Narrowing gap in self-rated health between men and women in Russia: measurement problem or fact?

Introduction

The 'male-female health-survival paradox' is such a common phenomenon that it is often taken as a natural rule of sex differences in health. There are several possible explanations for women's longevity advantage over men, despite their apparently poorer health. These explanations can be classified as biological, [1] social[2] or methodological[3]. It is likely that they interact. However, the magnitude of the paradox is heterogeneous in time and space. Russia, along with other post-Soviet European states, has long held the record[4] for the widest survival gap between men and women, exceeding 10 and even 13 years of life expectancy at birth.[5] However, Russian women have historically been disadvantaged compared to their male counterparts in both self-rated health and more objectively measured health indicators such as physical functioning and depressive symptoms,[6] making the male-female health-survival paradox even more pronounced in Russia than elsewhere[7]. In addition, the burden of ill health among Russian women was extremely high compared with women in Western European and other Eastern European countries. [8] This suggests

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[1] Austad S. Why women live longer than men: sex differences in longevity. Gend Med. 2006;3:79–92.
Waldron I. Contributions of biological and behavioral factors to changing sex differences in ischemic heart disease mortality. In: Lopez AD, Caselli G, Valkonen T, editors. Adult Mortality in Developed Countries: From Description to Explanation. Oxford: Oxford University Press; 1995. pp. 167–78.
Owens IPF. Ecology and evolution: sex differences in mortality rate. Science. 2002;297:2008–9.

[2] Verbrugge LM. Gender and health: an update on hypotheses and evidence. J Health Soc Behav. 1985;26:156–82.
Wingard DL. The sex differential in morbidity, mortality, and lifestyle. Annu Rev Public Health. 1984;5:433–58.
Waldron I. What do we know about causes of sex differences in mortality? A review of the literature. Population Bulletin of the United Nations. 1985:59–76
Waldron I. Recent trends in sex mortality ratios for adults in developed countries. Soc Sci Med. 1993;36:451–62.

[3] Chatfield MD, Brayne CE, Matthews FE. A systematic literature review of attrition between waves in longitudinal studies in the elderly shows a consistent pattern of dropout between differing studies. J Clin Epidemiol. 2005;58:13–9.
Nathanson CA. Sex roles as variables in the interpretation of morbidity data: a methodological critique. Int J Epidemiol. 1978;7:253–62.

[4] Outside wartime

[5] Vergeles, Marina, Evolution Of Sex Gap In Life Expectancy Across High-Income Countries: Universal Patterns And Country-Specific Attributes (November 25, 2021). Higher School of Economics Research Paper No. WP BRP 98/SOC/2021, Available at SSRN: https://ssrn.com/abstract=3971659 or http://dx.doi.org/10.2139/ssrn.3971659

[6] Oksuzyan, A., Shkolnikova, M., Vaupel, J. W., Christensen, K., & Shkolnikov, V. M. (2014). Sex differences in health and mortality in Moscow and Denmark. European journal of epidemiology, 29, 243-252.

[7] Alberts, S. C., Archie, E. A., Gesquiere, L. R., Altmann, J., Vaupel, J. W., & Christensen, K. (2014). The male-female health-survival paradox: a comparative perspective on sex differences in aging and mortality. In Sociality, hierarchy, health: comparative biodemography: a collection of papers. National Academies Press (US).
Oksuzyan, A., Shkolnikova, M., Vaupel, J. W., Christensen, K., & Shkolnikov, V. M. (2015). Sex differences in biological markers of health in the study of stress, aging and health in Russia. PloS one, 10(6), e0131691.

[8] Andreev, E. M., McKee, M., & Shkolnikov, V. M. (2003). Health expectancy in the Russian Federation: a new perspective on the health divide in Europe. Bulletin of the World Health Organization, 81, 778-787.
Minagawa, Y. (2013). Inequalities in healthy life expectancy in Eastern Europe. Population and development review, 39(4), 649-671.

that Russian women were severely disadvantaged in terms of health. The decline in mortality observed in Russia since 2005[9] must have been accompanied by a narrowing of the paradox, since male excess mortality, which is the main contributor to the paradox, has seen the greatest reductions. However, amidst the overall improvements in self-rated health for both sexes[10], the direction of the gender gap is less clear. Using the Russian Longitudinal Monitoring Survey,[11] we examined the main trends in self-reported health by sex, age and educational attainment as well as look at the annual change (1994-2022) in healthy life expectancy by sex.

Methods

Data

We use data from the Russian Longitudinal Monitoring Survey (RLMS)[12]. It is an annual (since 1994, except for 1997 and 1999) nationally representative survey on the health and economic well-being of Russian households and individuals. Each round (we use rounds 5-31) contained exactly the same health self-assessment question 'Please tell me: How would you rate your health?' with five fixed responses ('very good'; 'good'; 'fair - not good but not bad'; 'bad'; 'very bad') and the option of refusing to answer or saying 'don't know'. The latter two options together did not account for more than two percentage points of all responses in any round and were therefore ignored. We use only a representative sample (the RLMS also contains panel data, but not all of those pooled there are part of the nationally representative sample) and extract respondent data on sex, age, survey round (year), self-rated health status, educational attainment and place of residence[13]. The sample size is on average 11,632 from 1994 to 2022 (with a minimum of 8,340 in 1994 and a maximum of 17,022 in 2011). Following the approach used in previous studies of self-rated health in Russia and other Eastern European countries,[14] we derived two out of five health status

[9] Shkolnikov, V. M., Andreev, E. M., McKee, M., & Leon, D. A. (2013). Components and possible determinants of the decrease in Russian mortality in 2004-2010. Demographic research, 28, 917-950.

