Gender Gap in Life Expectancy in Russia: The Role of Alcohol Consumption

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We investigate alcohol consumption as one of the main factors contributing to variation in the gender gap in life expectancy in the Russian regions. We consider the socioeconomic indicators and mortality coefficients that enable us to capture the causes of death related primarily to alcohol abuse and smoking. We assume that macroeconomic situation, coupled with alcohol consumption are substantial determinants of the gender gap in life expectancy in the Russian regions. A panel data analysis confirms that alcohol consumption has a significant influence on the gender gap in life expectancy and reduces the life expectancy of men first and foremost, as they are more inclined toward unhealthy behaviours. We have determined that employment and income support policies should be conducted in conjunction with the anti-alcohol policy. Social policy aimed at reducing alcohol consumption should be vigorously reinforced during an economic recovery.

Keywords: Life expectancy at birth, gender gap, social policy, alcohol consumption, Russia.

Introduction

It has long been observed that women's life expectancy exceeds that of men all over the world (Trovato and Heyen, 2003; Liu *et al.*, 2013). According to the data of the World Health Organization, the maximum gender gap in life expectancy in 2015 was around six to seven years in wealthy countries. Russia, meanwhile, has a higher gender gap in life expectancy than all other countries, at 11.6 years in 2015 (WHO, 2015a). During the period from 2000 to 2005, the gender gap was approximately thirteen and a half years. In addition, there are significant regional gender differences in life expectancy at birth within Russia. Of particular concern is the fact that such a large gap can be explained by the low life expectancy of men. To improve this situation, it is necessary to investigate the determinants of this gap.

At present, the factors determining the gender gap in life expectancy are still under discussion. Some authors have suggested that biological differences between men and women are the culprit (Van Oyen *et al.*, 2010). Other authors consider socioeconomic factors. Such research has been carried out both at the macro and micro levels and includes such factors as income, unemployment, degree of economic inequality, fertility rate and

mortality coefficients (Clark and Peck, 2012). Lastly, it has been proposed that behavioural factors might significantly influence the gender gap in life expectancy (Flandorfer and Fliegenschnee, 2011). Women's longer life expectancy might be explained by the fact that they have stronger social networks (Jusrut and Kalipeni, 2012). The gender gap in life expectancy may result from differences in men's and women's propensity for healthy lifestyle choices (Van Oyen *et al.*, 2010; Jusrut and Kalipeni, 2012). The latter authors investigate the effects of smoking rates and alcohol consumption.

The Russian government is constantly trying to increase the country's birth rate and reduce its mortality rate. These attempts include special initiatives such as subsidies for the birth of the second child and attempts to improve accessibility to health care. Efforts are also aimed at increasing life expectancy by improving the performance of the healthcare system. The main government program in the health sector is titled 'Development of Health Care Until 2020'. Its goal is to gradually reduce mortality from all causes, as well as to increase life expectancy at birth for both sexes combined to seventy-four years by 2020. In 2016, life expectancy at birth was 66.5 for men, 77.06 years for women, and 71.85 years for both sexes combined (Federal State Statistics Service of Russia, 2017). It is important to note that the target value of life expectancy at birth is adjusted downwards over time.

At the same time, alcohol abuse is a serious problem that needs to be adequately addressed by social policy in Russia. According to the World Health Organization, the total per capita consumption of pure alcohol in Russia is 15.1 litres (WHO, 2014). Even though WHO data include both registered and unregistered alcohol consumption, unregistered consumption is difficult to estimate, and the 15.1-litre value provides us with a rough idea of the actual alcohol consumption. However, this is one of the world's highest values. Half of the total volume of alcohol consumption is accounted for by spirits, which have an especially destructive effect on public health.

Our study aims to investigate the role of alcohol consumption in the presence of a large gender gap in life expectancy in Russia. Alcohol consumption may greatly contribute to the increase in mortality from external causes, since injuries, accidents, suicides, and murders are often associated with alcohol abuse (Pridemore, 2006). However, alcohol consumption itself is an indicator of an unhealthy lifestyle, contributing to reduced life expectancy. We assume that men are more inclined towards unhealthy lifestyles and, consequently, live shorter lives than women. At the same time, the economic situation in the region of residence can also have a significant effect not only on the life expectancy itself, but also on the gender gap in the value of this indicator. The main concern is that the problem of alcohol abuse can nullify the effect of economic growth on reducing the gender gap in life expectancy. We put forward the hypothesis that macroeconomic conditions significantly influence the gender gap in life expectancy along with alcohol consumption, which is the main driver of the gender gap in Russia.

We examine macroeconomic data on the Russian regions from the Federal State Statistics Service of Russia from 1998 to 2015. It should be mentioned that most of the studies at micro level are non-representative across the Russian regions. This is a significant restriction due to the existence of substantial regional social and economic inequality in Russia. Moreover, studies based on survey data might significantly underestimate the amount of consumed alcohol. Respondents often forget the actual amount of consumed alcohol or keep silent about it. Even though data on alcohol sales do not include unregistered alcohol, these estimates are more reliable for public policy recommendations. Our results should inform decision-makers on the feasibility of social policies aimed at

reducing mortality and increasing the life expectancy of the population. The significance of alcohol consumption to our explanation of the gender gap should allow social policymakers to strengthen their arguments in favour of more restrictive anti-alcohol policies.

