/A |
| | | Range | N/A | 8.9 (22.6, 31.5) | N/A | N/A | 7.0 (29.8, 36.8) | N/A |
| HLY50 | EU25 | Value | 17.4 | 17.9 | 0.5 | 18.2 | 18.6 | 0.4 |
| | | Range | 14.5 (9.2, 23.7) | 15.5 (9.9, 25.4) | 1.0 | 13.5 (10.6, 24.1) | 16.3 (9.7, 26.0) | 2.8 |
| HLY50 | EU15 | Value | 18.0 | 18.6 | 0.6 | 18.5 | 19.1 | 0.6 |
| | | Range | 10.8 (12.9, 23.7) | 10.7 (14.7, 25.4) | -0.1 | 11.3 (12.8, 24.1) | 12.5 (13.5, 26.0) | 1.2 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HLY50 | EU10 | Value | 14.6 | 14.2 | -0.4 | 16.9 | 15.9 | -1.0 |
| | | Range | 12.6 (9.2, 21.8) | 13.3 (9.9, 23.2) | 0.7 | 12.1 (10.6, 22.7) | 14.1 (9.7, 23.8) | 2.0 |
| HLY50 | EU27 | Value | N/A | 17.7 | N/A | N/A | 18.4 | N/A |
| | | Range | N/A | 15.5 (9.9, 25.4) | N/A | N/A | 16.3 (9.7, 26.0) | N/A |

**Table 2: Meta-regression analyses of factors associated with Healthy Life Years at age 50 (HLY50) in Europe (EU25), by gender and year (2005, 2010)**

| EU25 | 2005 | | | | 2010 | | | |
|---|---|---|---|---|---|---|---|---|
| | men | | women | | men | | women | |
| | Coeff (SE) | p value | Coeff (SE) | P value | Coeff (SE) | p value | Coeff(SE) | p value |
| Gross domestic product | 0.042 (0.017) | 0.114 | 0.038 (0.018) | 0.266 | 0.044 (0.017) | 0.080 | 0.047 (0.016) | **0.050** |
| Poverty risk for people ≥65 years (%) | 0.066 (0.077) | 0.949 | 0.011 (0.079) | 1.000 | 0.149 (0.104) | 0.635 | 0.056 (0.105) | 0.997 |
| Inequality of income distribution | 1.119 (0.851) | 0.662 | 0.120 (0.998) | 1.000 | 2.352 (0.960) | 0.112 | 0.803 (1.169) | 0.986 |
| Employment rate of older workers (%) | 0.067 (0.075) | 0.959 | -0.038 (0.058) | 0.991 | 0.193 (0.082) | 0.209 | 0.026 (0.063) | 1.000 |
| Long term unemployment rates (%) | -0.68 (0.292) | 0.200 | -0.185 (0.264) | 0.989 | -0.71 (0.228) | **0.033** | -0.821 (0.270) | 0.052 |
| Life-long learning (%) | 0.258 (0.122) | 0.279 | 0.149 (0.092) | 0.584 | 0.275 (0.120) | 0.176 | 0.169 (0.077) | 0.230 |
| Low education attainment (%) | 0.099 (0.042) | 0.108 | 0.077 (0.043) | 0.424 | 0.107 (0.043) | 0.094 | 0.080 (0.046) | 0.454 |
| Material deprivation (%) | -0.15 (0.043) | **0.018** | -0.127 (0.044) | 0.089 | -0.21 (0.060) | **0.005** | -0.197 (0.057) | **0.015** |

**Table 3: Meta-regression analyses of factors associated with Healthy Life Years at age 50 (HLY50) in EU10 and EU15, by gender and year (2005, 2010)**