[10] Minagawa Y. Trends in happy life expectancy in Russia, 1994-2015. SSM Popul Health. 2021 Dec 16;17:101005. doi: 10.1016/j.ssmph.2021.101005. PMID: 34984222; PMCID: PMC8693025.
Рамонов, А. В. (2011). Ожидаемая продолжительность здоровой жизни как интегральная оценка здоровья россиян. Экономический журнал Высшей школы экономики, 15 (4), 497-518.

[11] "Russia Longitudinal Monitoring survey, RLMS-HSE", conducted by National Research University "Higher School of Economics" and OOO “Demoscope” together with Carolina Population Center, University of North Carolina at Chapel Hill and the Institute of Sociology of the Federal Center of Theoretical and Applied Sociology of the Russian Academy of Sciences. (RLMS-HSE web sites: https://rlms-hse.cpc.unc.edu, https://www.hse.ru/org/hse/rlms)

[12] "Russia Longitudinal Monitoring survey, RLMS-HSE", conducted by National Research University "Higher School of Economics" and OOO “Demoscope” together with Carolina Population Center, University of North Carolina at Chapel Hill and the Institute of Sociology of the Federal Center of Theoretical and Applied Sociology of the Russian Academy of Sciences. (RLMS-HSE web sites: https://rlms-hse.cpc.unc.edu, https://www.hse.ru/org/hse/rlms)

[13] Whether residents of regional centers versus other towns versus rural areas, or capitals versus the rest of the country

[14] Andreev, E. M., McKee, M., & Shkolnikov, V. M. (2003). Health expectancy in the Russian Federation: a new perspective on the health divide in Europe. Bulletin of the World Health Organization, 81, 778-787.

responses - **'good'** as the sum of 'very good', 'good' and 'fair', and **'poor'** as the sum of 'bad' and 'very bad'. Educational attainment was also aggregated into three categories (corresponding to higher, secondary and lower education from the previous studies on mortality differentials by educational attainment in the former USSR).[15] Thus, by tabulating individual data, we obtain the final dataset with the distribution of good and poor self-rated health responses by sex, 5-year age groups (the last interval - 85 years and older), and educational attainment for the Russian population in 1994-1996, 1998, and 2000-2022. Mortality rates by sex and age for the same period were also obtained from the Russian Fertility and Mortality Database (RusFMD).[16]

Methods

First, for selective years we ran logistic regression models to establish the link between poor self-rated health and sex, age, education attainment, and place of residence. As the variables of place of residence become insignificant once educational attainment is controlled for, we ran a logistic regression for each year with only three variables - age, gender and educational attainment - to estimate the importance of gender on poor self-rated health.

We examined the sex-specific crude prevalence of poor self-rated health over the study period using the dataset obtained. However, since over the period 1994-2022, both the Russian population and the RLMS sample experienced both ageing and education expansion. These two processes affected the crude prevalence of poor self-rated health in opposite directions. To account for changes in the composition of the sample (both in terms of age and educational attainment) and differences between the sexes in these respects, we weighted the prevalence for each year according to the age and educational composition of the 2022 RLMS sample, which itself was very similar to the 2021 All-Russia Census.

We then looked at trends in poor self-rated health by sex and by the three main education groups. We standardized the prevalence of poor self-rated health across all six categories, using the Russian population in mid-2020 from the RusFMD[17] as the reference. To increase the number of observations in each category, we calculated the average prevalence for three-year periods (2004-2006, 2009-2011, 2014-2016, 2017-2019, and 2020-2022). Student's t-test was used to estimate

[15] Shkolnikov, V. M., Leon, D. A., Adamets, S., Andreev, E., & Deev, A. (1998). Educational level and adult mortality in Russia: an analysis of routine data 1979 to 1994. Social science & medicine, 47(3), 357-369.
[16] *Russian Fertility and Mortality Database*. Center for Demographic Research, Moscow (Russia). Available at http://demogr.nes.ru/index.php/ru/demogr_indicat/data (data downloaded on 1.10.2023).
[17] *Russian Fertility and Mortality Database*. Center for Demographic Research, Moscow (Russia). Available at http://demogr.nes.ru/index.php/ru/demogr_indicat/data (data downloaded on 1.10.2023).

the significance of changes between periods in the prevalence of poor self-rated health in each category.

Finally, we estimated sex-specific annual values of life expectancy[18] and healthy life expectancy at age 20 using the Sullivan method[19] for the study period. A third-degree polynomial was used to smooth the age-specific prevalence of good self-rated health. We then assessed the contributions of differences in mortality and morbidity to the sex difference in healthy life expectancy in Russia using the decomposition algorithm proposed by Andreev, Shkolnikov and Begun.[20]

Results

The prevalence of poor self-rated health weighted by age and educational attainment (according to the 2022 RLMS sample, averaged for both sexes), as well as a crude (unweighted) indicator, more than halves for females between 1994 and 2022 (Figure 1). The decline was also evident for males, although not to the same extent, so that by the 2020s the once large gap between males and females in self-rated health had almost disappeared.