Determinants of the gender gap in life expectancy

A large number of studies have investigated the gender gap in life expectancy at birth and its determinants. Authors have demonstrated that the gender gap varies across countries and over time (Teriokhin *et al.*, 2004; Van Oyen *et al.*, 2010; Clark and Peck, 2012; Jusrut and Kalipeni, 2012; Liu *et al.*, 2013; Rochelle *et al.*, 2015). For example, Jusrut and Kalipeni (2012) investigated differences between male and female life expectancies in southern African countries. In those countries, the gap narrows because of substantial decrease in the life expectancy of women. Authors argued that accessibility to maternal health care services should be seriously improved.

The problem of a large gender gap in life expectancy in Russia is widely discussed in Russian academic literature. Andreev (2003), Kharchenko *et al.* (2003), Kvasha and Khar'kova (2011), Shkolnikov *et al.* (2014) and Aganbegyan (2015) presented analyses of life expectancy in Russia in a historical perspective. These authors also drew comparisons with other countries. Zvezdina and Ivanova's (2015) article drew attention to the factors that influence life expectancy in the Russian regions. They highlighted the significance of mortality coefficients and indicators of healthcare efficiency. Andreev (2003), Pietilä and Rytkönen (2008) and Cockerham (2012) analysed the determinants of the large gender gap in life expectancy in Russia. Andreev (2003) placed special emphasis on mortality coefficients, Pietilä and Rytkönen (2008) concentrated on structural changes in Russian society and Cockerham (2012) investigated the factors of stress and unhealthy lifestyle. These articles provide a good foundation for further research.

Socio-economic factors might significantly influence the gender gap in life expectancy (Clark and Peck, 2012; Jusrut and Kalipeni, 2012; Rochelle *et al.*, 2015). The majority of relevant studies are devoted to the cross-country analysis. However, the conclusions are useful for our research, since they provide us with the guidance on possible determinants of the gender gap. The most common measure of income is the gross domestic product per capita (Van Oyen *et al.*, 2010; Clark and Peck, 2012; Jusrut and Kalipeni, 2012; Rochelle *et al.*, 2015). The impact of income distribution inequality on the gender gap in life expectancy is considered using the Gini coefficient (Clark and Peck, 2012; Rochelle *et al.*, 2015). One more important factor is the unemployment rate (Van Oyen *et al.*, 2010). In addition to the latter, researchers use the share of women in the labour force (Trovato and Heyen, 2003), the ratio of women's share in the labour force to the corresponding share of men, and fertility rate as measures of women's status (Clark and Peck, 2012). Authors have analysed the contribution of various causes of death to the reduction or increase of the gender gap in life expectancy. Clark and Peck (2012) considered mortality from external causes in their cross-national study. Researching the Republic of Korea, Yang *et al.* (2012) revealed that causes of death related to smoking make a significant contribution to the gender gap while mortality from traffic accidents reduces the gap.

Using the case of Italy, Conti *et al.* (2003) concluded that a reducing gender gap in life expectancy might be explained by the tendency of young women to follow unhealthy lifestyles coupled with the reverse trend for young men. Jusrut and Kalipeni (2012) in their research for the countries of southern Africa showed that a longer life expectancy for

women might be explained by more frequent use of disease prevention methods by women. Several authors have drawn attention to the factor of smoking. Luy and Wegner-Siegmundt (2014) revealed that the gender gap can be attributed to smoking in most populations of the western world. However, the factor of smoking cannot be regarded as the main driver. Yorifuji *et al.* argued that 'smoking is one of major contributors to the gender gap in life expectancy in Japan' (Yorifuji *et al.*, 2013: 483). Sundberg *et al.* found that 'smoking-related causes decreased in men but increased in women' in Sweden (Sundberg *et al.*, 2018: 673). The authors underscored the importance of addressing modifiable lifestyle factors such as smoking to reduce avoidable mortality. Rochelle *et al.* (2015) also examined the impact of the prevalence of smoking and alcohol consumption on the gender gap in life expectancy. They analysed data from fifty-four countries from 1994 to 2005 and revealed that alcohol consumption and life satisfaction factors account for the gender gap in life expectancy. The authors argued that 'women drink moderately while men drink excessively, which results in the female advantage' in life expectancy (Rochelle *et al.*, 2015: 135). Russia was also included into the cross-country analysis. Rochelle *et al.* analysed the period when Russia was experiencing a difficult process of transition to a market economy. Since the mid-2000s, these factors no longer exert a decisive influence on the gender gap in life expectancy, since Russia has been experiencing macroeconomic and political stabilisation. Furthermore, there has been a change in the structure of alcohol consumption over the past ten years in Russia (Kossova *et al.*, 2017). Consumption of strong alcohol (vodka) is partially replaced by low-alcohol beverages (beer). It is explained by an aggressive entry of beer companies into the Russian market and a mass campaign by the State against the abuse of strong alcohol in recent years. The ongoing changes require the close monitoring of the continuing alcohol impact on health.

