Divergent paths for adult mortality in Russia and Central Asia: Evidence from Kyrgyzstan

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Abstract

A puzzling pattern of mortality trends in former Soviet Central Asian republics is that the mortality increases recorded in these republics after the break-up of the Soviet Union have not been as severe as in Russia. For example, in Kyrgyzstan, life expectancy at birth declined by 3.3 years between 1990 and 1995 (from 68.8 to 65.5 years), while in Russia during the same period, it declined by 4.6 years (from 69.3 to 64.7 years). Moreover, the gap in life expectancy between Russia and Kyrgyzstan has increased in recent years, at the advantage of Kyrgyzstan. This is puzzling to many observers because the economic crisis has been more severe in Central Asian republics. In 1990, the gross national income per capita in Russia was about 6.5 times greater than in Kyrgyzstan. In 2008, it was about 13 times greater. Russia, a much more developed country than Kyrgyzstan, exhibits lower life expectancy.

In this paper, we take advantage of unpublished official mortality data from one Central Asian republic, Kyrgyzstan, to examine the reasons for this divergence. We focus on adult ages (20-59), a critical age range for understanding mortality fluctuations in post-Soviet states. We calculate for the first time a consistent time series of age-specific death rates by sex and cause in Kyrgyzstan for the period 1981-2006. We then examine the causes of death that explain the divergence between Kyrgyzstan and Russia. We find that this divergence is overwhelmingly attributable to external and cardio-vascular causes, and more generally, to causes that have been demonstrated to be strongly related to alcohol consumption. This result is interpreted in view of the respective social, economic and cultural contexts of Russia vs. Kyrgyzstan.

Introduction

A puzzling pattern of mortality trends in former Soviet Central Asian republics is that the drops in life expectancy recorded in these republics after the break-up of the Soviet Union have not been as large as in Russia. For example, in Kyrgyzstan – the Central Asian republic that is the focus of this paper –, life expectancy at birth declined by 3.3 years between 1990 and 1995 (from 68.8 to 65.5 years), while in Russia during the same period, it declined by 4.6 years (from 69.3 to 64.7 years). Moreover, the gap in life expectancy between Russia and Kyrgyzstan has increased in recent years, at the advantage of Kyrgyzstan. The most recent estimates show that life expectancy in Kyrgyzstan remains higher than in Russia.

This is puzzling to many observers, because Central Asian republics are much poorer than Russia, and in many ways have been more severely hit by the economic crisis associated with the transition to capitalism. In 1990, the gross national income per capita in Russia was about 6.5 times greater than in Kyrgyzstan. In 2008, it was about 13 times greater (World Bank 2009). Since the mortality fluctuations in Russia have been primarily attributed to abrupt changes in the socio-economic environment, including drops in gross national income per capita and unemployment resulting from mass privatization (Cornia and Paniccia 1995; Shapiro 1995; Shkolnikov et al. 1998; Leon and Shkolnikov 1998; Leon et al., 2007, 2009; Stuckler et al. 2009), similar – if not greater – mortality increases should be expected in a Central Asian republic like Kyrgyzstan.

The most common explanation is that data quality may be lower in Central Asia and may have deteriorated since the break-up of the Soviet Union, while in Russia official mortality rates have reflected true patterns (Becket et al., 1998). This would have created a situation in which official mortality rates in Central Asia are too low and underestimate the scale of mortality deterioration. Indeed, data quality has always been described as problematic in Central Asia (Anderson and Silver 1997).

However, recent evaluations of data quality in Kyrgyzstan have brought qualifications to this statement. The conclusion is that the amount of underestimation varies greatly over time and age. While reported infant mortality is grossly underestimated and shows clear signs of deterioration in the 1990s (Guillot and Lim 2009), reported adult mortality appears to provide overall a reliable picture of true mortality levels and trends at these ages, especially since the 1980s (Guillot 2004, 2007).

