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Question: Do Women live longer (from birth) than men?

It may be well known and widely accepted that women live longer (from birth) than men. This is an important societal and demographic question, whether woman live longer than men, and the possible reasons for that difference. Recently, a new study carried out by a Danish research team, came to “nearly” the opposite conclusion. The conclusion from the Danish group is, certainly nuanced- excerpted in full below:

Premise

Something for everyone-

- Possibly an example for statistics students to replicate with the freely available data used in the publications
- two very different statistical methodologies, and two different datasets, that, without a critical statistical insight seem to address the same question but yield different results, and the media
- Media balanced reporting vs media hyperbole “everything you learned is a lie”

Recently a Danish group used data assembled from about a 200-year period. Relative to population level survival analyses, by say, CDC, the Danish data led to a new finding as to survival (from birth) of women vs men. The ‘traditional’ Method 1 are Population lifetable uses survivors (at risk of death) and deaths, and “Demographer” Method 2, demographers use age (from birth) at death only among the deaths. Unsurprisingly the two methods do not yield identical results. . In some sense Both are “right”

Key Danish Finding

Men have a high probability of outliving women
Men have a high probability of outliving women—especially those who are married and have a degree—reveals a statistical analysis spanning 200 years across all continents of the globe and published in the open access journal BMJ Open .
Between 25% and 50% of men have outlived women, challenging the received wisdom that men simply don’t live as long as women, say the researchers, who point out that sometimes large differences in life expectancy mask substantial overlap in lifespan between the sexes.
The female survival advantage has been observed over time across many different populations. But sex differences in survival are often identified by comparing life expectancy, which summarises the average length of life, rather than years lived, and this has been interpreted as ‘men do not live as long as women,’ explain the researchers.

Key CDC/NCHS/Census finding to date

...And researchers estimate that the gap in longevity will continue. According to the U.S. **Census Bureau**, women's life expectancy is projected to reach 87.3 years by 2060, compared with 83.9 years for men. ...

Women live longer than men

PNAS- studied seven documented populations

<https://www.pnas.org/doi/10.1073/pnas.1701535115>

Women live longer than men in nearly all populations today. Some research focuses on the biological origins of the female advantage; other research stresses the significance of social factors. We studied male–female survival differences in populations of slaves and populations exposed to severe famines and epidemics. We find that even when mortality was very high, women lived longer on average than men. Most of the female advantage was due to differences in mortality among infants: baby girls were able to survive harsh conditions better than baby boys. These results support the view that the female survival advantage is modulated by a complex interaction of biological environmental and social factors.

blog

<https://blogs.bmj.com/bmjopen/2022/08/03/men-have-high-probability-of-outliving-women-especially-the-married-and-degree-educated/>

Key Finding Danish data

Men have a high probability of outliving women—especially those who are married and have a degree—reveals a [statistical analysis](#) spanning 200 years across all continents of the globe and published in the open access journal *BMJ Open*.

Between 25% and 50% of men have outlived women, challenging the received wisdom that men simply don't live as long as women, say the researchers, who point out that sometimes large differences in life expectancy mask substantial overlap in lifespan between the sexes

Full publication- Danish Data 1751-2020

Probability of males to outlive females: an international comparison from 1751 to 2020, *BMJ Open*(2022). DOI: [10.1136/bmjopen-2021-059964](https://doi.org/10.1136/bmjopen-2021-059964)

<https://medicalxpress.com/news/2022-08-men-high-probability-outliving-women.html>

News

Hyperbole “everything you know is a lie”

<https://news.yahoo.com/turns-women-may-not-live-112800553.html>

Savin, J

“Turns out, women may not live longer than men after all...

“ Yahoo News, accessed Wed, August 3, 2022.

Hello and welcome to today's edition of 'everything you know is a lie!' – as new data has flipped the long-held belief that women, in general, live longer than men. However, it's not quite as straightforward as 'if you're a man, you've got an extra ten years no matter what', as there are certain lifestyle factors and caveats that the researchers observed along the way.

News Excerpt Danish Results

<https://medicalxpress.com/news/2022-08-men-high-probability-outliving-women.html>

British Medical Journal “Men have high probability of outliving women, especially the married and degree educated” MedXpress, 2022; accessed 8/1/2022

Danish 200-year Study - BMJ Blog

<https://blogs.bmj.com/bmjopen/2022/08/03/men-have-high-probability-of-outliving-women-especially-the-married-and-degree-educated/>

Men have a high probability of outliving women—especially those who are married and have a degree—reveals a [statistical analysis](#) spanning 200 years across all continents of the globe and published in the open access journal *BMJ Open*.

