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Gender Inequality in Survival at Older Ages

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Abstract

Gender gaps are typically measured by subtracting the survival rates for women from that of men. In most countries and at most ages, these gender gaps indicate a survival rate disadvantage for men. This method is not informative because it is unclear whether larger or smaller gaps would be more equitable.

Here we reconceptualize the gender gap in survival based on differences from gender-specific best practice rates and express those gender gaps in the metric years of age. If the age-specific survival rates for women in a particular country are farther behind the best-practice survival rates for women than the survival rates for men are behind their best-practice rates, then there is a gender gap to the disadvantage of women. This facilitates the analysis of gender gaps over ages, time periods and countries. We find that there has not generally been a trend toward gender equality in survival when measured relative to gender-specific best practice. In some countries, gender gaps in survival to the disadvantage of women existed in 1960 and have even grown larger over time. In the UK, gender gaps to the disadvantage of men in 1960 evolved into gender gaps to the disadvantage of women by 2010.

The methodology employed here can be applied to quantify gender gaps in a variety of variables and help in the formulation of healthcare policies.

Acknowledgments

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1 Background

Gender gap measures have been developed to document inequities across the genders and to point policy-makers to areas where interventions could be most useful (United Nations Development Programme, 2015; World Economic Forum, 2015). Traditionally, gender gaps are measured as the difference or ratio between the value of an indicator for men and the value of the same indicator for women (Böttcher et al., 2016; van der Slik et al., 2015; Weber et al., 2014). Since the age-specific survival rates for women are typically higher than they are for men, there generally appears to be a gender gap in favor of women. This gender gap does not point policy-makers to areas they can target for improvement because it is not clear whether policy interventions should be targeted to making that gap larger or smaller.

Here, we suggest a more policy relevant measure of the gender gap, one based on differences from gender-specific best-practice survival rates. The resulting gender gaps provide clearer guidance to policy-makers about health disparities. Measures of gender gaps in survival are most useful to policy-makers when they distinguish between those gaps for children, people of reproductive age, and people of post-reproductive age because the policies to reduce those gaps would be different depending on the age group. Our focus here is on the patterns of gender gaps for post-reproductive age people, a group for which there has been little gender gap analysis (Crimmins et al., 2010).

2 Methods

One clear goal of public policy is to raise the gender-specific survival rates in the policy-maker's country toward those in the country, which has the highest survival rates in the same year. This goal may be achievable in principal through improvements in health care system and behavioral changes towards more healthy life styles. To make this concrete, the best-practice survival rates that we use are the gender-specific rates observed in those countries which had the highest life expectancies at age 50 in specific years among all countries of the world that had 500,000 or more people 50+ years old. Those best practice rates are the uppermost boundaries of what was achievable at the time. With very few exceptions, the survival rates in the best-practice countries are the highest at each age from 50 through 75 among all countries of the world in the year in question. All survival rates are derived from UN life tables (United Nations, 2015).