| | 2005 | | | | 2010 | | | |
|---|---|---|---|---|---|---|---|---|
| | men | | women | | men | | women | |
| **EU10** | Coeff (SE) | p value | Coeff (SE) | P value | Coeff (SE) | p value | Coeff (SE) | p value |
| Gross domestic product | 0.131 (0.071) | 0.648 | 0.080 (0.086) | 0.979 | 0.213 (0.077) | 0.155 | 0.136 (0.086) | 0.701 |
| Poverty risk for people ≥65 years (%) | 0.068 (0.095) | 0.991 | -0.008 (0.105) | 1.000 | 0.207 (0.123) | 0.590 | 0.120 (0.123) | 0.938 |
| Inequality of income distribution | 1.635 (1.592) | 0.900 | 1.058 (2.123) | 0.999 | 3.045 (1.422) | 0.422 | 2.063 (1.786) | 0.883 |
| Employment rate of older workers (%) | -0.035 (0.123) | 1.000 | -0.205 (0.073) | 0.202 | 0.203 (0.157) | 0.805 | -0.099 (0.097) | 0.934 |
| Long term unemployment rates (%) | -0.134 (0.413) | 1.000 | 0.187 (0.386) | 0.999 | -0.819 (0.300) | 0.163 | -1.195 (0.351) | **0.026** |
| Life-long learning (%) | 0.414 (0.422) | 0.928 | -0.023 (0.363) | 1.000 | 0.256 (0.397) | 0.992 | 0.018 (0.287) | 1.000 |
| Low education attainment (%) | 0.162 (0.054) | 0.239 | 0.125 (0.053) | 0.453 | 0.197 (0.060) | 0.103 | 0.149 (0.050) | 0.215 |
| Material deprivation (%) | -0.119 (0.077) | 0.761 | -0.102 (0.083) | 0.912 | -0.167 (0.126) | 0.766 | -0.143 (0.110) | 0.822 |
| **EU15** | | | | | | | | |
| Gross domestic product | 0.003 (0.021) | 1.000 | 0.010 (0.023) | 0.999 | 0.008 (0.017) | 1.000 | 0.026 (0.019) | 0.696 |
| Poverty risk for people ≥65 years (%) | 0.025 (0.102) | 1.000 | 0.010 (0.110) | 1.000 | 0.000 (0.138) | 1.000 | -0.105 (0.161) | 0.988 |
| Inequality of income distribution | -0.117 (0.882) | 1.000 | -0.925 (0.970) | 0.930 | -0.949 (1.251) | 0.980 | -1.908 (1.324) | 0.652 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Employment rate of older workers (%) | 0.096 (0.073) | 0.827 | 0.006 (0.066) | 1.000 | 0.092 (0.080) | 0.876 | 0.052 (0.072) | 0.980 |
| Long term unemployment rates (%) | -1.092 (0.522) | 0.280 | -0.200 (0.374) | 0.997 | -0.073 (0.319) | 1.000 | -0.345 (0.344) | 0.888 |
| Life-long learning (%) | 0.091 (0.123) | 0.989 | 0.092 (0.089) | 0.905 | 0.127 (0.107) | 0.843 | 0.125 (0.073) | 0.501 |
| Low education attainment (%) | 0.004 (0.050) | 1.000 | -0.036 (0.060) | 0.995 | -0.013 (0.046) | 1.000 | -0.086 (0.062) | 0.698 |
| Material deprivation (%) | -0.041 (0.154) | 1.000 | -0.063 (0.150) | 0.999 | -0.129 (0.122) | 0.906 | -0.213(0.129) | 0.562 |