a) **b)**

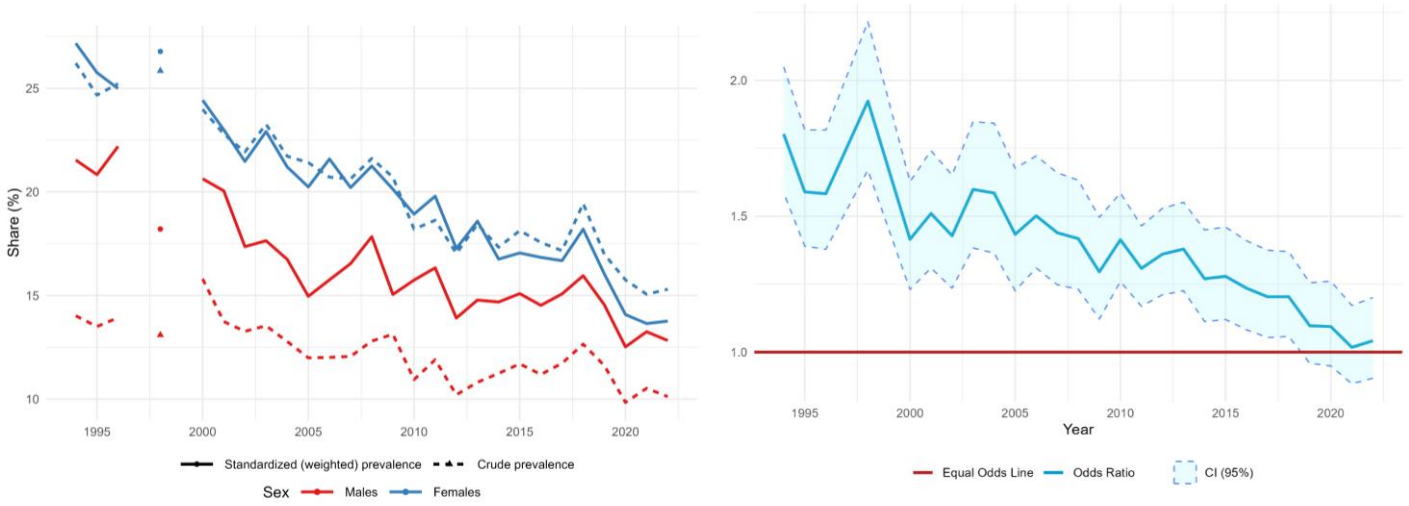


Figure 1a Crude and weighted (by age and education) prevalence of poor self-rated health, in percentage, males and females, 1994-1996, 1998, 2000-2022.

Figure 1b Odds ratio of poor self-rated health for females, reference level - males, 1994-1996, 1998, 2000-2022.[21]

[18] First, we constructed full life tables up to the age 100 and over based on the HMD protocol (https://www.mortality.org/File/GetDocument/Public/Docs/MethodsProtocolV6.pdf), with the a_{100+} values taken from the HLTD method protocol (https://www.lifetable.de/File/GetDocument/methodology.pdf)

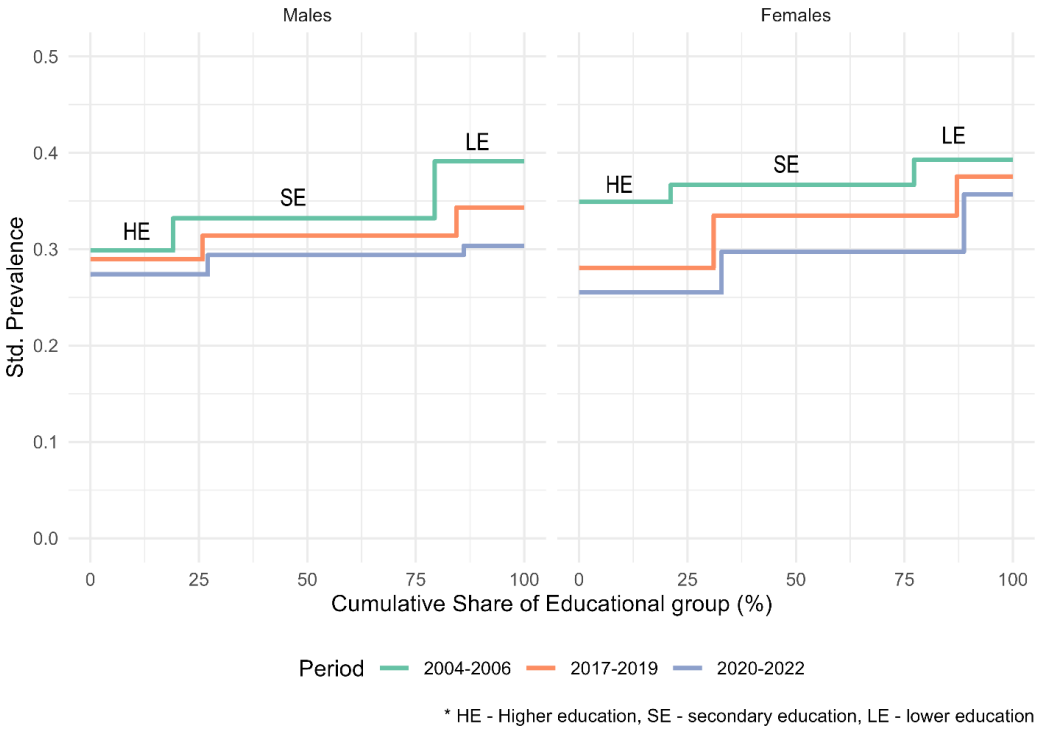
[19] Sullivan DF. A single index of mortality and morbidity. HSMHA health report 1964;86:347-54.

[20] Andreev EM, Shkolnikov VM, Begun AZ. Algorithm for decomposition of differences between aggregate demographic measures and its application to life expectancies, healthy life expectancies, parity progression ratios and total fertility rates. Demographic Research 2002; 7, article 14, p. 499-522.