It is worth noting that most research studies on alcohol consumption in Russia are based on microdata from individual population surveys. For example, Gundy *et al.* (2005) investigated alcohol use by Moscow and Toronto adults. They found that 'drinking norms interact with traditional gender role orientations to influence alcohol use patterns' (Gundy *et al.*, 2005: 2317). Tomkins *et al.* (2012) revealed 'that hazardous alcohol consumption has been a major determinant of mortality among working age men in a typical Russian city' (Tomkins *et al.*, 2012). With that, the analysis of macro-data provides a more complete picture of alcohol consumption, since the statistics of alcohol sales by region is free from subjectivity of respondents' answers about the amount of alcohol consumed. The advantage of interregional over cross-country analysis is the ability to more accurately identify the dependencies that occur in any country. Russia is the gender gap leader in life expectancy, but at the same time, it is not a problem of hygiene and malnutrition, as, for example, in African countries. To identify the reasons, it is necessary to move from investigation of general patterns in a large group of very diverse countries to the analysis of the Russian domestic data.

Concerning Russia, this country has extensive experience in fighting against alcohol consumption. The most significant example is Gorbachev's campaign of 1985–1987, which resulted in a strong decline in alcohol production. The opinions on the health effects of this campaign vary greatly. An important result of the campaign was the reduction in mortality from alcohol-related problems. Leon *et al.* (1997) accentuated the fact that 'the largest declines in mortality between 1984 and 1987 and subsequent increases between 1987 and 1994 in proportional terms were observed for alcohol-related deaths and accidents and violence' (Leon *et al.*, 1997). Reitan (2001) presented the detailed description of this alcohol policy experiment. Comparing this campaign with the
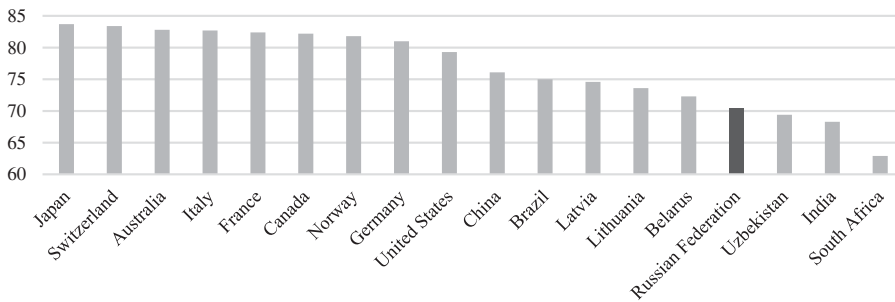
Figure 1. Life expectancy at birth in Russia and other countries, years, for both sexes.
Source: World Health Organization (2015a)

current anti-alcohol policy, we note that the present campaign does not set 'unrealistic goals, like the achievement of moderate drinking habits for the entire population within two or three years' (Reitan, 2001: 247). Gorbachev's measures were introduced very abruptly, and the restrictions were much more severe for the population than they are now. Gorbachev's campaign is remembered for long queues for alcohol beverages throughout the USSR. Now, even with the introduction of time limits on alcohol sales and various bans, there is no real alcohol deficit in Russia. Gorbachev's measures largely concerned the production of alcohol beverages. For example, vineyards were forcibly cut down. Current anti-alcohol measures are aimed at discouraging consumption, rather than forcing producers to reduce the supply of alcohol.

The problem of the large gender gap in life expectancy in Russia

The Russian government has long been trying to increase life expectancy at birth, but it is still rather low in comparison with wealthy countries. The World Health Organization (2015a) shows that life expectancy at birth in Russia and other post-Soviet states is on average ten years lower than in the countries with the highest indicators.

At present, the absolute leader by life expectancy at birth is Japan, but the countries of Western Europe, Australia and Canada demonstrate comparably high values of life expectancy. The lag of Russia and other post-Soviet states like Belarus and Uzbekistan might be explained by a variety of factors, including economic development, operation of the healthcare system, lifestyle of the population, etc. Figure 1 also shows the BRICS countries in order to compare them with each other and particularly with Russia. We note the success of China, where life expectancy exceeds seventy-five years. This is may be due to the effective implementation of a national program titled 'Healthy China – 2030', which entails disease prevention measures and the promotion of a healthy lifestyle, including regular physical exercise, healthy eating, and smoking cessation. Brazil is also in a relatively better position than Russia. Brazilians live seventy-five years on average. Objectively, this result can be achieved in Russia no earlier than five years from now. India has a lower life expectancy: 68.3 years. The lowest value among the BRICS countries is observed in South Africa, where life expectancy at birth for both sexes is only 62.9 years. This value is comparable to such African countries as Uganda, Zambia, and Tanzania.