Interestingly, the patterns of mortality divergence described earlier for life expectancy hold when we focus on mortality in the more reliable adult ages. Figure 1 shows age-standardized death rates at ages 20-59 in Kyrgyzstan vs. Russia, by sex. Among males, we see that adult mortality has been systematically lower in Kyrgyzstan. We also see that mortality fluctuations have

occurred in both countries in a similar fashion: abrupt mortality decline in 1985-1987, related to Gorgachev's anti-alcohol campaign, and abrupt mortality increase in the early 1990s. However, the amount of fluctuation is smaller in Kyrgyzstan, both in absolute and relative terms. As in the case of life expectancy, we also observe a divergence between the two countries, especially since 1998. Although the gap has slightly narrowed recently, adult mortality is still 1.67 times greater in Russia. For females, adult mortality was actually higher in Kyrgyzstan during the 1980s and 1990s. However, Russia lost its advantage around 1999. As for males, we observed a mortality divergence between the two countries, at the advantage of Kyrgyzstan.

-- Figure 1 about here --

In this paper, we investigate the reasons for this divergence by examining the causes of death that have generated these patterns. We first examine the causes of death explaining trends in adult mortality in Kyrgyzstan. We then estimate the causes of death are responsible for the increasing in gap in adult mortality between Kyrgyzstan and Russia. We focus on adult ages, because this age range has emerged as a critical age range for understanding mortality fluctuations in Soviet and post-Soviet states. Moreover, this age range appears to be less affected by data quality problems than other age groups such as infant and child ages. Our focus on adult ages is thus motivated by both substantive and practical reasons.

Data and methods

This paper relies on official mortality data from both Kyrgyzstan and Russia. Information on deaths by cause comes from aggregate tabulations of deaths by age, sex and cause (Forms No. 5 and S51). Population estimates are official annual population estimates by age and sex.

We focus here on two different merging of causes of death. In a first set of analyses, we use the seven broad causes commonly used in analyses of cause-specific mortality: (1) Infectious diseases; (2) Neoplasms; (3) Circulatory diseases; (4) Respiratory diseases; (5) Digestive diseases; (6) External causes; and (7) All other causes.

In a second set of analyses, we examine causes of death that have been identified as strongly-related to alcohol consumption in several studies based on Russian data. The reason for this particular focus on alcohol-related mortality is that these causes have been shown to explain most of the fluctuations in Russian mortality (Zaridze et al. 2009a, 2009b). Since all-cause adult mortality in Kyrgyzstan presents both similar and contrasting features with Russia, we would like to examine the role of alcohol-related mortality in explaining these similarities and differences.

The identification of strongly alcohol-related causes is based on a case-control study of adult deaths in three cities of Western Siberia (Zaridze et al. 2009b). Causes were identified as strongly alcohol related if they presented a strong dose-response association with alcohol consumption. (The decedent's past alcohol use was provided by family proxy information.) These causes include: upper aero-digestive tract cancer; tuberculosis; pneumonia; liver disease other than cancer; pancreatic disease other than cancer; heart disease other than myocardial infarction; ill-specified diseases; and external causes, including alcoholic psychosis and poisoning. Obviously not all the deaths from these causes are due to alcohol. The purpose of this merging is not to estimate the amount of mortality attributable to alcohol, but to examine the extent to which adult mortality trends in Kyrgyzstan vs. Russia can be explained by causes that have been shown to be strongly related to alcohol, vs. causes that have been shown not to be strongly related to alcohol.

The classification of deaths by cause changed over time in both countries, but in different ways. Before the break-up of the Soviet Union, codes where similar in both countries. (One exception is the coding of external causes, which changed in 1985 in Kyrgyzstan and in 1988 in Russia.) Discrepancies started to appear after independence. Most notably, Russia adopted a modified version of ICD-10 in 1999, with its own set of numerical codes (1-238). In Kyrgyzstan, the transition to ICD-10 occurred in 2000, but with the use of ICD-10 alpha-numerical codes (A00-Y98). Given the broad merging of causes that we use in this paper, changes of classification were relatively straightforward to accommodate in our analyses. The codes we use in this paper are presented in Table 1 (Kyrgyzstan) and Table 2 (Russia).