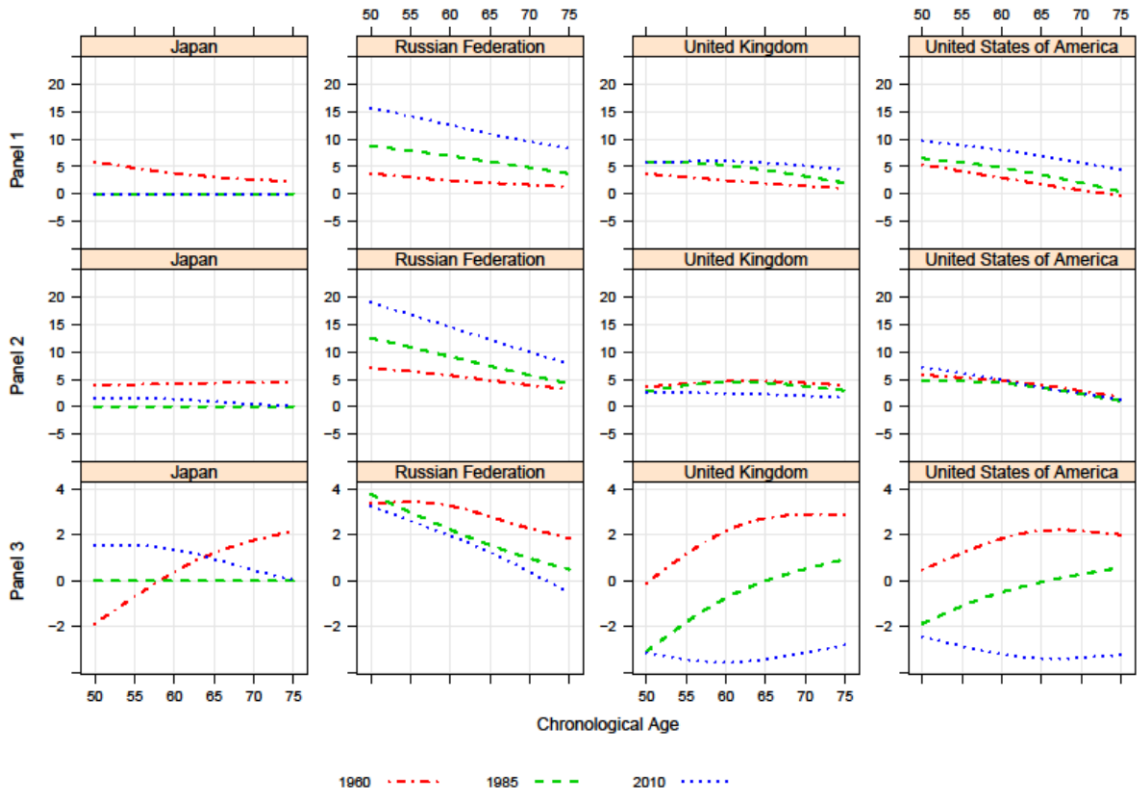
In order to quantify deviations from best-practice survival rates in a form that is most informative in studying differences across ages, countries, time periods and genders, we translate those deviations into the number of years behind best practice. The number

of years behind best practice at any specific age is the difference between the age in the best practice country with the same five-year survival rate and that specific age. For example, if women of age 60 in 1985 in a particular country had the same five-year survival rate as 65-year-old women in the best practice country in 1985, then they would be five years behind best practice. Women in the best practice country lived five more years than the 60-year-olds before their five-year survival rate fell to the same level. This approach is based on Sanderson and Scherbov (2005, 2010, 2013, 2016).

3 Findings

The results are shown in Figure 1 for Japan, the Russian Federation, the UK, and the USA, and in Figure 2 for Brazil, China, India, and Nigeria. Each figure has three panels and provides data for 1960, 1985, and 2010. The upper panel shows the number of years behind best practice for women. The middle panel shows the same thing for men, and the lower panel shows the gender gap, the values in the middle panel minus those in the upper one. The best practice rates for women are those observed in Norway in 1960 and Japan in 1985 and 2010. The best practice rates for men are those observed in Norway in 1960, Japan in 1985, and Australia in 2010.

Figure 1. Gender Gaps in Survival for 50 to 75 Year Olds, Japan, Russian Federation, United Kingdom and United States of America, 1960, 1985, and 2010.



For example, in Figure 1, we show that 50-year-old UK women in 1960 were around 3 years behind their best practice counterparts in terms of survival rates in that year, while 50 year old UK women in 2010 were around 6 years behind their best-practice counterparts. Over the half century from 1960 to 2010, UK women fell further behind the

best practice leader. In 1960, 50-year-old UK men were around 3 years behind best practice and in 2010 they were still 3 years behind. The gender gap is the difference between how far men are behind best practice and how far behind women are.

The gender gap in survival at age 50 in the UK in 1960 was, therefore, zero. But this gender equality did not continue. In 2010, UK men at age 50 were still around 3 years behind best-practice, while women at age 50 were around 6 years behind. The gender gap for UK 50 year olds in 2010 was, therefore, around -3 years (=3-6). Over the period from 1960 to 2010, the gap between the survival rates for UK women and their best practice counterparts increased, while for men the gap remained about the same. The result was that, over time, the gender equality observed for 50 year olds in 1960 evolved into a survival rate disadvantage for women.

One motivation for using the number of years behind best practice is its interpretability. For example, 50-year-old UK women in 1960 had the same 5-year survival rates as 53-year-old women in the best practice population. This is easier to understand than if we were to report the corresponding survival rate differences or ratios by themselves.