At the same time, Russia has a considerably high gender gap in life expectancy. According to WHO data (2015a), Russia is the absolute leader on this indicator alongside
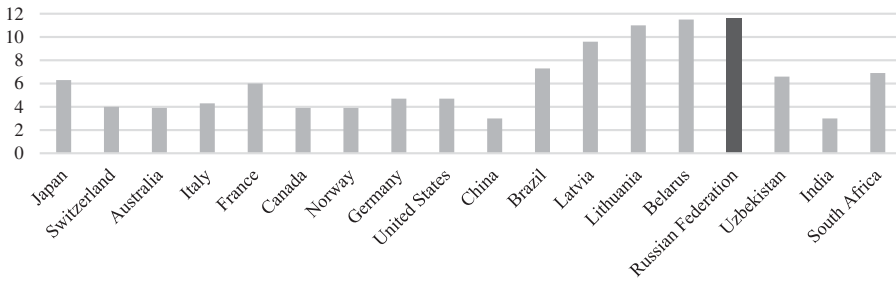
Figure 2. Gender gap in life expectancy in Russia in comparison with other countries.
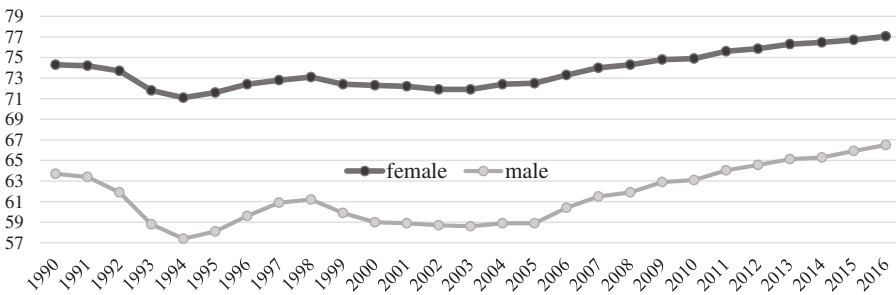*Source*: World Health Organization (2015a)

Figure 3. Life expectancy of females and males in Russia, years.
Source: Federal State Statistics Service of Russia (2017)

Belarus and Lithuania, which are also post-Soviet states. Figure 2 presents the gender gap in life expectancy in the countries from Figure 1.

The large gender gap in Russia and other post-Soviet countries is primarily driven by the rather low life expectancy of men in these countries. It should be noted that a smaller gender gap is observed not only in the most developed and prosperous countries, but also in disadvantaged regions where life expectancy of men and women are equally small.

Analysing these cross-country comparisons, we can conclude that the life expectancy of men leaves much to be desired in Russia. This should motivate researchers to investigate the causes of this unfavourable situation and find solutions to improve it. The dynamics of life expectancy for the period from 1990 to 2015 are presented in Figure 3.

Figure 3 shows that the life expectancy of men is more sensitive to economic and political changes in the country. The period from 1991 to 2000 was characterised by a noticeable decrease in life expectancy, particularly that of men. It was a difficult time of transition to a market economy, which was very stressful for the population. During this period, many Russians lost their jobs, experienced declining incomes, or were forced to change professions. This had a devastating impact on the population's life expectancy, especially that of men. In the Russian mentality, a man is the head of his household, and he is fully responsible for its financial well-being. According to Shkolnikov *et al.* (1998), the reason of an increase in mortality in 1992–94 was in the implementation of economic reforms and transition to a market economy. It caused the great psychological stress for the population and provoked 'adverse health effects of excessive alcohol consumption' (Shkolnikov *et al.*, 1998: 1995). Men *et al.* (2003) supported this conclusion. Another

42

significant factor affecting the life expectancy of men was the war in Chechnya from 1994–1996 and from 1999–2001. The population's real incomes began to increase steadily beginning in 2005. This has led to an increase in life expectancy at birth for both sexes. Moreover, the recovery of men's life expectancy was faster than that of women. Grigoriev *et al.* showed that 'the recent decline in Russian mortality can be attributed to a combination of factors, including changes in behaviour (decreases in alcohol consumption, improvements in diet), the implementation of health policies, and improvements in economic conditions' (Grigoriev *et al.*, 2014: 125). They argued that the reason for the recent reduction in premature mortality is the decline in alcohol consumption.

Leon *et al.* (2009) suggested that alcohol consumption might explain high mortality among working age men in Russia. They identified that 'men drink appreciably more than women in Russia', and 'conservative estimates attribute 31–43% of deaths among working-age men to alcohol' (Leon *et al.*, 2009: 1630). Rechel *et al.* (2013) revealed that 'the main reason for low life expectancies is the very high burden of premature mortality at working ages' in post-Soviet states (Rechel *et al.*, 2013: 1146). At the same time, Hinote *et al.* (2009) suggested, 'after the collapse of the Soviet state, women are more able to embrace behavioral practices related to alcohol, and many may do so as an overt rejection of traditional Soviet norms and values' (Hinote *et al.*, 2009). Horvat *et al.* (2018) showed that 'drinking frequency is associated positively with mortality among men and women in Russia' (Horvat *et al.*, 2018: 1252). Thus, the hypothesis that alcohol consumption has a positive effect on the gender gap in life expectancy remains relevant.

The government aims to solve the problem of low life expectancy by implementing large-scale programs both at the federal and regional levels. These are essentially programs meant to develop the healthcare system and improve social support. In addition, there is the federal housing program, which involves granting plots of land on a non-reimbursable basis for the construction of residential houses for large families, and measures to increase the availability of mortgage loans to young families with children. The government also provides housing in rural areas to young university graduates with the profession of high social importance, e.g. doctors and teachers. According to the optimistic prognosis of the country's demographic development made by the Ministry of Economic Development of Russia (2013), it will be possible to achieve an average life expectancy of seventy-eight years by 2030. However, the rapid ageing of the population and the shrinking of the working-age population might prevent the average life expectancy from exceeding seventy-four years by 2030 (Ministry of Economic Development of Russia, 2013).

