Paradox lost?
Interpreting gender differences in life and health expectancy

Marc Luy[1], Paola Di Giulio[1], Vanessa di Lego[1], Yuka Minagawa[2]

[1] Vienna Institute of Demography of the Austrian Academy of Sciences
[2] Sophia University, Tokyo

Extended Abstract

Research question

Starting in the 1920s, a common wisdom about gender differences in health and mortality emerged, best exemplified by the well-known phrase "women get sicker, but men die quicker" (Lorber and Moore 2002). Recently, this wisdom has been increasingly questioned (Gorman and Ghazal Read 2006; Kulminski et al. 2008; Rieker and Bird 2005). Nonetheless, the general idea of a gender paradox persists until today. Based on our previous studies about this topic, we hypothesize that this 'gender and health paradox' can be resolved by the following two factors:

1. The 'mortality effect' which implies that women's higher life expectancy translates into a higher number of life years spent in poor health (Luy and Minagawa 2014).
2. 'Different item functioning' (DIF), that is, gender differences in health reporting behaviors caused by women's higher sensitivity to bodily discomforts and greater willingness to report symptoms of distress and illness in health surveys (Di Lego et al. 2020).

To test the first hypothesis, we decompose the differences in unhealthy life years (ULY) between women and men into the effects due to gender differences in mortality, i.e., the 'mortality effect' (ME), and gender differences in health, that is, 'health effect' (HE). HE separates the gender differences in ULY from ME. To test the second hypothesis, we use anchoring vignettes to control for the effect of DIF on ME-adjusted gender differences in ULY. The vignette approach corrects intergroup heterogeneity in reporting behaviors and has been widely used to identify DIF in various topics, such as student performance (Coenen et al. 2021), life satisfaction (Angelini et al. 2012), job satisfaction (Kristensen and Johansson 2008), and economic welfare (Ravallion et al. 2013). Recently, we introduced an approach that uses anchoring vignettes to adjust for the impact of DIF on cross-country differences in healthy life years (Luy et al. 2023).

Data and research methods

ULY for women and men are estimated with the Sullivan (1971) method for the three health domains covered by the Minimum European Health Module (MEHM), including self-perceived health, limitations in activities of daily living, and chronic morbidity. Self-perceived health reflects the self-assessment of a person's overall health based on the question "How do you rate your health in general?" with the five answer categories of 'very good', 'good', 'fair', 'poor', and 'very poor'. Activity limitations are measured via the Global Activity Limitations Indicator (GALI) based on the question "For at least the past six months, to what extent have you been limited because of a health problem in activities people usually do?" with the three response options of 'strongly limited', 'limited but not strong', and 'not limited'. Chronic morbidity is defined as the presence of longstanding health problems based on the question "Do you have any longstanding illness or health problem?" with the two possible responses 'yes' and 'no'. In estimating ULY, we defined unhealthy state through poor or very poor self-perceived health status, strong limitations in activities of daily living, and the presence of longstanding health problems.

Data on sex- and age-specific prevalence of these health conditions is taken from the Survey of Health, Age and Retirement in Europe (SHARE). Life tables are from the Human Mortality Database (HMD). Differences in ULY between women and men are decomposed into ME and HE with the method proposed by Nusselder and Looman (2004). Finally, the HE is adjusted for DIF with the help of anchoring vignettes. Anchoring vignettes are brief, hypothetical descriptions of fictional characters who manifest certain health problems to a lesser or greater degree (King et al. 2004). Respondents are asked to evaluate the severity of the described health problems, and response categories included 'none,' 'mild,' 'moderate,' 'severe,' and 'extreme.' SHARE included 27 health vignettes in the first wave of 2004, for a sub-sample of 4,372 individuals from Belgium (548), France (876), Germany (495), Greece (657), Italy (437), the Netherlands (517), Spain (429), and Sweden (413). The SHARE vignettes cover seven different health traits, with three vignettes each from the traits of 'bodily aches or pains,' 'difficulty with sleeping,' 'problem with moving around,' 'difficulty with concentrating and remembering,' 'problem because of shortness of breath,' 'problem with feeling sad, low, or depressed,' and nine vignettes from the trait 'limitations with the kind or amount of work one could do.' In addition to the evaluations of the vignette characters' health conditions, respondents were asked to rate their own health for the same seven health dimensions with the same answer scale.