Between 25% and 50% of men have outlived women, challenging the received wisdom that men simply don't live as long as women, say the researchers, who point out that sometimes large differences in life expectancy mask substantial overlap in lifespan between the sexes.

The female survival advantage has been observed over time across many different populations. But sex differences in survival are often identified by comparing life expectancy, which summarises the average length of life, rather than years lived, and this has been interpreted as 'men do not live as long as women,' explain the researchers.

BMJ open

Results In random pairs of one male and one female at age 0, the probability of the male outliving the female varies between 25% and 50% for life tables in almost all years since 1751 and across almost all populations. We show that ϕ is negatively correlated with sex differences in life expectancy and positively correlated with the level of lifespan variation. The important reduction of lifespan inequality observed in recent years has made it less likely for a male to outlive a female.

Conclusions Although male life expectancy is generally lower than female life expectancy, and male death rates are usually higher at all ages, males have a substantial chance of outliving females. These findings challenge the general impression that 'men do not live as long as women' and reveal a more nuanced inequality in lifespans between females and males.

Probability of males to outlive females: an international comparison from 1751 to 2020, BMJ Open(2022).

DOI: [10.1136/bmjopen-2021-059964](https://doi.org/10.1136/bmjopen-2021-059964)

Bergeron-Boucher M, Alvarez J, Kashnitsky I, et al

Probability of males to outlive females: an international comparison from 1751 to 2020

BMJ Open 2022;12:e059964.

Supplemental technical results

[supp bmjopen-2022-July-12-8--inline-supplementary-material-1.pdf](#)

Outsurvival statistics

Ouellette N , Bourbeau R . Changes in the age-at-death distribution in four low mortality countries: a nonparametric approach. Demogr Res 2011;25:595–628.doi:10.4054/DemRes.2011.25.19

https://www.researchgate.net/publication/227409025_Changes_in_the_age-at-death_distribution_in_four_low_mortality_countries_A_nonparametric_approach

P-Splines – Non-parametric estimation of Modal age of death

Ouellette: Most variability indicators discussed in the literature have been computed with deaths extracted from life tables closed with a parametric model and/or involve the modal age at death, estimated using a parametric model. With the nonparametric smoothing approach based on P-splines, standard deviation of ages at death above the mode estimates are free from any kind of predetermined data structure with the potential to influence results.

This section is divided into two parts. First, an illustration of the nonparametric Poisson Pspline smoothing approach using Japanese data is provided. An analysis of recent trends in adult mortality in Canada, France, Japan, and the USA follows

Rectangularization

Wilmoth JR , Horiuchi S . Rectangularization revisited: variability of age at death within human populations. Demography 1999;36:475–95.doi:10.2307/2648085 pmid:http://www.ncbi.nlm.nih.gov/pubmed/10604076

Rectangularization of the Survival Curve in the Netherlands, 1950-1992¹

[Wilma J. Nusselder, MA](#), [Johan P. Mackenbach, PhD](#)

[Author Notes](#)

The Gerontologist, Volume 36, Issue 6, December 1996, Pages 773–782, <https://doi.org/10.1093/geront/36.6.773>

<https://www.semanticscholar.org/paper/Rectangularization-revisited%3A-Variability-of-age-at-Wilmoth-Horiuchi/b35d33618d71141f7ed935bf87fc1923fe2dbbf0>

<https://academic.oup.com/gerontologist/article/36/6/773/567086#:~:text=Rectangularization%20is%20defined%20as%20a%20trend%20toward%20a,of%20deaths%20around%20the%20mean%20age%20at%20death.>

Caselli, G., Egidi, V. (2021). Rectangularization of Survival Curve. In: Gu, D., Dupre, M.E. (eds) Encyclopedia of Gerontology and Population Aging. Springer, Cham. https://doi.org/10.1007/978-3-030-22009-9_796

Caselli Egidi: Definition of Rectangularization

Rectangularization of survival curve is the process that modifies the shape of the survival curve of a life table as the result of mortality decline producing a postponement of mortality risks from lower to higher ages until a hypothetical natural limit to the human life span is reached (Fries [1980](#)). The consequence of these dynamics is that age-at-death increases and its variability decreases (Wilmoth and Horiuchi [1999](#)), so that deaths are compressed toward ages closer and closer to the maximum life span. The geometrical reference is justified by the ideal situation in which all premature deaths are eliminated and all components of the (actual or fictitious) cohort survive until some maximal age and then die suddenly at that age

Data availability statement

Data are available in a public, open access repository. The data are publicly available at <http://www.mortality.org> and <https://population.un.org/wpp/>. The R code to replicate the calculations and the figures is openly available in GitHub <https://github.com/CPop-SDU/outsurvival-in-perspective>