Another major problem that prevents life expectancy from increasing is environmental pollution in many regions. Industrial enterprises that do not pay due attention to waste removal and pollution control have a profoundly negative impact. This concerns primarily the metallurgical and mining industries. Crotty (2002) provided an appropriate example in the intensification of pollution for the Chelyabinsk and Novgorod regions. Doctors frequently diagnose these workers with allergies, asthma, respiratory problems, cancers and other diseases. Children and elderly people are the most vulnerable category, because they are less capable of withstanding poor environmental conditions. Krinitsyn's study (2004) confirmed this conclusion using the example of chemical production in Cheboksary. The main employees in such enterprises are males due to difficult working conditions. This further reduces their life expectancy. By neglecting to solve environmental problems, the government inevitably faces a high risk of rising population mortality.

Estimating determinants of the gender gap in life expectancy in Russia

To estimate determinants of the gender gap in life expectancy, we use official statistics from the Federal State Statistics Service of Russia (Federal State Statistics Service of Russia, 2017). We consider seventy-seven Russian regions from 1998 to 2015. More recent data on the necessary statistics are unavailable. Furthermore, we exclude from the analysis the North Caucasian Republics – namely, Dagestan, Ingushetia, and Chechnya – because the data for the early 2000s are unavailable. The use of macroeconomic data has several advantages. We ensure coverage of almost all the regions, which allows us to get a complete picture of the current changes in the country. This has important social policy implications, as the government's activities affect the entire population of Russia. In contrast to survey data, there are no problems related to representativeness or dishonest answers to the question of alcohol consumption. Nevertheless, macroeconomic data do not enable us to break down alcohol consumption or mortality from external causes by gender.

Estimating the total volume of per capita alcohol consumption is a very difficult task because of unregistered alcohol consumption. According to WHO, unrecorded consumption is 3.6 litres of pure alcohol per capita per year in Russia (WHO, 2014). This value is in the top ten among the countries included in the WHO rating. It is a part of Russian culture to produce alcoholic beverages at home and drink them with friends and relatives. The most popular drink is moonshine, which is a forty-proof alcoholic beverage. It is forbidden to sell homemade alcohol, and its consumption is not recorded in the official statistics. One possible way to gauge the volume of homemade alcohol consumed is to conduct a survey. The Russia Longitudinal Monitoring survey (RLMS-HSE) is the only regular survey containing information about the consumption of homemade alcohol. This approach is proposed by Radaev (Radaev, 2015; Radaev, 2016). However, the microdata of this survey is not representative of the regions. The macrodata of the Federal State Statistics Service of Russia do not include estimations of unregistered alcohol consumption. Thus, we do not have reliable data on unregistered alcohol consumption in the Russian regions. In our research, we consider the volume of alcohol sales per capita (*alc*) in each region provided by the Federal State Statistics Service of Russia (2017). This could be regarded as a minimum level of alcohol consumption. We assume that all this volume is consumed by the population of a region.

We measure gender gap in life expectancy as a natural log of the ratio of female to male life expectancy at birth (*ln(ratio)*). All explanatory variables are also taken in logarithms.

Based on the literature review, we assume that socio-economic factors influence the gender gap in life expectancy, namely, per capita average monthly income in 1999 prices (*income*), unemployment rate (*unempl*), Gini coefficient (*gini*), fertility rate (*fertility*), death from external causes (*death_ext*), and death from respiratory diseases (*death_breath*). We use Gini coefficient values provided by the Federal State Statistics Service of Russia for all Russian regions. The methodology of calculating Gini coefficient is based on analysing 20 per cent population groups by the criterion of income. Gini coefficient ranges from zero to one. The higher value of the coefficient indicates more unequal distribution of income in the society.

Including both mortality rates and alcohol consumption in the equation makes it possible to identify the effect of alcohol consumption on other components of life expectancy. Mortality from external causes is often associated with the abuse of alcoholic beverages. Homicide, suicide, and car accidents often involve people who are in a state of alcoholic intoxication. Smoking also significantly reduces life expectancy. Since we do

not have data on smoking rates in the Russian regions, mortality from respiratory diseases is used as a proxy variable for the factor of smoking.

In our econometric analysis, we estimate a panel data model. To choose between fixed effects and random effects models, we conduct a Hausman test. This test shows a preference for fixed effects models. The model with fixed effects fits best, because we include regions of one country in the analysis. Fixed effects allow us to consider constant individual characteristics of regions. For example, some regions are touristic like Moscow and Saint Petersburg, where more alcohol is bought and consumed by tourists. In addition, individual features might be related to the regional climates and customs.

The model is specified as follows:

$$\ln(ratio_{it}) = \alpha + \beta_1 \ln(alc_{it}) + \beta_2 \ln(income_{it}) + \beta_3 \ln(unempl_{it})$$
$$+ \beta_4 \ln(gini_{it}) + \beta_5 \ln(fertility_{it}) + \beta_6 \ln(death\_ext_{it})$$
$$+ \beta_7 \ln(death\_breath_{it}) + \alpha_i + \varepsilon_{it},$$

where

($ratio_{it}$) – the ratio of female to male life expectancy at birth in region i in year t;
(alc_{it}) – alcohol sales (litres of absolute alcohol per capita) in region i in year t;
($income_{it}$) – per capita average monthly income (in 1999 prices) in region i in year t;
($unempl_{it}$) – unemployment rate in region i in year t;
($gini_{it}$) – Gini coefficient in region i in year t;
($fertility_{it}$) – fertility rate in region i in year t;
($death\_ext_{it}$) – death from external causes (per 100000 people) in region i in year t;
($death\_breath_{it}$) – death from respiratory diseases (per 100000 people) in region i in year t.