The adjustment for DIF in the HE would require vignettes designed for the self-perceived health, GALI and chronic morbidity. However, such vignettes are not available because vignettes can describe only very specific health problems. Nonetheless, the seven health traits of the vignettes are likely to cover the most important health problems experienced by people who report poor health in the MEHM domains. We use the approach of Luy et al. (2023) to identify those health traits that are statistically associated with the three MEHM domains by the least absolute shrinkage and selection operator (lasso) regression for the age groups 50-59, 60-74, and 75+. From the respective selection of vignettes, we calculate female/male ratios of vignette characters that the respondents assigned as having health problems. These ratios are

used as DIF-adjustment factors to correct the prevalence of poor health for the different health reporting of women and men in the three MEHM domains. The DIF-adjusted prevalence values are then used to estimate DIF-adjusted ULY.

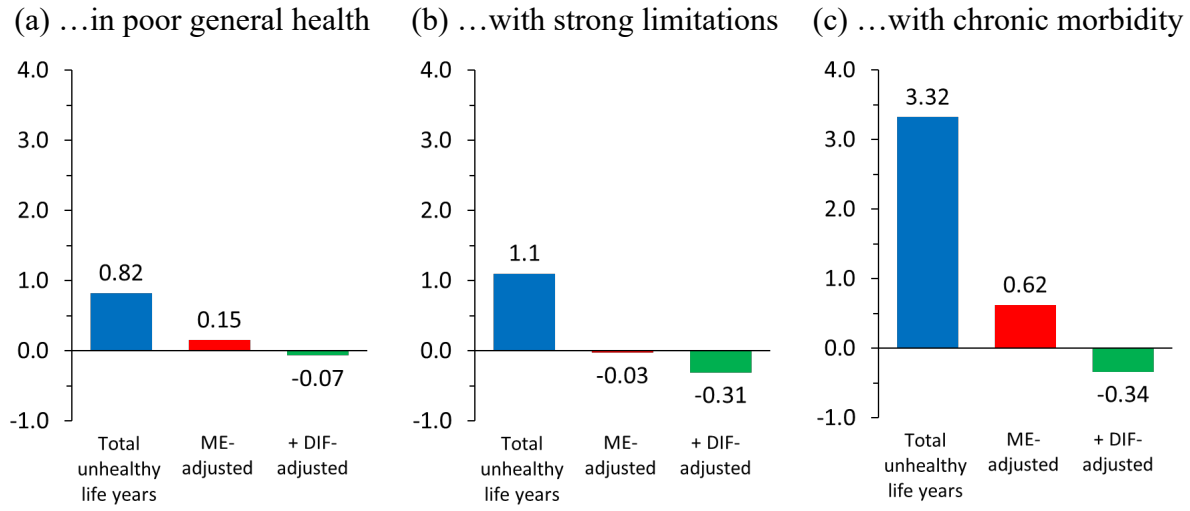
Preliminary findings

Figure 1 shows the results for Germany with data for the year 2012. The figure consists of three graphs showing the gender difference (women minus men) in the total number of life years at age 50 spent in poor self-rated health (Fig. 1a), with strong limitations in activities of daily living (Fig. 1b), and with chronic morbidity (Fig. 1c). Each of these graphs includes three bars. The first bar on the left-hand side (colored in blue) shows the gender differences in total ULY, the bar in the middle (colored in red) shows the gender differences once the ME is controlled for, and the bar on the right-hand side (colored in green) shows the gender difference after additional adjustment for DIF.

In Germany, the gender difference in life expectancy at age 50 was 4.8 years in favor of women in 2012. The blue bars show all positive values, conforming the gender paradox that women spent more life years in poor health compared to men, regardless which of the three HDs is considered. However, there are marked variations in the magnitude of the gender paradox by the HD. The disadvantage of women is smallest for life years spent in poor general health (0.8 years) and largest for life years spent with chronic morbidity (3.3 years). As outlined by Luy (2021), this difference between the HDs is primarily due to their different severity, that is, the level of mortality risk associated with them: the lower the risk of dying associated with a specific HD, the larger the women's surplus in ULY. The red bars show that most of the gender differences in ULY can be explained by the ME. Once the difference in the total number of life years of women and men is controlled for, the gender gap in ULY disappears completely for life years spent with strong limitations and almost completely for life years spent in poor general health. Even for the life years spent with chronic morbidity, the disadvantage of women decreases from 3.3 to 0.6 years once ME is controlled for. Finally, the green bars show that the remaining disadvantages of women regarding life years spent in poor general health and life years spent with chronic morbidity disappear completely once DIF is taken into account. Thus, once both ME and DIF are controlled for, women spent fewer years in poor health for all three HDs.