[21] Supplementary table S2

Consequently, the odds ratio of females compared to males to rate their health as 'poor', adjusted for age and education (other variables such as place of residence become insignificant once educational attainment is taken into account[22]), peaked in the late 1990s and has been declining ever since, eventually becoming insignificant from 2019 onwards (Figure 2).

Between 2004-2006 and 2017-2019, the prevalence of poor self-rated health by sex and educational attainment, standardized by age (the standard was the Russian population in 2020), decreased for both sexes and all three education groups (Figure 3). The decline was statistically significant for males with lower education, females with higher and secondary education, and for both sexes when the education groups were merged[23]. Accordingly, the inequality gradient decreased for males over this period, while it increased significantly for females. Between 2017-2019 and 2020-2022, the previous trends largely continued; in the midst of the COVID-19 pandemic and its aftermath, we observe a further decline in poor self-rated health across all six sex and educational groups, among which the most profound and statistically significant declines were for females with higher and secondary education. Moreover, when the education groups were merged, the 'pandemic decline' in poor self-rated health was significant for both sexes. In addition, education expansion has been more pronounced for women over the period studied.[24]



[22] Supplementary table S1
[23] Supplementary table S3
[24] Supplementary figure S4

Figure 3 Standardized prevalence of poor self-rated health by educational attainment, in percentage, males and females, 2004-2006, 2007-2019, 2020-2022.

Figure 4 shows trends in life expectancy (LE) and healthy life expectancy (HLE) at age 20 by sex in Russia over the period studied. While for men LE and HLE changed in parallel, except for the COVID years, for females, the increase in HLE was much higher than the increase in LE. As a result, the gap between LE and HLE, which reached a record high of 14 years in 1994, was reduced to about 7 years in 2021-2022. It is also noteworthy that despite the steep decline in LE in 2020-2021 in the midst of the COVID-19 pandemic in Russia, HLE for both sexes was barely affected and fully recovered to pre-pandemic levels in 2022, largely due to the record high prevalence of 'good health' in those years.

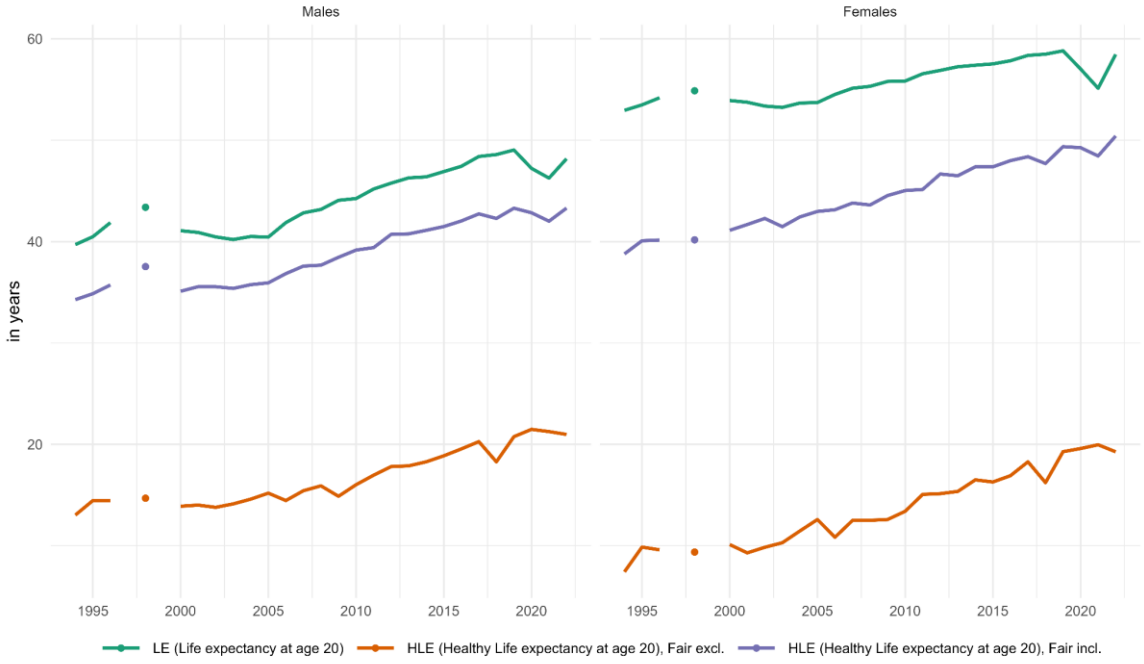


Figure 4 Life expectancy and Healthy life expectancy at age 20, in years, males and females, 1994-1996, 1998, 2000-2022.

The decomposition of the gender gap in HLE (Figure 5) shows the same picture: the substantial mortality disadvantage for males was partly offset by the higher prevalence of poor self-rated health among females, with the male advantage eroding over the last two decades and disappearing completely by 2021. The disappearance of the gender gap in self-rated health (due to rapid improvements among women, especially those with higher and secondary education, and a steady increase in their share of all women) was accompanied by a narrowing of the gender gap in mortality (this time due to higher rates of mortality reduction among men). By 2022, however, the gender gap in mortality in Russia had widened considerably.

Figure 5 Decomposition of sex differences in healthy life expectancy into mortality and morbidity components, in years, 1994-1996, 1998, 2000-2022.

Discussion

Summary of results

The decline in mortality in Russia in the late 2000s and 2010s was accompanied by notable improvements in self-rated health. These improvements affected both males and females in all the three main educational groups, although to varying degrees. Women with higher and secondary educational attainment improved the most, followed by men with lower educational attainment. Overall, gender differences in self-rated health, perhaps the most pronounced in Europe in the late 1990s, became insignificant by 2019, signalling the possible disappearance of the male-female health-survival paradox in Russia. During the pandemic years, self-rated health continued to improve or did not change significantly compared with the previous period for both sexes, despite the sharp increase in mortality.