-- Tables 1 and 2 about here --

In this paper, we standardize mortality in the age range 20-59 using equal weights for each five-year age group. Thus our age-standardized mortality rate, ${}_{40}M_{20}^{S}$ is equal to $1/8*({}_{5}M_{20} + {}_{5}M_{25} + \ldots + {}_{5}M_{55})$. ${}_{40}M_{20}^{S}$ is conveniently related to the life table probability of death between ages 20 and 60, ${}_{40}q_{20}$, through the following relation: ${}_{40}q_{20} = 1 - \exp\{40*{}_{40}M_{20}^{S}\}$. The age-standardized mortality rate by cause is calculated in the same manner, using cause-specific instead of all-cause deaths in the numerators. These cause-specific age-standardized mortality rates conveniently add up to the rate for all causes. Therefore the contribution of cause-specific mortality to differences in all-cause ${}_{40}M_{20}^{S}$ over time and place can be directly estimated by examining differences in cause-specific ${}_{40}M_{20}^{S}$.

Kyrgyzstan is a multi-ethnic society. While the ethnic Kyrgyz represent the largest ethnic group, there are substantial Uzbek and Russian minorities. The ethnic distribution of the population changed rapidly during the 1990s. In particular, many ethnic Russians left Kyrgyzstan to return to Russia. Between 1989 and 1999, the percentage of ethnic Russians declined from 21.5% to 12.5%. These compositional changes affect mortality trends at the national level, because ethnic

Russians and ethnic Kyrgyz exhibit quite distinct mortality profiles (Guillot 2007, Guillot et al, forthcoming)). Unfortunately, deaths by cause and ethnicity, together with population by ethnicity, are not available on an annual basis, preventing the calculation of ethnic- and cause-specific mortality trends. In this paper, we focus on national-level mortality trends, keeping in mind that these trends reflect in part changes in the ethnic composition of the population. The analysis of ethnic differences in mortality in Kyrgyzstan is examined in detail elsewhere (Guillot et al., forthcoming).

Results

Trends in cause-specific adult mortality in Kyrgyzstan, 1981-2006

Figure 2 shows trends in all-cause and cause-specific mortality (broad causes) in Kyrgyzstan between 1981 and 2006. For males, we find that fluctuations in all-cause mortality are primarily explained by changes in circulatory diseases and external causes. While both sets of causes play an important role in these fluctuations, we find that external causes play a more important role in the fluctuations associated with Gorbachev's anti-alcohol campaign (1984-89). The large fluctuations of the 1990s, however, are primarily explained by changes in mortality from circulatory diseases. Indeed, starting from a similar level in the early 1990s, mortality from circulatory diseases increased by a larger amount than mortality from external causes between 1992 and 1995. The other five broad causes presented in Figure 2 play a much smaller role overall, and do not explain much of the mortality fluctuations. However, we do note a sustained and worrisome increase in infectious diseases after 1991.

-- Figure 2 about here --

For females, fluctuations are primarily explained by variations in circulatory diseases. External causes play some role in explaining the 1984-89 fluctuation, but this role is less important than that of circulatory causes. Overall, the role of external causes is much smaller than for males. Cancers is the second cause of death among adult females in Kyrgyzstan, but played little role in the mortality fluctuations. The other broad causes also remained more or less constant throughout the period.

Many deaths within the external broad category are known to be related to alcohol consumption, most notably deaths from alcohol poisoning. Also, it has been shown that, in Russia, many alcohol-related deaths are wrongly attributed to diseases of the circulatory system, especially to heart diseases other than myocardial infarction. Given that these two broad causes, like in Russia, explain most of the fluctuations in adult mortality in Kyrgyzstan, we suspect that alcohol is likely to play an important role in Kyrgyzstan as well. In order to further examine the role of

alcohol, we thus calculated mortality from causes identified as strongly-related to alcohol in Zaridze's study, as explained in the previous section.

Figure 3 shows trends in strongly alcohol-related adult mortality in Kyrgyzstan, together with mortality from all other causes. For males, we find that alcohol-related causes dominate throughout the period. However, there is a clear distinction between the 1984-89 and 1992-99 fluctuations. The 1984-89 fluctuation is almost entirely explained by mortality attributable to alcohol-related causes. Indeed, mortality from other causes varied little during this period. In 1992-99, we find that most of the fluctuation is explained by alcohol-related causes. However, we also find a substantial increase in mortality from other causes.

-- Figure 3 about here --

For females, we find that, in contrast to males, other causes dominate throughout the period. However, the respective role of alcohol-related vs. other causes in explaining the fluctuations is similar to males. The 1984-89 fluctuation is almost entirely explained by alcohol-related causes, while the 1992-99 fluctuation is explained by both sets of causes, with a somewhat larger increase for alcohol-related causes.

