Assessing Population Health: A Closer Look at the Healthy Life Years Indicator

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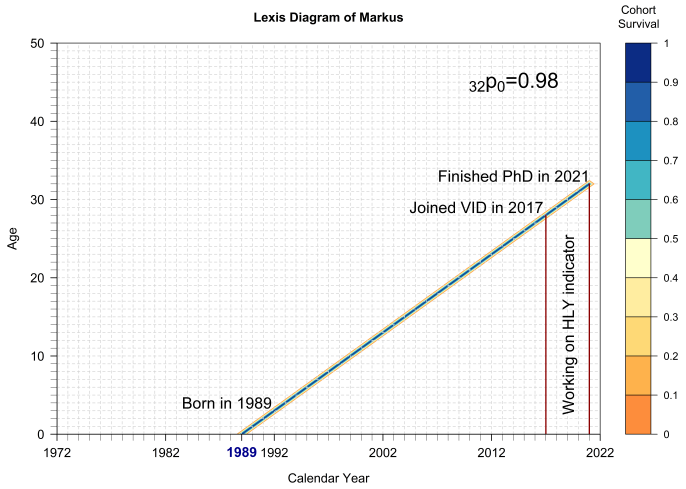
About 4 years research on the Healthy Life Years (HLY) indicator



Source: Mortality data comes from the Human Mortality Database (HMD).

Marc Luy's research team on the ERC project "Levels and trends of health expectancy: understanding its measurement and estimation sensitivity" (LETHE)

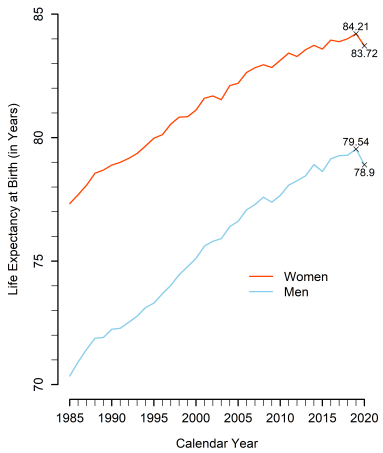
What is Health Expectancy and why do we need it?

Most European countries such as Austria have experienced gains in longevity.

The question is: Are they living longer in good or poor health?

The idea is: Let's have something like life expectancy (LE) but adjusted for health $\rightarrow$ health expectancy (HE).

Figure: Period LE for Austria



Source: Own illustration with data from Statistik Austria.

There are many ways to construct HE, the EU relies on one specific way, i.e., HLY

- HLY combines period life tables (i.e, LE is basis) with prevalence data from the European Union Statistics on Income and Living Conditions (EU-SILC) in accordance with the Sullivan method (1971).

- Health survey question: Global Activity Limitation Indicator (GALI).

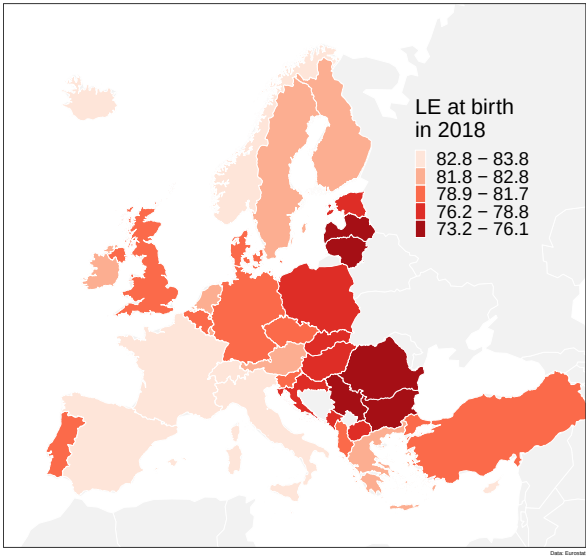
  "For at least the past 6 months, to what extent have you been limited because of a health problem in activities people usually do?"