**Figure 1: Age of onset of activity limitation in the EU27 countries in 2005 and 2010, by gender**

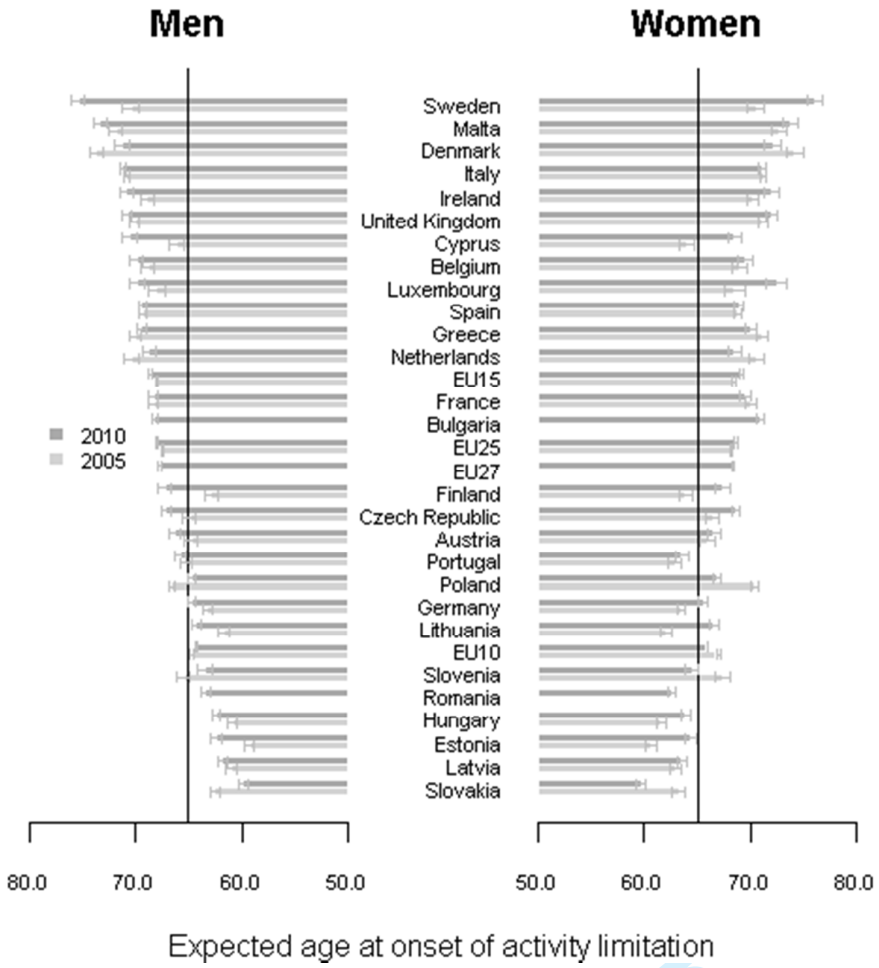

**Table S1: Definition and quality grade of structural and sustainable indicators, Europe**

| Indicator | By Gender | Definition | Quality grade |
|---|---|---|---|
| Gross Domestic Product per capita (GDP) | No | A measure of economic activity. It is defined as the value of all goods and services produced less the value of any goods or services used in their creation. The volume index of GDP per capita in Purchasing Power Standards is expressed in relation to the EU27 countries average set to equal 100. | A |
| Poverty risk for aged over 65 years (%) | No | The share of persons with an equivalised disposable income below the risk-of-poverty threshold, which is set at 60 % of the national median equivalised disposable income (after social transfers), as a percentage of all people aged 65 years and over. | C |
| Inequality of income distribution | Yes | The ratio of total income received by the 20% of the population with the highest income (top quintile) to that received by the 20% of the population with the lowest income (lowest quintile). | A |
| Employment rate of older workers (%) | Yes | Employed people aged 55-64 years as a percentage of the total population of the same age group. | A |
| Long term unemployment rate (%) | Yes | Long term unemployed (12 months or more) as a percentage of the total active population. | A |
| Life-long learning (%) | Yes | Percentage of the adult population aged 25-64 years participating in education and training over the 4 weeks before the survey was carried out. | A |
| Low education attainment (%) | Yes | Percentage of population aged 25-64 having completed at most lower secondary education (international standard classification of education level 2 or less) | A |
| Material deprivation (%) | Yes | Percentage of population with an enforced lack of at least three out of nine material deprivation items in the 'economic strain and durables' dimension.<br><br>Economic strain items are; arrears on mortgage/rent; arrears on utility bills; arrears on Hire | A |

| | |
|---|---|
| | purchase instalments or other loan payments; capacity to afford paying for one week annual holiday away from home; capacity to afford a meal with meat, chicken, fish (or vegetarian equivalent) every second day; ability to keep home adequately warm.<br><br>Durables items are; owning a colour TV; owning telephone (including mobile); owning a car. |

Quality grade

A = data obtained from reliable sources applying high standards of methodology and accuracy, with a common method for the EU, comparable over time

C = data might have to be interpreted with care since there could be incompatibility across countries (including the absence of data) and breaks in the series that hamper comparison over time