We use this procedure to determine whether or not there has been a general tendency for gender gaps at older ages to shrink over time. We can see from the figures that there has not been a general tendency for gender gaps in survival to decrease over time. Nor has there been a general tendency for gender-specific survival rates to converge toward best-practice. Indeed, in a number of countries gender gaps in survival to the disadvantage of women have increased.

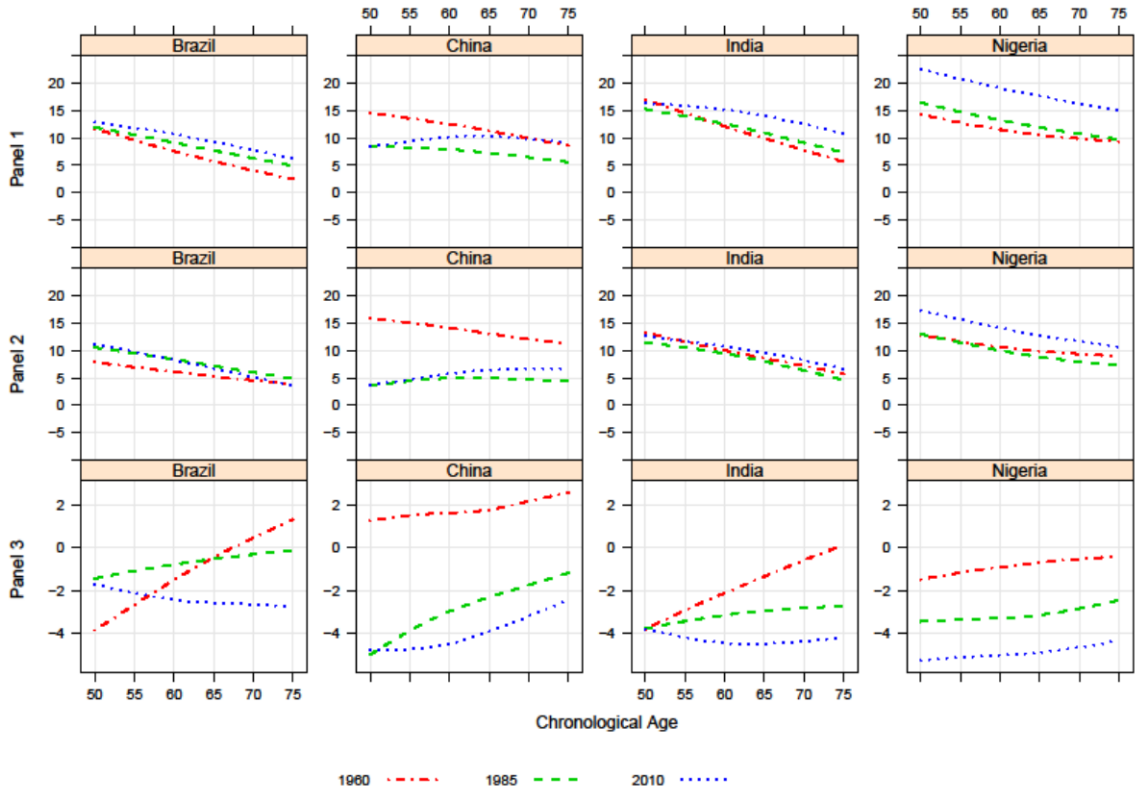
Among the wealthier countries, the UK and the US provide examples of gender gaps to the disadvantage of women increasing over time. Given the differences in their healthcare systems, the similarities in the gender gap patterns for the UK and the US is striking. Changes in the gender gaps in survival in low mortality countries have been associated to a certain extent with changes in smoking and other health behaviors (Christensen et al., 2010; Crimmins et al., 2010; McCartney et al., 2011). Whether these can account for the similarities between the UK and the US remains to be seen.

In the Russian Federation, the gender gap in survival was high around age 50 in all three years in Figure 1 and declined with age. The decrease in the gender gap was larger between 1960 and 1985 than from 1985 to 2010. This may have arisen because 1985 was one of the years of the anti-alcoholism campaign there (Bhattacharya et al., 2013). Although there is little change in the gender gap in the Russian Federation around age 50 between 1960 and 2010, both Russian women and men fell further behind best practice. The gender gaps around age 50 did not change much because the deteriorations were roughly equivalent.