Possible explanations

While the overall improvements in self-rated health in Russia after the mid-2000s were to be expected given the decline in mortality, the disappearance of the once prominent gender gap seems counterintuitive at first. As men experienced greater reductions in mortality during this period, it was Russian women who experienced greater improvements in self-rated health, eventually catching up with their male counterparts. However, this may be directly related to the gender

differences in mortality decline by age and cause of death. For Russian men, most of the decline is due to external and alcohol-related causes of death, which are mainly concentrated in young and middle age; conversely, the biggest factor contributing to the decline in female mortality is the cardiovascular revolution,[25] including the decline in untreated hypertension, which is not seen in Russian men.[26]

Meanwhile, could the biases in the self-rated health data we use explain the disappearance of the "male-female health-survival paradox" in Russia? The "Russia Longitudinal Monitoring Survey" is a repeated sample with a split panel; as the response rate declined, the sample was reshuffled (in 2001, 2011) or enlarged (in 2006 and 2010, in 2014 it was reduced) in order to remain nationally representative. This has not altered the observed gender trends in self-rated health, which are slow and gradual rather than abrupt.

To corroborate our findings, we looked at another nationally representative survey on Russian health,[27] conducted annually since 2019 (and previously every five years since 2013) by the Russian Statistical Service (Rosstat). The same question on self-rated health is asked in this survey. It did not show that sex becomes insignificant in predicting poor self-rated health after adjusting for age and educational level.[28] However, the estimated odds ratio is well within the confidence intervals of the RLMS-based odds ratio and shows an overall rather moderate effect of sex. Furthermore, in 2013 the RLMS and Rosstat odds ratios were in complete agreement and between 2013 and 2022-2023 both showed a clear downward trend. Overall, we place more trust in the RLMS survey than in Rosstat because of the longer observation period and greater transparency.

If there had been a systematic change in health perceptions for one sex but not the other, assigning 'fair' ('not good but not bad') responses to 'good' health, in line with previous studies on Russia, might have affected our results. The prevalence of fair self-rated health, which has always been higher for women, has decreased for both sexes since the early-mid 2000s; at the same time, we observed a decrease in the prevalence of poor self-rated health and an increase in good self-rated health as the sum of only 'very good' and 'good' responses.[29] Thus, trends in poor self-rated health

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[25] Grigoriev, P., Meslé, F., Shkolnikov, V. M., Andreev, E., Fihel, A., Pechholdova, M., & Vallin, J. (2014). The recent mortality decline in Russia: beginning of the cardiovascular revolution?. Population and Development review, 40(1), 107-129.

[26] Churilova, E., Shkolnikov, V. M., Shalnova, S. A., Kudryavtsev, A. V., Malyutina, S., Nilssen, O., ... & Leon, D. A. (2021). Long-term trends in blood pressure and hypertension in Russia: an analysis of data from 14 health surveys conducted in 1975–2017. BMC public health, 21, 1-10.

[27] https://rosstat.gov.ru/free_doc/new_site/zdor23/PublishSite_2023/index.html upon request to Rosstat, individual survey data were obtained.

[28] Supplementary figure S5

[29] Supplementary figure S6

were not influenced by unilateral changes in the proportion of 'fair' responses, as there were no inconsistencies in the movement between these three response categories by sex.

The overall improvement in self-rated health between 2004-2006 and 2020-2022 varied considerably between the education groups for women, but was more or less the same for men, thus reversing the inequality gradient. By 2020-2022, women with higher education rated their health better than their male counterparts; there were no significant differences between men and women with secondary education, the most numerous group. Women with lower education made the least progress (compared to other women) and still lagged significantly behind their male counterparts. Differences in education expansion between the two sexes in Russia, with the educational composition of women changing more rapidly, may be one possible explanation. For example, in just 16 years (2005-2021), the proportion of women with lower education has almost halved. Such a rapid increase in the share of the higher educated at the expense of the lower educated could have increased negative health-selective pressures among the latter. The former, on the other hand, acted as the vanguard of the health transition within the Russian population.

A final finding worth highlighting is the neutral to positive trend in self-rated health during the last pandemic. In the 2021 survey round,[30] when COVID-related losses were highest in Russia, this was particularly pronounced.[31] There are several possible explanations for this: first, survival bias, with excess mortality from COVID concentrated in those with poorer baseline health. Second, there may have been a psychological effect from the reassurance of improved health during the pandemic. Third, the pandemic may have introduced a systematic bias amidst a possible decline in response rate (unfortunately, the RLMS team stopped publishing the response rate at their site in 2020). Other studies of self-rated health during the COVID pandemic found that it worsened in Brazil;[32] while in the Netherlands there was a net increase in self-rated health of 11.7 percentage points, with "individuals with bad/mediocre/reasonable SRH more often reported increased SRH"[33].

Conclusions

[30] The RLMS survey was carried out at the end of the year 2021, after the most deadly wave of COVID in the autumn.

[31] Scherbov, S., Gietel-Basten, S., Ediev, D., Shulgin, S., & Sanderson, W. (2022). COVID-19 and excess mortality in Russia: Regional estimates of life expectancy losses in 2020 and excess deaths in 2021. Plos one, 17(11), e0275967.