**Table S2: Levels of structural and sustainable indicators by country, Europe for 2005**

| | Gross domestic product (GDP per head) | Poverty risk for people ≥65 years (%) | Inequality of income distribution | | Employment rate of older workers (%) | | Long term unemployment rates (%) | | Life-long learning (%) | | Low education attainment (%) | | Material Deprivation (%) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | F | M | F | M | F | M | F | M | F | M | F | M |
| Austria | 125 | 14.3 | 4.0 | 3.6 | 22.9 | 41.3 | 1.4 | 1.3 | 13.5 | 12.3 | 24.6 | 14.2 | 9.0 | 7.5 |
| Belgium | 120 | 21.4 | 3.0 | 3.1 | 22.1 | 41.7 | 5.0 | 3.9 | 8.5 | 8.2 | 34.1 | 33.7 | 13.8 | 12.8 |
| Cyprus | 93 | 50.3 | 4.3 | 4.8 | 31.5 | 70.8 | 1.8 | 0.8 | 6.3 | 5.4 | 35.4 | 31.2 | 31.8 | 30.7 |
| Czech Republic | 79 | 5.3 | 2.4 | 2.1 | 30.9 | 59.3 | 5.3 | 3.4 | 5.9 | 5.2 | 13.7 | 6.4 | 23.9 | 21.5 |
| Denmark | 123 | 17.6 | 2.4 | 2.7 | 53.5 | 65.6 | 1.2 | 1.1 | 31.2 | 23.6 | 20.4 | 17.6 | 8.4 | 6.8 |
| Estonia | 61 | 20.3 | 3.3 | 3.3 | 53.7 | 59.3 | 4.2 | 4.2 | 7.3 | 4.3 | 9.1 | 12.9 | 27.7 | 25.4 |
| Finland | 114 | 18.7 | 2.9 | 3.0 | 52.7 | 52.8 | 2.0 | 2.4 | 26.1 | 19.0 | 19.0 | 23.3 | 11.4 | 10.2 |
| France | 110 | 16.4 | 4.4 | 4.4 | 35.7 | 41.5 | 4.3 | 3.3 | 6.1 | 5.7 | 35.2 | 31.3 | 14.1 | 12.3 |
| Germany | 116 | 13.4 | 3.6 | 3.4 | 37.6 | 53.6 | 5.8 | 6.1 | 7.4 | 8.0 | 20.3 | 13.4 | 11.7 | 10.3 |
| Greece | 91 | 27.9 | 5.1 | 4.9 | 25.8 | 58.8 | 8.9 | 2.6 | 1.8 | 1.9 | 41.1 | 39.0 | 28.0 | 24.6 |
| Hungary | 63 | 6.5 | 2.6 | 2.7 | 26.7 | 40.6 | 3.2 | 3.2 | 4.6 | 3.2 | 27.3 | 19.7 | 40.9 | 38.4 |
| Ireland | 144 | 32.8 | 3.3 | 3.6 | 37.3 | 65.7 | 0.9 | 1.9 | 8.6 | 6.2 | 31.9 | 37.8 | 12.1 | 10.3 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Italy | 105 | 22.6 | 4.3 | 4.7 | 20.8 | 42.7 | 5.2 | 2.9 | 6.2 | 5.4 | 49.8 | 50.1 | 14.8 | 13.9 |
| Latvia | 50 | 21.2 | 3.9 | 3.8 | 45.2 | 55.2 | 4.0 | 4.8 | 10.6 | 5.0 | 12.6 | 18.7 | 58.7 | 53.5 |
| Lithuania | 55 | 17.0 | 3.5 | 3.4 | 41.7 | 59.1 | 4.4 | 4.1 | 7.7 | 4.2 | 11.4 | 13.5 | 53.2 | 50.0 |
| Luxembourg | 254 | 7.8 | 3.1 | 3.3 | 24.9 | 38.3 | 1.2 | 1.2 | 8.5 | 8.5 | 38.3 | 30.0 | 3.7 | 4.1 |
| Malta | 80 | 23.4 | 3.6 | 3.9 | 12.4 | 50.8 | 3.4 | 3.5 | 4.5 | 6.1 | 77.4 | 64.0 | 15.9 | 14.0 |
| Netherlands | 131 | 5.4 | 2.9 | 3.8 | 35.2 | 56.9 | 2.1 | 2.1 | 16.1 | 15.6 | 31.6 | 24.8 | 8.0 | 7.1 |
| Poland | 51 | 7.3 | 3.4 | 3.6 | 19.7 | 35.9 | 11.5 | 9.4 | 5.4 | 4.3 | 16.1 | 14.2 | 51.5 | 50.0 |
| Portugal | 79 | 27.6 | 5.4 | 6.1 | 43.7 | 58.1 | 4.4 | 3.8 | 4.2 | 4.0 | 71.4 | 75.8 | 22.1 | 20.2 |
| Slovakia | 60 | 7.1 | 2.4 | 2.5 | 15.6 | 47.8 | 12.4 | 11.3 | 5.0 | 4.3 | 15.3 | 8.9 | 43.4 | 41.7 |
| Slovenia | 87 | 20.3 | 3.8 | 3.2 | 18.5 | 43.1 | 3.3 | 2.9 | 17.2 | 13.6 | 22.6 | 16.9 | 15.3 | 14.0 |
| Spain | 102 | 29.3 | 4.4 | 4.5 | 27.4 | 59.7 | 3.4 | 1.4 | 11.4 | 9.7 | 51.5 | 51.6 | 11.1 | 10.5 |
| Sweden | 122 | 10.1 | 2.7 | 2.9 | 66.7 | 72.0 | 0.8 | 1.2 | 21.9 | 13.0 | 14.3 | 18.5 | 6.7 | 4.7 |
| UK | 123 | 24.8 | 4.1 | 4.9 | 48.0 | 65.9 | 0.7 | 1.3 | 32.0 | 23.1 | 32.5 | 24.1 | 12.9 | 12.1 |