These preliminary findings suggest that the gender paradox in health is not as paradoxical as it seems. It can be fully explained by the interaction of HD, ME and DIF. It is important to note, however, that these findings are based on – and are valid for – the population and data used for the analyses. Therefore, we will extend this analysis to the seven other European countries included in SHARE 2004 (Belgium, France, Greece, Italy, the Netherlands, Spain, and Sweden) to test whether and to what extent these findings can be generalized. The inclusion of additional countries from other sister surveys of SHARE will also be considered.

Figure 1: Gender difference (women minus men) in the total number of life years at age 50 spent…



Notes: gender difference in life expectancy at age 50 = 4.8 years; DIF = different item functioning;
Source: author's own calculations.

References

Angelini, V., D. Cavapozzi, L. Corazzini, and O. Paccagnella. 2012. "Age, Health and Life Satisfaction Among Older Europeans." *Social Indicators Research* 105(2): 293-308.

Coenen, J., B.H.H. Golsteyn, T. Stolp, and D. Tempelaar. 2021. "Personality traits and academic performance: Correcting self-assessed traits with vignettes." *PLoS One* 16(3): e0248629.

Di Lego, V., P. Di Giulio, and M. Luy. 2020. "Gender Differences in Healthy and Unhealthy Life Expectancy." Pp. 151-172 in *International Handbook of Health Expectancies*, edited by C. Jagger, E.M. Crimmins, Y. Saito, R.T. De Carvalho Yokota, H. Van Oyen, and J.-M. Robine. Cham: Springer International Publishing.

Gorman, B.K. and J.N. Ghazal Read. 2006. "Gender disparities in adult health: an examination of three measures of morbidity." *Journal of Health and Social Behavior* 47(2): 95-110.

King, G., C.J.L. Murray, J.A. Salomon, and A. Tandon. 2004. "Enhancing the Validity and Cross-Cultural Comparability of Measurement in Survey Research." *American Political Science Review* 98(1): 191-207.

Kristensen, N. and E. Johansson. 2008. "New evidence on cross-country differences in job satisfaction using anchoring vignettes." *Labour Economics* 15(1): 96-117.

Kulminski, A.M., I.V. Culminskaya, S.V. Ukraintseva, K.G. Arbeev, K.C. Land, and A.I. Yashin. 2008. "Sex-specific health deterioration and mortality: the morbidity-mortality paradox over age and time." *Experimental Gerontology* 43(12): 1052-1057.

Lorber, J. and L.J. Moore. 2002. *Gender and the social construction of illness*. The gender lens series Plymouth, UK: AltaMira Press.

Luy, M. 2021. "The cross-sectional association between health and mortality: insights from the Cloister Study." Pp. 61-82 in *The Male-Female Health-Mortality Paradox: Research Report of the ERC Project HEMOX*, edited by M. Luy. Vienna: Verlag der Österreichischen Akademie der Wissenschaften.

Luy, M., P. Di Giulio, and Y. Minagawa. 2023. "The impact of interpersonal reporting heterogeneity on cross-country differences in Healthy Life Years in Europe." *European Journal of Public Health*: DOI: 10.1093/eurpub/ckad1142.

Luy, M. and Y. Minagawa. 2014. "Gender gaps - life expectancy and proportion of life in poor health." *Health Reports* 25(12): 12-19.

Nusselder, W.J. and C.W.N. Looman. 2004. "Decomposition of differences in health expectancy by cause." *Demography* 41(2): 315-334.

Ravallion, M., K. Himelein, and K. Beegle. 2013. *Can subjective questions on economic welfare be trusted? Evidence for three developing countries*. World Bank Policy Research Working Paper 6726.

Rieker, P.P. and C.E. Bird. 2005. "Rethinking gender differences in health: why we need to integrate social and biological perspectives." *Journal of Gerontology: Psychological Sciences and Social Sciences* 60B(Special Issue II): 40-47.

Sullivan, D.F. 1971. "A single index of mortality and morbidity." *HSMHA-Health Reports* 86(4): 347-354.