Overall, this analysis of cause-specific mortality in Kyrgyzstan presents many similarities with patterns observed in Russia. Fluctuations occurred at about the same time, and are explained by the same broad causes, external causes and circulatory causes (Zaridze et al. 2009a, Shkolnikov et al 1998, Shkolnikov et al. 2001). Like in Russia, alcohol seems to play an important role in these fluctuations (Mckee et al. 2001, Leon et al. 1997, Zaridze et al 2009b). These similarities are not very surprising, given the fact that Kyrgyzstan was one of the most russified Central Asian republics, and in many ways has experienced similar socio-economic changes since independence. Kyrgyzstan remains strongly anchored in the former Soviet space, and in many areas Kyrgyzstan's experience parallels that of Russia.

Cause-specific contributions to the mortality gap between Russia and Kyrgyzstan

In spite of the similarities highlighted above, adult mortality in Kyrgyzstan vs. Russia also exhibit important discrepancies. First of all, adult mortality is lower in Kyrgyzstan among males throughout the period, and among females since 1999. Most strikingly, we find an increasing mortality divergence, at the advantage of Kyrgyzstan, throughout the period.

Figure 4 shows the contribution of broad causes to the gap between the two countries. This figure simply shows the difference (Russia minus Kyrgyzstan) in all-cause and cause-specific ${}_{40}M_{20}{}^{S}$ for the period 1981-2006. For males, the line for all causes illustrates the gap in all-cause mortality between the two countries, with Russia experiencing an increasing amount of excess

mortality during the period. External causes appear as the major contributor to Russia's excess mortality. Circulatory causes and neoplasms play a second role at the beginning of the period, but while the role of neoplasms remain more or less constant, circulatory causes play a increasing role during the period 1998-2006. As a result, we find that the increasing gap between the two countries is primarily explained by external causes, with circulatory causes also playing an important role in 1998-2006.

-- Figure 4 about here --

The situation is more complex for females, because among them there is a shift from a situation of excess mortality in Kyrgyzstan to a situation of excess mortality in Russia. Two sets of causes are consistently higher in Russia: external causes and neoplasms. All the other causes are higher in Kyrgyzstan, contributing negatively to the gap. However, neoplasms played no role in the increasing gap. The loss of the Russian advantage is primarily explained by mortality from external causes, which increased by a larger amount in Russia, and by mortality from circulatory causes, which became higher in Russia in the early 2000s.

Here also, given the importance of external causes and circulatory causes in explaining the gap, it is useful to make the distinction between strongly alcohol-related causes and other causes. Figure 5 shows the contribution of these causes to the Russia-Kyrgyzstan mortality gap between 1989 and 1999. For males, it appears that excess adult mortality in Russia is basically entirely explained by alcohol-related causes. Other causes contribute virtually nothing – which means that mortality from these causes has been relatively similar in the two countries. As a result, it can be concluded that among males, the mortality divergence between Russia and Kyrgyzstan is *entirely* explained by a set of causes that have been identified as strongly related to alcohol.

-- Figure 5 about here --

For females, alcohol-related mortality is higher in Russia through the period, contributing positively to the gap, while mortality is lower for other causes, contributing negatively to the gap. This means that mortality from other causes is actually higher in Kyrgyzstan, which is perhaps more in line with expectations, given Kyrgyzstan's level of socio-economic development. The sum of these positive and negative contributions has varied over time. The narrowing of the gap since 1995 and the 1999 cross-over appears to be due to a combination of an increasingly positive role of alcohol-related causes and a diminishingly negative role of other causes.

Discussion

Cause-specific mortality at adult ages in Kyrgyzstan since the 1980s presents many similarities with Russia, but also some important discrepancies. As in Russia, fluctuations are primarily due to changes in external causes and circulatory causes. As in Russia, alcohol appears to play an important role, as we can see in the mortality decrease during Gorbachev's anti-alcohol campaign. However, in Russia, mortality from these causes (external, circulatory, and alcohol-related causes) has been higher than in Kyrgyzstan throughout the period, and has increased by a greater amount since the break-up of the Soviet Union. Also, in Kyrgyzstan, a more varied set of causes appear to explain the mortality increase of the 1990s. Consequently, the mortality divergence that we observe for all causes is overwhelmingly attributable to external and cardio-vascular causes, and more generally, to causes that have been demonstrated to be strongly related to alcohol consumption.