In addition, we estimate equations for mortality from external causes (*death_ext*) and its components: namely, murders (*kill*), suicides per 100000 people (*suicides*), deaths from road accidents per 100000 people (*traf_accid*) and deaths from accidental alcohol poisoning per 100000 people (*drag*). The explanatory variables are the same as in the equation for the gender gap in life expectancy excluding death from external causes and death from respiratory diseases. This enables us to analyse the impact of alcohol consumption on mortality from external causes and its components. These are also panel data models with fixed effects. All variables are taken in natural logarithms.

Estimates of models for mortality from external causes and its components are presented in Appendix 1. In all equations, the signs of the coefficients coincide. This means that the direction of the influence of these factors is the same for all types of mortality as well as the gender gap in life expectancy. If alcohol consumption increases by 1 percent, then mortality from external causes increases by 0.21 percent, mortality from homicides by 0.36 percent, mortality from suicides by 0.18 percent, mortality from road accidents by 0.3 percent, and mortality by accidental poisonings by 0.57 percent.

Estimation results for the main model for the gender gap in life expectancy are given below Table 1.

Overall, alcohol consumption is positively related to the gender gap in life expectancy. In regions with higher alcohol consumption, the gender gap is larger. We assume that alcohol consumption has the strongest effect on the life expectancy of men, because men are more inclined toward unhealthy lifestyles. According to WHO (2014), average per capita consumption of pure alcohol was 23.9 litres per year for the male population in

Table 1   Estimating determinants of the gender gap in life expectancy in the Russian regions from 1998 to 2015

VARIABLES	Ln(ratio)
ln(alc)	0.00666***
	(0.00113)
ln(income)	−0.00908***
	(0.00202)
ln(unempl)	−0.000874***
	(0.000103)
ln(gini)	0.0118**
	(0.00600)
ln(fertility)	−0.00371
	(0.00347)
ln(death_ext)	0.0720***
	(0.00195)
ln(death_breath)	0.00564***
	(0.00167)
Constant	−0.198***
	(0.0137)
Observations	1,380
R-squared	0.844
Number of regions	77

Standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

2008–2010. For the female population, it is 7.8 litres per capita per year. Furthermore, men prefer stronger alcoholic drinks than women do. Under such conditions, alcohol has a more destructive effect on the health of men than that of women.

We discover a negative relationship between the gender gap and monthly per capita income. An increase in economic well-being contributes to the reduction of the gender gap in life expectancy. We believe that a favourable economic situation increases the expected life expectancy of both sexes. However, it increases the life expectancy of men more than the life expectancy of women. On the other hand, men experience greater stress under adverse economic conditions and a lack of money. The life expectancy of men is thus more sensitive to changes in the macroeconomic situation.

The unemployment rate also has a significant impact on the gender gap in life expectancy. Unemployment is highest in regions where unfavourable economic conditions have persisted for a long time. A negative correlation between the gender gap and unemployment indicates that the life expectancy of men and women in disadvantaged regions is equally low. Thus, we observe the lowest gender gap in life expectancy in regions with the most favourable economic conditions and the highest in regions with the least favourable economic conditions.

The mortality coefficients also make a significant contribution to the gender gap in life expectancy. This again confirms the negative impact of the propensity for unhealthy lifestyles on the gender gap. Since murders, suicides, road accidents often involve people who are in a state of alcoholic intoxication, the significance of mortality from external causes points to the negative impact of alcohol abuse on life expectancy. This primarily

46

reduces men's life expectancy, since men are more inclined toward risky behaviours. The positive relationship between the gender gap and mortality from respiratory diseases might be explained by the fact that men die from these diseases more often than women do. There is a high probability that these kinds of diseases are strongly correlated with smoking. Men smoke more than women do in Russia. According to WHO (2015b), the prevalence of smoking among those aged fifteen years or older was 59.8 per cent for males and 22.7 per cent for females in 2013. We conclude, therefore, that men are more susceptible to respiratory diseases and suffer more from negative health consequences. All the above indicates that men are the most vulnerable category. Government policymakers should pay special attention to this fact while designing measures aimed at increasing life expectancy in the country.

Discussion and policy implications

In this section, we discuss the possible implications of our findings for social policy in Russia. There is no doubt that the success of social policy is largely determined by the amount of funds that the state allocates to it. While the Russian government continues to reform health care and improve the demographic situation, Russia's health expenditure as a percent of GDP is much lower than in Japan, Australia, Canada, European countries, and the other countries with the highest life expectancies. Other problem countries in terms of life expectancy demonstrate the same lower level of health care expenditure as a percent of GDP. This primarily includes post-Soviet states such as Belarus and Lithuania (Figure 4).