In Figure 2, we see that gender gaps to the disadvantage of women increased in all four countries, Brazil, China, India, and Nigeria. The survival rates for these countries, especially for 1960, are based partly on data and partly on various techniques of demographic estimation and should be treated cautiously. In India, there is a gender gap to the disadvantage of women at age 50. In 1960, that gender gap gradually disappeared with age and vanished by age 75. By 2010, the gender gap in India increased to around age 60 and then stayed roughly constant. Over the half century from 1960 to 2010, gender inequality to the disadvantage of women increased.

The same pattern of increase in the gender gap to the disadvantage of women in apparent in China. In 1960, there was a gender gap to the disadvantage of men. By 1985, the gender gap to the disadvantage of men turned into a gender gap to the disadvantage of women, and the gender gap to the disadvantage of women was even larger in 2010. Nigeria exhibits a pattern of increasing gender gaps to the disadvantage of women for the entire period from 1960 to 2010. None of the eight countries shown in Figures 1 and 2 have as large gender gaps to the disadvantage of women as is observed in Nigeria in 2010.

Figure 2. Gender Gaps in Survival for 50 to 75 Year Olds, Brazil, China, India and Nigeria, 1960, 1985, and 2010.



4 Alternative measures

In this paper, gender gaps are measured in two steps. First, we compute gender-specific numbers of years behind best practice. For example, 65-year-old women in the UK in 2010 had the same 5-year survival rate as 70-year-old Japanese women in that year. Second, the differences in the gender-specific number of years behind best practice are calculated. So at that age, the UK women were 5 years behind best practice. UK men were 2 years behind best practice so the gender gap at that age was 3 years.

Two alternative quantifications of deviations from best practice could be percentage deviations from best-practice survival rates or percentage deviations from best-practice death rates. The use of percentage deviations from best-practice rates has three disadvantages. First, it is not expressed in a meaningful metric. Measuring the gender gap in terms of years behind best practice is at the heart of the gender gap measures presented here. If we were to subtract the percentage difference in female survival rates

from the percentage difference in male survival rates, for example, the result is not in any natural unit.

The second disadvantage of using percentage deviations from best practice survival rates or death rates is that the resulting gender gaps change depending on whether survival rates or death rates are used. Gender gaps based on the number of years behind best practice are exactly the same regardless of whether survival rates or death rates are used in the analysis. The results of gender gap analyses based on years behind best practice are invariant to monotonic transformations of survival rates, including those that translate survival rates into death rates.

The third disadvantage is that the same percentage difference in survival or death rates has a different interpretation at different ages and in different countries and years, where levels of survival and death rates can be quite different. A one percent difference in survival rates, for example, might indicate a relatively large difference at ages where survival rates vary little, but indicate a relatively small difference at ages where survival rates vary more.

We demonstrate these disadvantages graphically in the Supplementary Material, where we show gender gaps based on percentage differences in survival rates and percentage differences in death rates for the same eight countries that are in Figures 1 and 2. The evolution of the resulting gender gap measures over age and time are quite different depending on whether survival rates and death rates are used.

5 Interpretation

The gender gaps presented here have two innovative features. First, instead of comparing the survival rates for men and women directly, we take the intermediate step of measuring each relative to the best practice rates for their genders in the same year. When gender gaps are computed in this way, we observe, in the UK for example, a growing gender gap in survival to the disadvantage of women at all ages from 50 to 75.

These gender gaps provide policy-makers useful suggestions. For example, the increase in the gender gap in the US from 1985 to 2010 was due to deterioration of women's survival rates relative to best practice. Men's survival rates, relative to best practice, were about the same in the two years. The same sort of pattern is seen in the UK. This suggests that explanations of the changes in the gender gap should consider common factors. Past increases in the prevalence of women smoking is one possible common factor.

Our results for the Russian Federation are also suggestive. There is a large gender gap to the disadvantage of men around age 50. This is commonly associated with higher rates of alcoholism among men. But 1985 was one of the years of Gorbachev's anti-alcohol campaign and the age pattern of gender gaps between 1985 and 2010 are quite similar (Bhattacharya et al., 2013). Similar increases in the years behind best practice for both men and women from 1985 to 2010 suggest a general deterioration in health conditions, not one in which the end of the anti-alcohol campaign had a particularly large effect on the health of men.

The second innovative feature is the expression of differences between actual and best practice survival rates in terms of the number of years behind best practice. This is simple to understand. If 40-year-old women and men both had the same survival rates as

50 year olds in the best-practice country, then the gender gap would be zero, measured this way, but it would not generally be zero if the gender gap is measured either in terms of percentage differences in survival or death rates.