**Table S3: Levels of structural and sustainable indicators by country, Europe for 2010**

| | Gross domestic product (GDP per head) | Poverty risk for people ≥65 years (%) | Inequality of income distribution | | Employment rate of older workers (%) | | Long term unemployment rates (%) | | Life-long learning (%) | | Low education attainment (%) | | Material Deprivation (%) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | F | M | F | M | F | M | F | M | F | M | F | M |
| Austria | 127 | 15.2 | 3.7 | 3.5 | 33.7 | 51.6 | 0.9 | 1.3 | 14.7 | 12.7 | 22.5 | 12.4 | 11.4 | 10.0 |
| Belgium | 119 | 19.4 | 3.3 | 4.2 | 29.2 | 45.6 | 4.1 | 4.0 | 7.4 | 7.0 | 29.0 | 30.0 | 12.6 | 12.0 |
| Bulgaria | 44 | 32.2 | 4.6 | 4.2 | 37.7 | 50.3 | 4.5 | 5.0 | 1.3 | 1.1 | 20.4 | 20.7 | 60.7 | 58.0 |
| Cyprus | 97 | 40.5 | 4.4 | 4.9 | 42.5 | 70.5 | 1.3 | 1.3 | 7.9 | 7.4 | 26.7 | 25.1 | 28.6 | 28.3 |
| Czech Republic | 80 | 6.8 | 2.4 | 2.3 | 35.5 | 58.4 | 3.5 | 2.6 | 7.7 | 7.3 | 10.9 | 5.2 | 16.2 | 13.9 |
| Denmark | 128 | 17.7 | 3.1 | 4.2 | 53.6 | 63.3 | 1.2 | 1.8 | 39.1 | 26.0 | 25.3 | 23.5 | 6.1 | 5.8 |
| Estonia | 63 | 15.1 | 2.9 | 3.0 | 54.9 | 52.2 | 5.9 | 9.4 | 13.0 | 8.6 | 8.2 | 13.7 | 22.5 | 22.0 |
| Finland | 113 | 18.3 | 2.9 | 3.2 | 56.9 | 55.6 | 1.5 | 2.5 | 27.1 | 18.9 | 14.8 | 19.2 | 9.0 | 7.7 |
| France | 108 | 10.6 | 4.5 | 4.6 | 37.5 | 42.2 | 3.9 | 3.9 | 5.4 | 4.6 | 30.4 | 28.0 | 13.1 | 12.1 |
| Germany | 119 | 14.1 | 3.6 | 4.0 | 50.5 | 65.0 | 3.0 | 3.6 | 7.6 | 7.7 | 16.7 | 11.7 | 11.5 | 10.6 |
| Greece | 87 | 21.3 | 4.0 | 4.2 | 28.9 | 56.5 | 8.1 | 3.9 | 2.9 | 3.1 | 35.7 | 39.2 | 25.2 | 23.0 |
| Hungary | 65 | 4.1 | 2.5 | 2.6 | 30.1 | 39.6 | 5.2 | 5.8 | 2.9 | 2.6 | 21.6 | 15.7 | 40.7 | 39.1 |
| Ireland | 127 | 10.6 | 3.8 | 4.2 | 42.1 | 58.2 | 3.8 | 9.2 | 7.2 | 6.3 | 24.3 | 30.2 | 16.4 | 15.7 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Italy | 101 | 16.6 | 4.1 | 4.2 | 26.2 | 47.6 | 4.8 | 3.6 | 6.5 | 5.9 | 44.0 | 45.7 | 16.6 | 15.4 |
| Latvia | 54 | 18.8 | 3.9 | 3.7 | 48.7 | 47.6 | 6.8 | 11.1 | 6.5 | 3.4 | 8.4 | 14.9 | 47.6 | 44.3 |
| Lithuania | 61 | 10.2 | 3.5 | 3.9 | 45.8 | 52.3 | 5.8 | 9.1 | 4.8 | 3.2 | 7.2 | 9.1 | 36.8 | 35.2 |
| Luxembourg | 267 | 5.9 | 3.0 | 3.6 | 31.3 | 47.7 | 1.4 | 1.3 | 14.0 | 12.8 | 25.4 | 19.3 | 4.4 | 3.7 |
| Malta | 86 | 18.0 | 3.5 | 4.0 | 13.0 | 48.2 | 2.7 | 3.4 | 6.4 | 6.0 | 68.8 | 60.9 | 14.8 | 14.5 |
| Netherlands | 131 | 5.9 | 3.1 | 3.2 | 42.8 | 64.5 | 1.2 | 1.2 | 17.2 | 16.0 | 29.2 | 26.1 | 7.1 | 7.2 |
| Poland | 63 | 14.2 | 3.5 | 3.4 | 24.2 | 45.3 | 3.2 | 2.9 | 5.9 | 4.8 | 11.7 | 11.3 | 29.4 | 27.2 |
| Portugal | 80 | 21.0 | 4.8 | 5.2 | 43.5 | 55.7 | 6.5 | 6.1 | 5.7 | 5.8 | 64.9 | 71.4 | 22.9 | 21.9 |
| Romania | 47 | 16.7 | 4.2 | 3.8 | 33.0 | 50.3 | 2.1 | 2.9 | 1.4 | 1.2 | 29.8 | 21.5 | 49.8 | 48.6 |
| Slovakia | 73 | 7.7 | 2.3 | 2.3 | 28.7 | 54.0 | 9.6 | 9.0 | 3.3 | 2.2 | 10.9 | 7.2 | 25.7 | 23.9 |
| Slovenia | 84 | 20.2 | 3.6 | 3.2 | 24.5 | 45.5 | 2.9 | 3.4 | 18.3 | 14.1 | 18.6 | 14.8 | 16.3 | 15.3 |
| Spain | 99 | 21.7 | 4.3 | 4.4 | 33.2 | 54.7 | 7.7 | 7.1 | 11.6 | 10.0 | 46.3 | 48.5 | 13.7 | 12.8 |
| Sweden | 124 | 15.5 | 3.0 | 3.2 | 66.9 | 74.0 | 1.4 | 1.8 | 30.9 | 18.0 | 18.8 | 18.8 | 4.1 | 3.8 |
| UK | 111 | 21.3 | 4.2 | 4.4 | 49.5 | 65.0 | 1.8 | 3.2 | 22.4 | 16.4 | 26.6 | 21.1 | 13.5 | 13.2 |