With limited budgetary resources, the social sphere is of lower priority for the Russian than other sectors. Ongoing reduction of healthcare expenditures contributes to the growth of regional inequalities (Grigoriev *et al.*, 2014; Lyytikäinen and Kemppainen, 2016). It is not surprising that the planned figures for life expectancy are constantly being adjusted downwards. Under such conditions, it is important to understand which factors can be targeted in order to narrow the gap, since it is impossible to change the situation radically. We find that the most significant factor related to the gender gap in life expectancy is alcohol consumption. Anti-alcohol policies in Russia should be designed with this finding in mind. The problem of low life expectancy for Russian men is largely explained by their unhealthy lifestyle. Men are more prone to alcohol abuse and other forms of risky behaviour. Men drink more alcohol than women, and, consequently, the male population would be more sensitive to restrictive anti-alcohol measures. This would enable decision-makers to reduce the gender gap by increasing men's life expectancy.

At present, anti-alcohol policy in Russia is characterised by a gradual tightening of the rules for alcohol sales. The government is trying to regulate the availability of alcoholic beverages. Our results underline the importance of such existing alcohol policy measures. One of the most important achievements has been the introduction of time restrictions on alcohol sales at the federal and regional levels. These prohibit alcohol sales during certain hours of the evening, afternoon and morning. It is worth noting that the high effectiveness of restrictive anti-alcohol measures is also supported in other articles devoted to Russia (Kolosnitsyna *et al.*, 2017). The feasibility of price controls and awareness campaigns has been demonstrated on the example of India (Kumar, 2017). The effectiveness of restrictive social measures to control alcohol is described in Chun *et al.*'s (2011) article about Korea. Raninen *et al.* revealed in their research for Sweden that people 'who grew up during a period with more restrictive alcohol policies currently drink less alcohol than those who
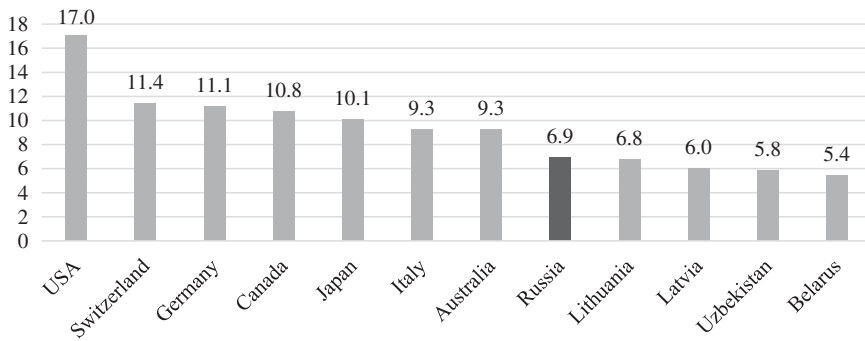
Figure 4. Average health expenditures, total for 2010 - 2014 (% of GDP).
Source: World Bank (2018)

grew up during periods with more liberal policies' (Raninen *et al.*, 2016: 1021). Holmes *et al.* (2014) showed that establishing a minimum unit price for alcohol in England would result in 'substantial health gains in terms of morbidity and mortality' (Holmes *et al.*, 2014: 1655).

Considering that alcohol consumption has a direct effect on the gender gap in life expectancy, the weakening of current anti-alcohol measures in the country – for example, the reduction of excise taxes on strong alcohol – could have disastrous consequences. Politicians frequently propose the reduction of the established minimum price for vodka and the removal of restrictions on the sale of alcohol over the Internet. There is a lobby for raising budget revenues by making alcohol more accessible and increasing volumes of consumption. However, increased availability of alcohol would lead to negative consequences for population's health, which would lead the government to incur higher costs to combat alcohol abuse. It should be noted that the loss of budget revenues is already occurring, but politicians believe that potential threats to public health and all the negative consequences of alcohol abuse are far in the future. Some officials believe that restrictive measures do not have a positive impact on public health. However, the scale of alcohol consumption in Russia is significant. Such initiatives would negatively affect the population of the country. A weakening of anti-alcohol measures would lead to a swift reduction in life expectancy at birth, especially for men.

It is also interesting to consider other post-Soviet countries with the same problem of a large gender gap in life expectancy. These are most notably Belarus and Lithuania. In Belarus, there is a state program titled 'People's Health and Demographic Security of the Republic of Belarus for 2016–2020' Ministry of Health Care of Belarus, 2018). These measures are aimed not only at raising the birth rate and supporting the family, but also at combating alcohol abuse, promoting sobriety and encouraging involvement in sports. Belarusian anti-alcohol policy is restrictive. The country is moving towards limiting retail sales of alcoholic beverages and introducing more stringent requirements for the quality of alcohol products. The government is attempting to prevent the population from drinking moonshine. This issue is also relevant in Russia. However, in Russia, there is no advertising campaign against moonshine, in contrast to Belarus. In Lithuania, anti-alcohol policy is also based on restrictive measures. Anti-alcohol law establishes a ban on the sale of alcohol at night. Officials are discussing initiatives to further narrow the window during which alcohol can be sold and to increase the minimum age at which alcohol can be purchased. Excise taxes on beer and wine are also being increased. Authorities are trying

to reduce the availability of alcohol overall. Several scholars believe that the increased life expectancy in Lithuania can be attributed to the success of health policy measures and alcohol policy measures there (Jasilionis *et al.*, 2011). Thus, increasing the cost of alcohol consumption and reducing the availability of alcohol are regarded as the key means to improve public health. When the level of alcohol consumption in a country is too high, only serious restrictive measures are able to contribute to societal progress.