Given the fact that Kyrgyzstan experienced a more severe economic crisis in the 1990s, and remains substantially poorer than Russia, Kyrgyzstan's more favorable adult mortality trends cannot be easily explained in macro-economic terms, such as GNI trends, amount of privatization, unemployment, price and trade liberalization, etc. Rather, our results suggest that these divergent mortality patterns are likely due to cultural and religious differences between the two countries, and their impact on patterns of alcohol consumption. Kyrgyzstan is a predominantly Muslim country, and while excessive alcohol consumption certainly causes a non-trivial number of deaths there, as we saw in the previous section, it appears to be a much less central part of Kyrgyzstan's society than Russia's (Cockerham et al. 2004).

This interpretation is consistent with mortality patterns by ethnicity for the period 1998-99 in Kyrgyzstan, which shows that while ethnic Russians who live in Kyrgyzstan are better-off than the ethnic Kyrgyz, they experience higher adult mortality, and this excess mortality is primarily due to alcohol-related causes (Guillot et al. forthcoming). In other words, the mortality gap between the two countries is very similar to the mortality gap between members of the two corresponding ethnic groups who live in Kyrgyzstan. This further supports the cultural dimension of the mortality divergence between the two countries.

If increases in excessive alcohol consumption were directly induced by abrupt socio-economic changes, as has been argued in the case of Russia, one would observe similar, or even larger, mortality increases related to alcohol in Kyrgyzstan. However, alcohol consumption appears to be largely shaped by societal norms (Heath 1995, Cockerham 2000, Cockerham et al. 2004). The existence of a deeply embedded "culture of alcohol" in Russia seems to generate so much excess mortality that it wipes out the potential benefits of its more advantageous economic situation, relative to Kyrgyzstan. Conversely, the more muted culture of alcohol in Kyrgyzstan

seems to have granted the country with a mortality advantage that appears to overcompensate for its far worse economic outcomes.

The Russia vs. Kyrgyzstan comparison further highlights the overwhelming role that alcohol plays in Russia's mortality. Although this role is already documented, the comparison of the two countries provides a richer framework for understanding its root causes. In particular, this comparison highlights the important cultural dimension of alcohol consumption, which is often ignored in explanations of mortality patterns among former Soviet republics. For example, a recent cross-national study of mortality change in post-communist countries found mortality increases to be related to mass-privatization (Stucker et al. 2009), but the authors did not seek to adjust for baseline patterns of alcohol consumption or related cultural characteristics such as ethnicity. In an earlier study, Brainerd (1998) found that, among former Soviet republics, the amount of decrease in life expectancy between 1992 and 1994 was largely related to the proportion of Russians in the republic at the beginning of the period. It would be interesting to examine how Stucker et al.'s results would be affected by taking into account baseline differences in patterns of alcohol consumption.

Levels of adult mortality in Kyrgyzstan, while lower than in Russia, remain an important source of concern. Indeed, today's levels are similar to those observed in 1981. The cause-specific mortality rates provided in this paper show that policy directed towards prevention and treatment of cardio-vascular diseases, and towards reduction of levels of alcohol consumption, would be particularly beneficial. The important increase in infectious diseases among males is another source of concern that calls for immediate attention.

References

Anderson, B.A. and B.D. Silver. 1997. "Issues of Data Quality in Assessing Mortality Trends and Levels in the New Independent States." Pp. 120-155 in *Premature Death in the New Independent State*, edited by J.L. Bobadilla, C.A. Costello, and F. Mitchell. Washington: National Academy Press.

Becker, C.M., D.I. Bibosunova, G.E. Holmes, and M.M. Ibragimova. 1998. "Maternal Care vs. Economic Wealth and the Health of Newborns: Bishkek, Kyrgyz Republic and Kansas City, USA." *World Development* 11: 2057-2072.

Brainerd, R. 1998. "Market Reform and Mortality in Transitions Economics." *World Development* 26(11):2013-2027.