**Table S4:** Meta-regression analyses of factors associated with Healthy Life Years at age 50 (HLY50) in EU27 and EU12, by gender (2010)

| | **EU27** | | | | **EU12** | | | |
|---|---|---|---|---|---|---|---|---|
| | men | | women | | men | | women | |
| | Coeff (SE) | p value | Coeff (SE) | P value | Coeff (SE) | p value | Coeff (SE) | p value |
| Gross domestic product | 0.042 (0.016) | 0.066 | 0.044 (0.016) | 0.073 | 0.109 (0.068) | 0.692 | 0.063 (0.073) | 0.968 |
| Poverty risk for people ≥65 years (%) | 0.129 (0.094) | 0.694 | 0.072 (0.096) | 0.978 | 0.204 (0.099) | 0.317 | 0.156 (0.106) | 0.649 |
| Inequality of income distribution | 2.324 (0.944) | 0.103 | 0.642 (1.109) | 0.995 | 2.935 (1.249) | 0.257 | 1.802 (1.466) | 0.832 |
| Employment rate of older workers (%) | 0.197 (0.080) | 0.159 | 0.034 (0.063) | 0.998 | 0.201 (0.147) | 0.765 | -0.086 (0.100) | 0.969 |
| Long term unemployment rates (%) | -0.672 (0.229) | 0.053 | -0.724 (0.285) | 0.151 | -0.74 (0.292) | 0.201 | -0.935 (0.433) | 0.352 |
| Life-long learning (%) | 0.269 (0.110) | 0.131 | 0.166 (0.074) | 0.228 | 0.155 (0.325) | 0.999 | -0.016 (0.250) | 1.000 |
| Low education attainment (%) | 0.106 (0.043) | 0.076 | 0.072 (0.047) | 0.595 | 0.189 (0.057) | 0.082 | 0.134 (0.057) | 0.341 |
| Material deprivation (%) | -0.136 (0.047) | 0.059 | -0.117 (0.047) | 0.161 | -0.05 (0.085) | 0.998 | -0.034 (0.082) | 1.000 |