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Appendix

Figure A1. Gender Gaps in Survival for 50 to 75 Year Olds, Japan, Russian Federation, United Kingdom and United States of America, 1960, 1985, and 2010 (based on percentage differences in survival rates)

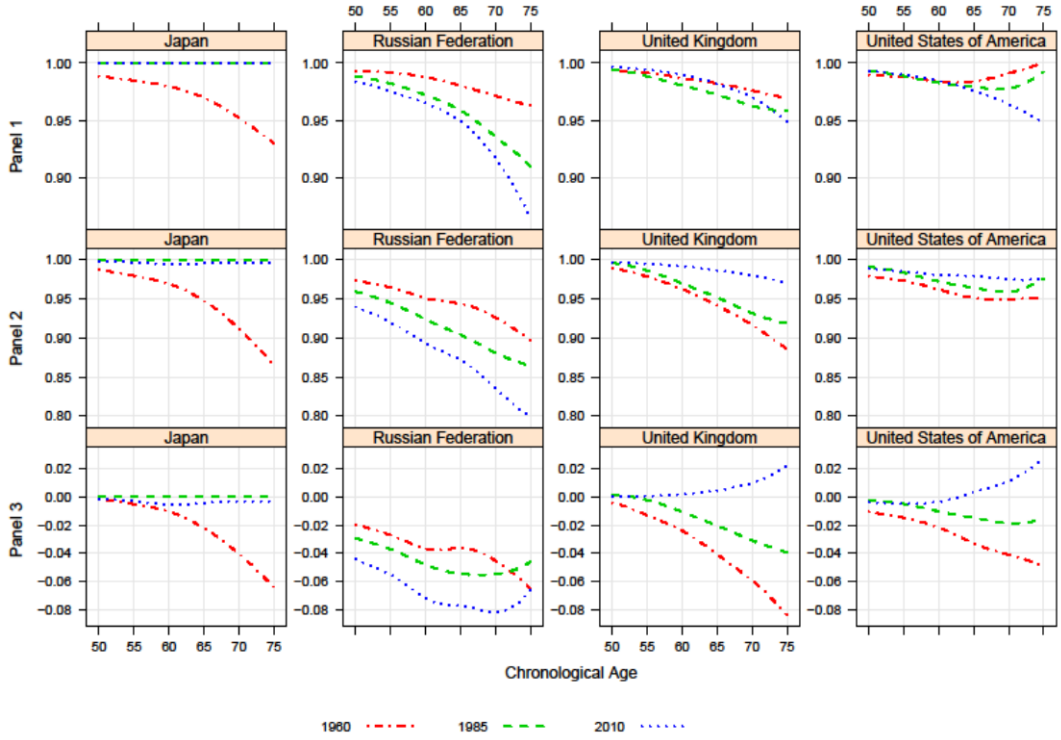

Figure A2. Gender Gaps in Survival for 50 to 75 Year Olds, Brazil, China, India, and Nigeria, 1960, 1985, and 2010 (based on percentage differences in survival rates)