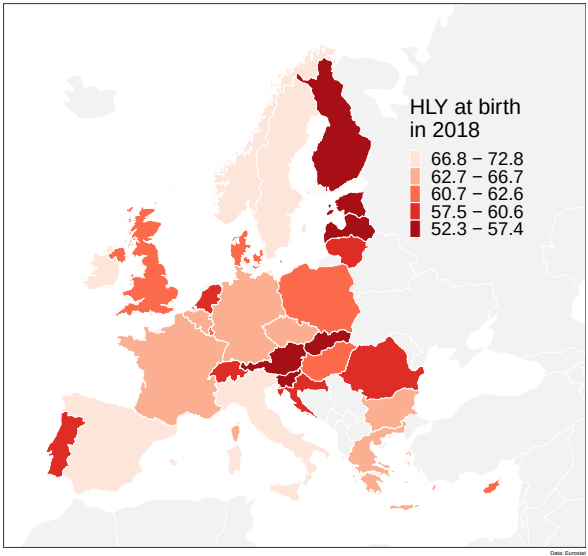
  ☐ severely limited

  ☐ limited but not severely

  ☒ not limited at all

- EU uses HLY to monitor population health in Europe with the aim of enabling EU citizens to lead healthy, active and independent lives while ageing (see www.healthyageing.eu).





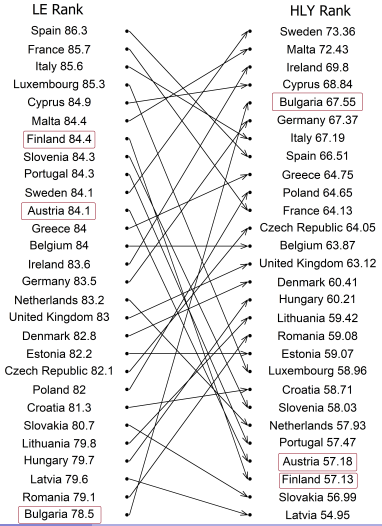
Source: Own illustration with data from Eurostat.

Countries with high LE do not necessarily show also high HLY values

- Finland ranks much higher in terms of LE as compared to HLY.
- Bulgaria, on the other hand, shows the lowest LE value in EU-28 and ranks high on the basis of HLY.
- Austria's HLY level is comparatively low.

Source: Own alculations with data from www.eurohex.eu.

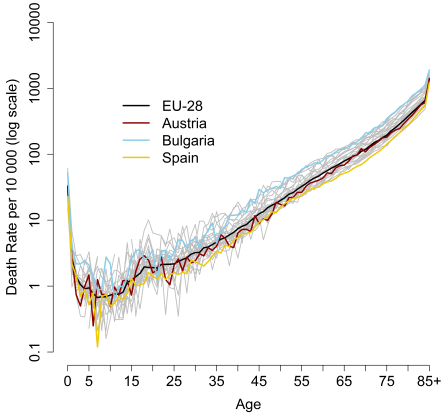
Figure: LE and HLY ranking in 2016, women



A closer Look at HLY Part I: What is the reason for the observed differences between LE and HLY?

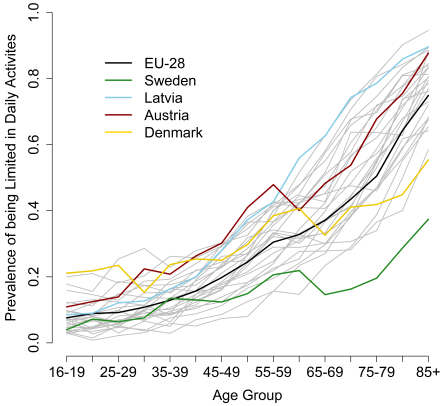
HLY is calculated from death rates and prevalence data

Figure: Death Rates for Women in 2016



Source: Own illustration with data from www.eurohex.eu.