[32] Szwarcwald, C. L., Damacena, G. N., Barros, M. B. D. A., Malta, D. C., Souza Júnior, P. R. B. D., Azevedo, L. O., ... & Pina, M. D. F. D. (2021). Factors affecting Brazilians' self-rated health during the COVID-19 pandemic. Cadernos de saude publica, 37.

[33] Van De Weijer, M. P., de Vries, L. P., Pelt, D. H., Ligthart, L., Willemsen, G., Boomsma, D. I., ... & Bartels, M. (2022). Self-rated health when population health is challenged by the COVID-19 pandemic; a longitudinal study. Social science & medicine, 306, 115156.

We have shown that age, gender and educational attainment are associated with poor self-rated health. The prevalence of poor self-rated health has decreased since the mid-2000s for both sexes and educational backgrounds, with the most significant improvements observed among women with tertiary and secondary education. By 2019, the gender gap in self-rated health had narrowed to insignificance. Despite the high excess mortality recorded during the pandemic years, the prevalence of poor self-rated health continued to decline in Russia. Healthy life expectancy (HLE) increased in Russia in line with life expectancy, but the gender gap in HLE remained stagnant due to the differential impact of morbidity and mortality. In Russia, higher-educated women have played a key role in the country's health progress, leading to the disappearance of the once substantial gender gap in self-rated health. However, a substantial and persistent mortality gap in favor of women persists and is expected to widen, calling into question the existence of the male-female health-survival paradox in modern Russia.

Supplementary table S1 Odds ratios and P-values of poor self-rated health by age, sex, educational attainment and place of residence, selected years

	2000		2010		2019	
Poor self-rated health	**Odds Ratio**	**P>z**	**Odds Ratio**	**P>z**	**Odds Ratio**	**P>z**
Age						
10	0.42	0.062	0.37	0.104	No obs.	
15	0.55	**0.035***	0.46	**0.005****	0.29	**0.002****
20	0.69	0.184	0.72	0.168	0.59	0.146
25	0.82	0.483	0.76	0.249	0.48	0.06
30 (Ref)	**.**	**.**	**.**	**.**	**.**	**.**
35	1.38	0.2	1.17	0.474	0.75	0.34
40	1.99	**0.003****	1.73	**0.008****	1.38	0.21
45	2.80	**0.000*****	2.21	**0.000*****	1.9	**0.009****
50	3.61	**0.000*****	4.19	**0.000*****	2.62	**0.000*****
55	4.78	**0.000*****	5.52	**0.000*****	4.55	**0.000*****
60	6.02	**0.000*****	7.45	**0.000*****	6.91	**0.000*****
65	11.01	**0.000*****	11.7	**0.000*****	8.65	**0.000*****
70	15.49	**0.000*****	15.92	**0.000*****	15.57	**0.000*****
75	17.62	**0.000*****	27.88	**0.000*****	22.16	**0.000*****
80	30.5	**0.000*****	32.67	**0.000*****	25.65	**0.000*****
85	31.23	**0.000*****	34.53	**0.000*****	52.06	**0.000*****
Sex						
Males (Ref)	**.**	**.**	**.**	**.**	**.**	**.**
Females	1.41	**0.000*****	1.41	**0.000*****	1.09	0.203
Education						
Higher (ref)	**.**	**.**	**.**	**.**	**.**	**.**
Secondary	1.5	**0.000*****	1.56	**0.000*****	1.56	**0.000*****
Lower	2.08	**0.000*****	2.18	**0.000*****	2.12	**0.000*****
Type of residence						
Centers (Ref)	**.**	**.**	**.**	**.**	**.**	**.**
Other urban	0.97	0.685	0.98	0.806	0.95	0.503
Rural	0.96	0.642	0.93	0.313	0.75	**0.001****
_cons	0.03	**0.000*****	0.02	**0.000*****	0.02	**0.000*****

***** p <0.001, ** p <0.01, * p <0.05**

Supplementary table S2 Odds ratios[1] of report of poor self-rated health among women, reference group – men

Year	*Odds Ratio*	*Std. Err.*	*P>|z|*	*[95% Conf. Interval]*	
1994	1.802	0.118	**0.000*** **	1.586	2.049
1995	1.59	0.109	**0.000*** **	1.39	1.818
1996	1.583	0.112	**0.000*** **	1.378	1.817
1998	1.923	0.139	**0.000*** **	1.67	2.216
2000	1.415	0.101	**0.000*** **	1.231	1.627
2001	1.51	0.11	**0.000*** **	1.309	1.741
2002	1.428	0.106	**0.000*** **	1.235	1.651
2003	1.599	0.118	**0.000*** **	1.383	1.848
2004	1.585	0.121	**0.000*** **	1.364	1.842
2005	1.434	0.115	**0.000*** **	1.226	1.676
2006	1.501	0.105	**0.000*** **	1.309	1.722
2007	1.439	0.105	**0.000*** **	1.248	1.66
2008	1.417	0.102	**0.000*** **	1.231	1.633
2009	1.295	0.095	**0.000*** **	1.122	1.496
2010	1.413	0.083	**0.000*** **	1.26	1.586
2011	1.308	0.075	**0.000*** **	1.169	1.464
2012	1.361	0.081	**0.000*** **	1.211	1.529
2013	1.379	0.083	**0.000*** **	1.226	1.551
2014	1.27	0.086	**0.000*** **	1.113	1.45
2015	1.279	0.087	**0.000*** **	1.12	1.46
2016	1.235	0.083	**0.002** **	1.082	1.41
2017	1.203	0.082	**0.006** **	1.054	1.375
2018	1.204	0.079	**0.005** **	1.058	1.37
2019	1.097	0.075	0.178	0.959	1.255
2020	1.094	0.079	0.215	0.949	1.261
2021	1.018	0.073	0.809	0.884	1.172
2022	1.042	0.075	0.571	0.904	1.201

***** p <0.001, ** p <0.01, * p <0.05**

[1] derived from logistic regression relating poor self-rated health to sex, age and educational attainment. Calculated separately for each year.