Our econometric analysis revealed a negative relationship between per capita income and the gender gap in life expectancy. This means that the stability of the economic situation in the country is of the utmost importance. The lack of permanent employment and a stable income is the main stress factor for most people. People need sufficient incomes to support their children and dependants and to fulfil their financial obligations in the form of consumer loans and mortgages. Traditionally, the breadwinner in a Russian family is the man, and he carries the main responsibility for the family. It is socially acceptable for women to be engaged only in housekeeping. With the transition to a market economy, employment stability has been lost. Employees cannot be sure that they will maintain their jobs, whereas in the Soviet Union employment was practically guaranteed to anyone who had the appropriate specialty and desire to work. More than twenty years have passed since the beginning of market reforms, but public consciousness has not fully adapted to the new reality. Under such circumstances, the poorest and most vulnerable groups of the population suffer most – for example, families with children. Support programs are needed to prevent families from delaying the decision to have children. The Russian government continues to develop such programs. For instance, the President has extended the program by which mothers are paid for giving birth to a second child and introduced additional regular payments for the birth of the first child for low-income families. Overall, many authors have confirmed that alcohol consumption is strongly associated with psychological distress in developing countries and that this requires an adequate policy response (Balogun *et al.*, 2014). Stress provokes an increase in alcohol consumption among men to a greater extent than women. Ultimately, this reduces the life expectancy of men relative to that of the female population.

We determined that unemployment makes a significant contribution to the gender gap in life expectancy. To improve Russian regional economic development and to increase labour market efficiency, Ministry of Labor and Social Protection has implemented the state program 'Promotion of Employment for 2013–2020' (Ministry of Labor and Social Protection, 2013). It includes active employment policy, job creation, and social support for unemployed citizens. Together with income support programs, it should contribute to stimulating economic growth. However, existing academic scholarship suggests that alcohol abuse may escalate during economic recovery. Kossova *et al.* (2017) found that alcohol consumption is procyclical in Russia, which is consistent with the findings of Ruhm and Black for the US (Ruhm and Black, 2002), Johansson *et al.* for Finland (Johansson *et al.*, 2006), and Ásgeirsdóttir *et al.* for Iceland (2014). Thus, there is an additional challenge for the public policy expressed in the need to combat alcohol abuse while improving macroeconomic conditions, rising household incomes, and reducing unemployment.

We conclude that the task of increasing the population's life expectancy is very complex. The most effective measures to influence life expectancy – primarily that of men – must be identified. In our article, we propose that restrictive anti-alcohol policy might be the key to reducing the gender gap in life expectancy.

Conclusions

Our analysis demonstrates that alcohol consumption has a significant effect on the gender gap in life expectancy in the Russian regions. The higher the volume of alcohol consumed, the greater the gender gap in life expectancy. This is mainly due to a reduction in the life expectancy of men, revealing that men are more inclined towards unhealthy behaviour than women. Deaths from external causes and deaths from respiratory diseases are related to alcohol abuse and smoking. Unhealthy lifestyles negatively affect life expectancy and increase the gender gap. To increase life expectancy and narrow the gender gap, a restrictive alcohol policy is required.

Exploring economic and lifestyle determinants of the gender gap, we have identified two divergent effects. On the one hand, higher unemployment reduces the gender gap, because both men and women live shorter lives in depressive regions with bad macro-economic conditions. Those regions require employment support programs as well as government interventions to support the population's incomes. This could contribute to narrowing the gap, since in prosperous regions men and women live longer lives. On the other hand, efforts aimed at economic recovery are associated with the growing problem of excessive alcohol consumption, because alcohol consumption is procyclical in Russia. In a situation when an improvement of the macroeconomic situation is accompanied by an increase in alcohol consumption, restrictive alcohol policies are crucial. Anti-alcohol policy measures should be reinforced in more prosperous regions as well as during an economic recovery. Since a reduction in alcohol sales causes insufficient revenues to the budget, all initiatives to weaken anti-alcohol restrictions must be stopped.

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Appendix 1 Estimating determinants of mortality from external causes in the Russian regions from 1998 to 2015

VARIABLES	Ln(death_ext)	Ln(kill)	Ln(suicides)	Ln(traf_accid)	Ln(drag)
ln(alc)	0.211***	0.358***	0.184***	0.304***	0.574***
	(0.0164)	(0.0316)	(0.0314)	(0.0570)	(0.0612)
ln(income)	−0.340***	−0.702***	−0.269***	−0.312**	−0.656***
	(0.0290)	(0.0557)	(0.0554)	(0.152)	(0.108)
ln(unempl)	−0.0161***	−0.0105***	0.000596	−0.0145**	−0.0187***
	(0.00153)	(0.00294)	(0.00292)	(0.00600)	(0.00570)
ln(gini)	0.542***	0.801***	0.0976	1.455***	1.238***
	(0.0912)	(0.175)	(0.174)	(0.485)	(0.340)
ln(fertility)	−1.166***	−2.061***	−1.500***	−0.453***	−2.212***
	(0.0419)	(0.0806)	(0.0801)	(0.166)	(0.157)
Constant	6.201***	4.351***	3.850***	4.457***	4.365***
	(0.113)	(0.218)	(0.217)	(0.572)	(0.423)
Observations	1,380	1,380	1,380	614	1,375
R-squared	0.722	0.750	0.582	0.195	0.428
Number of regions	77	77	77	77	77

Standard errors in parentheses ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$