Figure: GALI Prevalence for Women in 2016

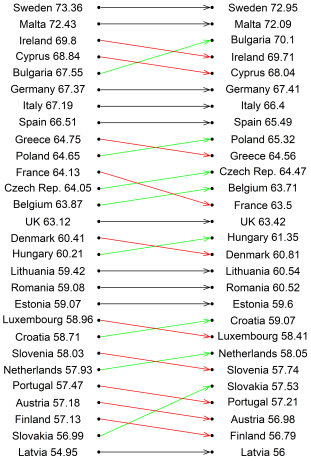


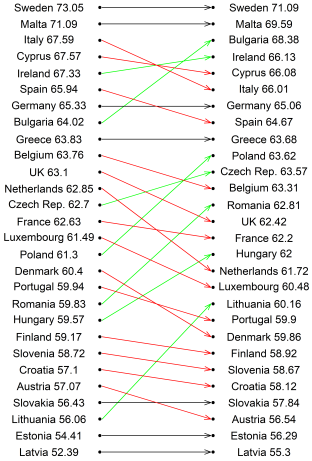
An experiment can help understanding the impact of health information on HLY

Idea:

- Download health and mortality data for the EU from www.eurohex.eu.
- Build a R function that calculates HLY on the basis of two arguments, country-specific mortality rates and country-specific prevalence data.
- The function call could look like **HLY.function(mortality.data = "EU28average", health.data = "Austria")**.
- In order to test the impact of health data on HLY, calculate HLY for each country on the basis of "EU-28 average death rates", i.e., holding mortality constant.

HLY rank change after assuming each country experienced EU-28 mortality rates for women (left) and men (right)





Source: Own calculations with data from www.eurohex.eu (adapted from Di Lego & Sauerberg (submitted manuscript)).

What is driving HLY changes over time? Another small exercise regarding HLY sensitivity

Question: What is the size of each effect, changes in age-specific prevalence and age-specific mortality rates?

- In 2016, HLY for men in Austria is 57.07 years.
- Reducing mortality rates at each age by 1% increases HLY to 57.12 years $(+0.09\%)$.
- Reducing prevalence rates at each age by 1% increases HLY to 57.30 years $(+0.40\%)$.

Caution: Only first preliminary results, not systematically tested yet.

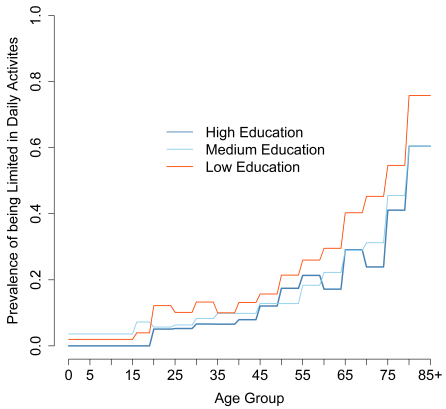
A closer Look at HLY Part II: Does it hold for subpopulations and if yes, what are the implications?

Examining educational differentials: Can some of the between-country variation be explained by compositional effects

GALI Prevalence differs by educational attainment and European countries also vary in terms of their relative number of low-educated population. For instance, about 50 % of Italian women were low-educated in 2016, while the same share in Estonia was only 18 %.

Source: Own calculations with EU-SILC data.

Figure: GALI Prevalence by Education, Italian women



Again, standardization reveals the impact of population's composition by educational attainment on HLY

Table: Education-adjusted and original HLY at age 30 for selected European countries, 2016, women

Country	Std. HLY	Original HLY	Change	Rank Change
Sweden	44.1	44.0	+0.0	1 → 1
Italy	40.2	38.5	+1.7	4 → 2
Norway	39.2	40.1	-0.9	2 → 3
Bulgaria	39.2	39.4	-0.2	3 → 4
Greece	37.7	36.0	+1.7	5 → 5
Poland	35.4	35.9	-0.6	6 → 6
Czech Rep.	34.6	35.9	-1.3	7 → 7
Denmark	33.3	35.1	-1.9	8 → 8
Hungary	32.0	32.1	-0.1	9 → 9
Romania	31.8	31.3	+0.6	10 → 10
Portugal	31.6	30.0	+1.6	15 → 11

Source: Own calculations with data from EU-SILC (adapted from Sauerberg 2021).