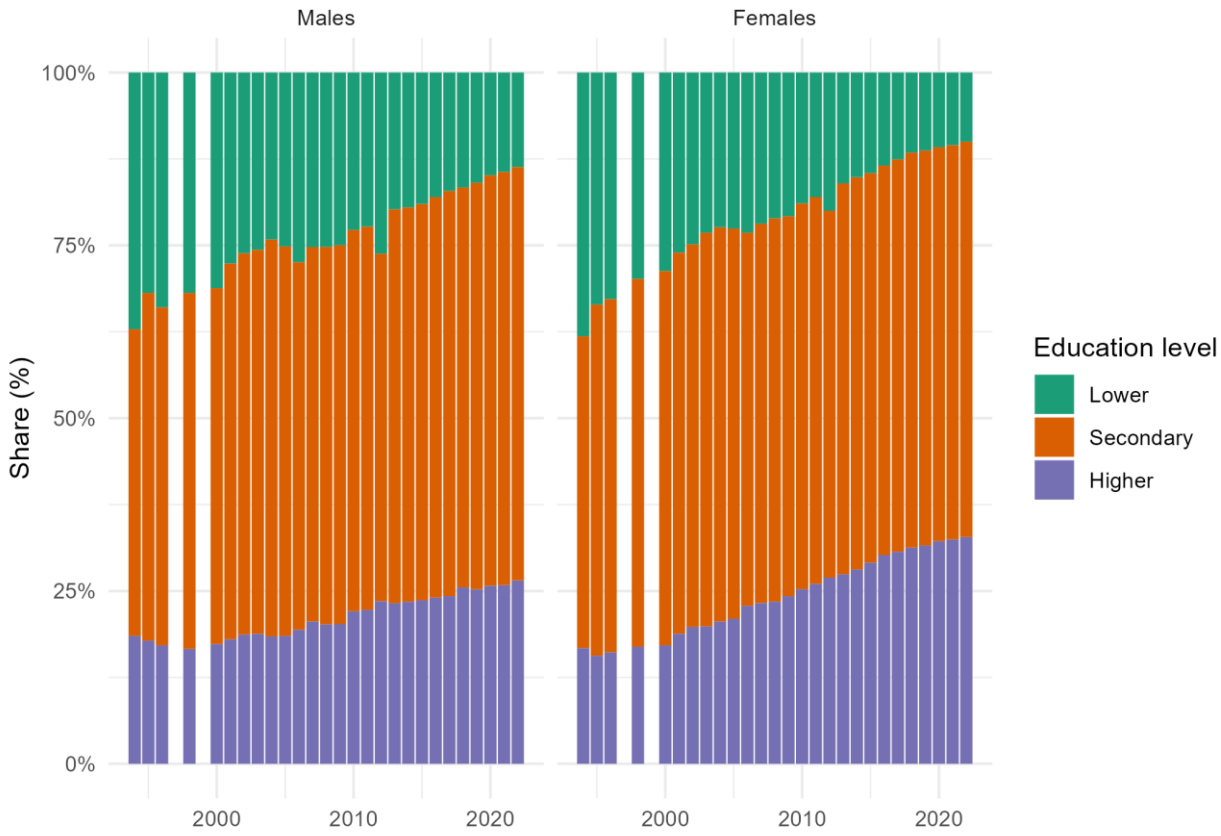
Supplementary table S3. Student's t-test for the change in the age-standardized prevalence of poor self-rated health by sex and level of education