<http://creativecommons.org/licenses/by-nc/4.0/>

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<http://dx.doi.org/10.1136/bmjopen-2021-059964>

Compression of Mortality

<https://www.ncbi.nlm.nih.gov/pmc/articles/pmid/28740358/>

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5520809/pdf/nihms871834.pdf>

George C. Myers, PhD, Kenneth G. Manton, PhD, Compression of Mortality: Myth or Reality?, *The Gerontologist*, Volume 24, Issue 4, August 1984, Pages 346–353, <https://doi.org/10.1093/geront/24.4.346>

Eric Stallard (2016) Compression of Morbidity and Mortality: New Perspectives, *North American Actuarial Journal*, 20:4, 341-354, DOI: [10.1080/10920277.2016.1227269](https://doi.org/10.1080/10920277.2016.1227269)

Stallard:

Abstract Compression of morbidity is a reduction over time in the total lifetime days of chronic disability, reflecting a balance between (1) morbidity incidence rates and (2) case-continuance rates— generated by case-fatality and case-recovery rates. Chronic disability includes limitations in activities of daily living and cognitive impairment, which can be covered by long-term care insurance. Morbidity improvement can lead to a compression of morbidity if the reductions in age-specific prevalence rates are sufficiently large to overcome the increases in lifetime disability due to concurrent mortality improvements and progressively higher disability prevalence rates with increasing age. Compression of mortality is a reduction over time in the variance of age at death. Such reductions are generally accompanied by increases in the mean age at death; otherwise, for the variances to decrease, the death rates above the mean age at death would need to increase, and this has rarely been the case. Mortality improvement is a reduction over time in the age-specific death rates and a corresponding increase in the cumulative survival probabilities and age-specific residual life expectancies. Mortality improvement does not necessarily imply concurrent compression of mortality. This paper reviews these concepts, describes how they are related, shows how they apply to changes in mortality over the past century and to changes in morbidity over the past 30 years, and discusses their implications for future changes in the United States. The major findings of the empirical analyses are the substantial slowdowns in the degree of mortality compression over the past half century and the unexpectedly large degree of morbidity compression that occurred over the morbidity/disability study period 1984–2004; evidence from other published sources suggests that morbidity compression may be continuing.

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British Medical Journal

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Social Security Administration, ACTUARIAL STUDY NO. 120, accessed August 3, 2022.

https://www.ssa.gov/oact/NOTES/as120/LifeTables_Body.html

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Probability of males to outlive females: an international comparison from 1751 to 2020, *BMJ Open*(2022). DOI: [10.1136/bmjopen-2021-059964](https://doi.org/10.1136/bmjopen-2021-059964)

accurate but not complete

<https://medicalxpress.com/news/2022-08-men-high-probability-outliving-women.html>

Refers CDC refers animals

https://www.voanews.com/a/science-health_new-study-looks-why-females-live-longer-males/6186357.html

Census life expectancy men vs women

<https://www.advisory.com/daily-briefing/2020/07/22/longevity>

Commonly used methods for estimating survival of men and women from CDC and Census Bureau

Commonly used methods are Life expectancy tells us the average number of years of life a person who has attained a given age can expect to live.

Life expectancy estimates from the National Center for Health Statistics (NCHS) provide a reliable snapshot of population health and mortality in the United States

While it's long been known that women tend to live longer than men, researchers for years ascribed the trend to lifestyle differences. But now, researchers in the emerging field of "geroscience," or the study of aging, are discovering some of the genetic and biological factors behind the longevity gap, Clare Ansberry writes for the *Wall Street Journal*.

Why women live longer than men

According to Ansberry, it is a well-known fact that women tend to outlive men. As of 2017, life expectancy for men was 76.1 years, while life expectancy for women reached 81.1 years.

And researchers estimate that the gap in longevity will continue. According to the U.S. **Census Bureau**, women's life expectancy is projected to reach 87.3 years by 2060, compared with 83.9 years for men.

Gender Differences Life expectancy

Population Reference Bureau

<https://www.prb.org/resources/around-the-globe-women-outlive-men/>

Census life expectancy

<https://www.census.gov/content/dam/Census/library/publications/2020/demo/p25-1145.pdf>

Calculation life expectancy

https://ec.europa.eu/health/indicators/docs/echi_10_ds_en.pdf

CDC calculation

<https://www.cdc.gov/nchs/nvss/life-expectancy.htm> W

life expectancy age cohort model

<https://pubmed.ncbi.nlm.nih.gov/9196656/>

NVSS

NATIONAL CENTER FOR HEALTH STATISTICS NCHS Fact Sheet | March 2021

NVSS https://www.cdc.gov/nchs/data/factsheets/factsheet_nvss.pdf