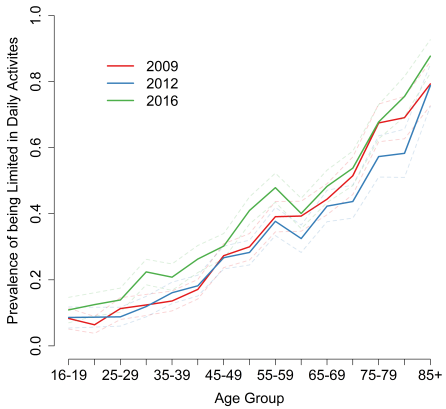
A closer Look at HLY Part III: Are some of the HLY differences across Europe simply the result of noisy prevalence data?

How to deal with fluctuation and uncertainty in age-specific prevalence data?

GALI Prevalence is usually showing substantial fluctuations over time and thus, it is not always clear whether changes in GALI prevalence reflect actual improvements/deteriorations in population health or can be attributed to data uncertainty.

Source: Own illustration with data from www.eurohex.eu.

Figure: Prevalence for three points in time, Austrian women



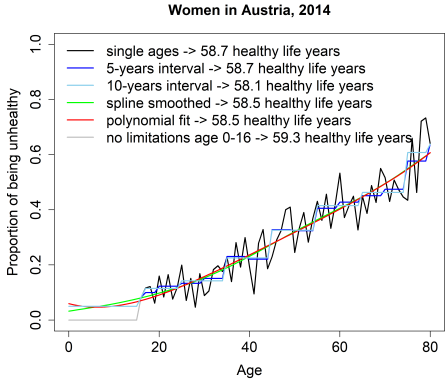
Smoothing, curve fitting, age graduation: Does it matter?

Vanessa and I tested:

- Smoothed data vs. observed data.
- Assumptions about disability before age 16.
- Extrapolating prevalence to higher ages.

Source: Own illustration with data from www.eurohex.eu.

Figure: Prevalence for three points in time, Austrian women

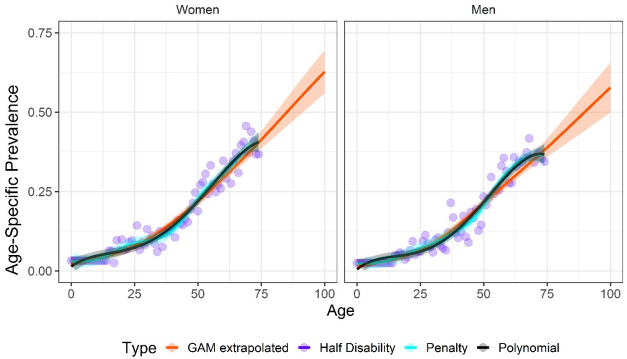


In some cases it does, but generally the effect is smaller than we expected

	GAM	Half dis.	Penalty	Polynomial
Women	66.6	68.6	68.1	68.1
Men	64.9	66.5	66.3	66.3

Source: Own calculations with data from EU-SILC and HMD (adapted from Di Lego & Sauerberg (submitted manuscript).

Figure: GALI Prevalence in Germany, 2017



Conclusions

- The HLY indicator is particulary sensitive to the health information.
- Countries differ considerbly in terms of their GALI prevalence and compensate mortality differences.
- This results in a disassociation of LE and HLY, e.g., Bulgaria and Finland.
- Difficult to correctly interpret differences in GALI prevalence (health inequalities or incomparable data).
- Great efforts have been made to harmonize and improve GALI and HLY, e.g., by the REVES network (see Jagger et al. 2020 and Robine et al. 2002).
- Maybe harmonization issues are not fully solvable but raising awareness is important in order to prevent misinterpretations, e.g., Brønnum-Hansen 2014.

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