			Males							Females						
Period A	Period B	Educational Level	Value A	Value B	Std. Error A	Std. Error B	T-Statistc	df	P-value	Value A	Value B	Std. Error A	Std. Error B	T-Statistc	df	P-value
2004-2006	2009-2011	Lower	0.3911	0.3674	0.0313	0.0238	0.854	3536.08	0.197	0.3927	0.3825	0.0288	0.0234	0.389	5872.15	0.349
		Secondary	0.3320	0.3296	0.0316	0.0234	0.087	10158.25	0.466	0.3666	0.3525	0.0180	0.0139	0.875	14533.38	0.191
		Higher	0.2986	0.2920	0.0381	0.0256	0.203	3034.02	0.419	0.3490	0.3130	0.0274	0.0201	1.501	5407.26	0.067.
		Total	0.3406	0.3304	0.0172	0.0122	0.682	16388.89	0.248	0.3668	0.3462	0.0109	0.0087	2.100	26462.79	0.018*
	2017-2019	Lower	0.3911	0.3432	0.0313	0.0258	1.670	3528.71	0.048*	0.3927	0.3754	0.0288	0.0267	0.621	5323.97	0.267
		Secondary	0.3320	0.3140	0.0316	0.0177	0.706	8273.37	0.24	0.3666	0.3349	0.0180	0.0118	2.083	12822.00	0.019*
		Higher	0.2986	0.2895	0.0381	0.0220	0.293	2722.75	0.385	0.3490	0.2807	0.0274	0.0156	3.069	4446.98	0.001***
		Total	0.3406	0.3156	0.0172	0.0114	1.714	15621.80	0.043*	0.3668	0.3243	0.0109	0.0082	4.418	25450.56	<0.001***
	2020-2022	Lower	0.3911	0.3035	0.0313	0.0275	2.974	3443.77	0.001***	0.3927	0.3568	0.0288	0.0278	1.267	4929.94	0.103
		Secondary	0.3320	0.2939	0.0316	0.0170	1.504	8025.35	0.066.	0.3666	0.2973	0.0180	0.0109	4.654	12130.75	<0.001***
		Higher	0.2986	0.2740	0.0381	0.0214	0.798	2668.60	0.212	0.3490	0.2551	0.0274	0.0146	4.281	4234.25	<0.001***
		Total	0.3406	0.2914	0.0172	0.0113	3.380	15433.02	<0.001***	0.3668	0.2910	0.0109	0.0079	7.976	24714.46	<0.001***
2009-2011	2014-2016	Lower	0.3674	0.3471	0.0238	0.0250	0.828	4593.36	0.204	0.3825	0.3814	0.0234	0.0260	0.044	6099.21	0.482
		Secondary	0.3296	0.3149	0.0234	0.0194	0.687	14286.22	0.246	0.3525	0.3378	0.0139	0.0129	1.098	20809.12	0.136
		Higher	0.2920	0.2858	0.0256	0.0238	0.251	5655.60	0.401	0.3130	0.2899	0.0201	0.0176	1.222	9597.08	0.111
		Total	0.3304	0.3152	0.0122	0.0119	1.260	25087.41	0.104	0.3462	0.3314	0.0087	0.0085	1.717	37280.01	0.043*
2014-2016	2017-2019	Lower	0.3471	0.3432	0.0250	0.0258	0.155	4159.56	0.438	0.3814	0.3754	0.0260	0.0267	0.226	5222.78	0.411
		Secondary	0.3149	0.3140	0.0194	0.0177	0.049	14592.60	0.48	0.3378	0.3349	0.0129	0.0118	0.232	20748.44	0.408
		Higher	0.2858	0.2895	0.0238	0.0220	-0.161	6225.38	0.436	0.2899	0.2807	0.0176	0.0156	0.557	10853.26	0.289
		Total	0.3152	0.3156	0.0119	0.0114	-0.028	25201.83	0.489	0.3314	0.3243	0.0085	0.0082	0.862	37350.41	0.194
2017-2019	2020-2022	Lower	0.3432	0.3035	0.0258	0.0275	1.488	3709.57	0.068.	0.3754	0.3568	0.0267	0.0278	0.683	4527.73	0.247
		Secondary	0.3140	0.2939	0.0177	0.0170	1.156	15001.47	0.124	0.3349	0.2973	0.0118	0.0109	3.314	21127.53	<0.001***
		Higher	0.2895	0.2740	0.0220	0.0214	0.717	6747.08	0.237	0.2807	0.2551	0.0156	0.0146	1.691	12010.67	0.045*
		Total	0.3156	0.2914	0.0114	0.0113	2.125	25551.69	0.017*	0.3243	0.2910	0.0082	0.0079	4.138	37871.35	<0.001***

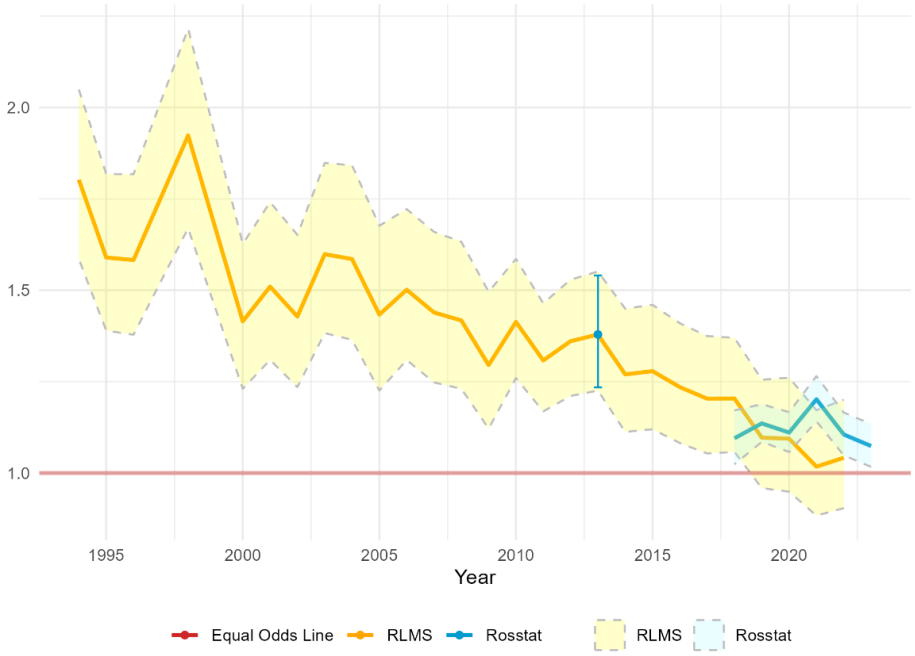
Note:

Stars of p-value: p<0.1 '.', p<0.05 '*', p<0.01 '**' , p<0.001 '***'

Supplementary figure S4. Education composition of the RLMS sample



Supplementary figure S5. Odds ratio of poor self-rated health* for females, reference level – males, according to RLMS (1994-2022) and Rosstat health survey (2013. 2018-2023) data.



*** Odds ratios of report of poor self-rated health among women are derived from corresponding logistic regressions with age, sex and educational attainment as independent variables.**

Supplementary figure S6. Crude and weighted (by age and education) prevalence of good, fair, and poor self-rated health, in percentage, males and females. 1994-1996. 1998. 2000-2022.