Cockerham, W.C. 2000. "Health Lifestyles in Russia." *Social Science and Medicine* 51:1313-1324.

Cornia, A.G., and R. Paniccia. 1995. "The Demographic Impact of Sudden Impoverishment: Eastern Europe During the 1989-1994 Transition." *UNICEF Innocenti Occasional Papers*. Florence, Italy: UNICEF. Economic Policy Studies No. 49.

Guillot, M. 2004. "Kachestvo Demograficheskikh Dannykh v Kyrgyzstane c 1958 g." [The quality of demographic data in Kyrgyzstan since 1958]. Pp. 53-76 in *Naselenie Kyrgyzstana* [The Population of Kyrgyzstan], edited by Z.I. Kudabaev, M. Guillot and M. Denisenko. Bishkek, Kyrgyz Republic: Natsional'ny Statistichesky Komitet Kyrgyzkoy Respubliki.

----------. 2007. "Mortality in Kyrgyzstan Since 1959: Real Patterns and Data Artifacts." *Espace-Populations-Sociétés* 1:113-126.

Guillot, M. and S. Lim. 2009. *Infant mortality in Kyrgyzstan before and after the break-up of the Soviet Union.* Paper presented at the 2009 meetings of the Population Association of America, Detroit MI.

Guillot, M. N. Gavrilova, and T. Pudrovska. Forthcoming. "Understanding the 'Russian Mortality Paradox in Central Asia: Evidence from Kyrgyzstan," M. Guillot and N. Gavrilova and T. Pudrovska. *Demography*.

Heath, D.B., ed. 1995. *International Handbook on alcohol and culture*. Westport, CT: Greenwood Press.

Leon D.A., L. Chenet, V.M. Shkolnikov, S. Zakharov, J. Shapiro, G. Rakhmanova, S. Vassin, and M. McKee. 1997. "Huge Variation in Russian Mortality Rates 1984-94: Artefact, Alcohol, or What?" *Lancet* 350(9075):383-388.

Leon D.A., V.M. Shkolnikov. 1998. "Social stress and the Russian mortality crisis." *JAMA* 11: 790-1.

Leon D.A., V.M. Shkolnikov, and M. McKee. 2009. "Alcohol and Russian mortality: a continuing crisis." *Addiction* 104: 1630-1636.

Leon D.A., L.Saburova, S. Tomkins, E. Andreev, N. Kiryanov, M. McKee and V.M. Shkolnikov. 2007. "Hazardous alcohol drinking and premature mortality in Russia: a population based case-control study." *The Lancet* 369:2001-09.

Mckee, M., V.M. Shkolnikov, and D.A. Leon. 2001. "Alcohol is Implicated in the Fluctuations in Cardiovascular Disease in Russia Since the 1980s." *Annals of Epidemiology* 11(1):1-6.

Shapiro, J. 1995. "The Russian Mortality crisis and its causes." Pp. 149-178 In *Russian Economic Reforms at risk*, edited by A. Aslund. London, England: Pinter.

Shkolnikov, V.M., G.A. Cornia, D.A. Leon and F. Meslé. 1998. "Causes of the Russian Mortality Crisis." *World Development* 26(11): 1995-2011.

Shkolnikov, V.M., M. McKee and D.A. Leon. 2001. "Changes in life expectancy in Russia in the mid-1990s." *The Lancet* 357(9260):917-921.

Stuckler, D., L. King and M. McKee. 2009. "Mass privatization and the post-communist mortality crisis: a cross-national analysis." *The Lancet* 373:399-407.

World Bank. 2009. *World Development Indicators 2008*. Washington, DC: World Bank.

Zaridze D., D. Maximovitch, A. Lazarev, V. Igitov, A. Boroda, J. Boreham, P. Boyle, R. Peto and P. Boffetta. 2009a. "Alcohol poisoning is a main determinant of recent mortality trends in Russia: evidence from a detailed analysis of mortality statistics and autopsies." *International Journal of Epidemiology* 38:143-153.

Zaridze, D., P. Brennan, J. Boreham, A. Boroda, R. Karpov, A. Lazarev, I. Konobeevskaya, V. Igitov, T. Terechova, P. Boffetta, R. Peto. 2009b. "Alcohol and cause-specific mortality in Russia: a retrospective case-control study of 48 557 adult deaths." *The Lancet* 373:2201-14.