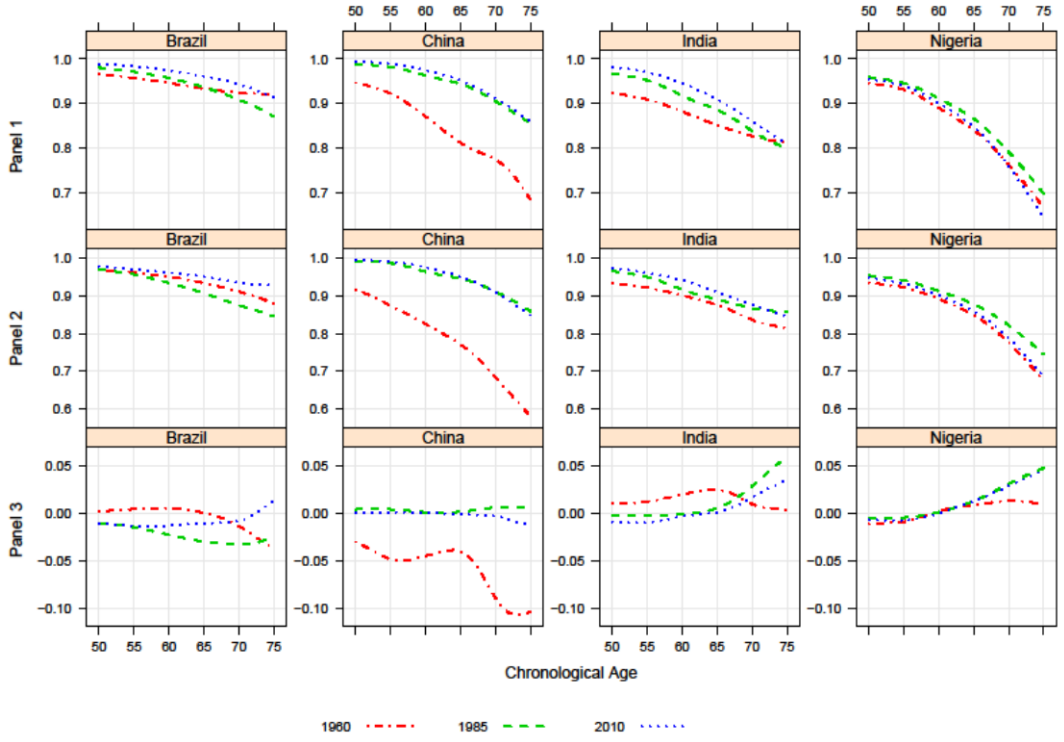

Figure A3. Gender Gaps in Survival for 50 to 75 Year Olds, Japan, Russian Federation, United Kingdom and United States of America, 1960, 1985, and 2010 (based on percentage differences in death rates)

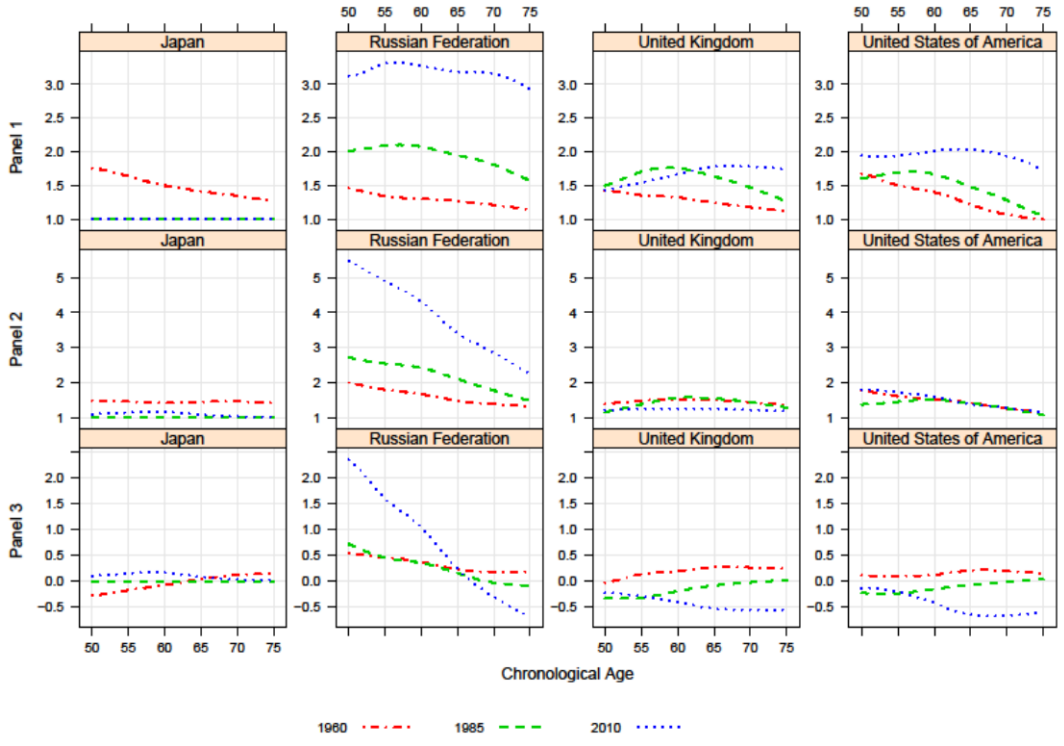

Figure A4. Gender Gaps in Survival for 50 to 75 Year Olds, Brazil, China, India, and Nigeria, 1960, 1985, and 2010 (based on percentage differences in death rates)