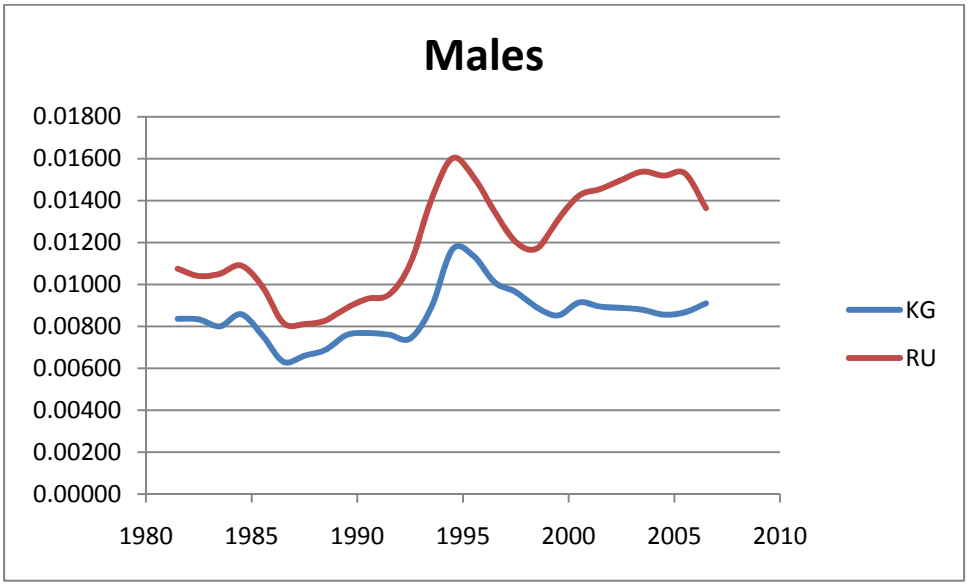
Table 1: Codes used for the calculation of cause-specific mortality in Kyrgyzstan

Cause of death	1981-1984	1985-1988	1989-1995	1996	1997-1998	1999	2000-06
All Causes	1-185	1-175	1-175, 206	1-97, 100-175, 196-206	1-97, 100-175, 196-208	1-97, 100-175, 196-209	A00-G99, H60-H95, I00-R00, V01-Y98 (Classes 1-18, 20)
Infectious and Parasitic Disease	1-44		1-44, 206				A00-B99 (Class 1)
Neoplasms	45-67						C00-D48 (Class 2)
Diseases of the Circulatory System	84-102			84-97, 100-102, 196-205			I00-I99 (Class 9)
Diseases of the Respiratory System	103-114						J00-J99 (Class 10)
Diseases of the Digestive System	115-127						K00-K93 (Class 11)
External Causes	160-185	160-175					V01-Y98 (Class 20)
Other Causes	68-83, 128-159				68-83, 128-159, 207-208		D50-D89, E00-E90, F00-F99, G00-G99, H00-H59, H60-H95, L00-L99, M00-M99, N00-N99, O00-O99, P00-P96, Q00-Q99, R00-R99 (Classes 3-8, 12-18)
Strongly alcohol-related causes	45-46, 52; 9-13, 43; 103-107, 110-114; 30, 122-123; 126; 92-97; 158-159; 73, 75, 160-185	45-46, 52; 9-13, 43; 103-107, 110-114; 30, 122-123; 126; 92-97; 158-159; 73, 75, 160-175					n/a

Table 2: Codes used for the calculation of cause-specific mortality in Russia

Cause of death	**1981-1987**	**1988-1998**	**1999-2006**
All Causes	1-159, 186-195	1-159, 186-195	1-238
Infectious and Parasitic Disease	1-44	1-44,206	1-55
Neoplasms	45-67	45-67	56-89
Diseases of the Circulatory System	84-102	84-102	115-147
Diseases of the Respiratory System	103-114	103-114	148-164
Diseases of the Digestive System	115-127	115-127	165-179
External Causes	186-195	186-195	229-238
Other Causes	68-83, 128-159	68-83, 128-159	90-114, 180-228
Strongly alcohol-related causes	45-46, 52; 9-13, 43; 103-107, 110-114; 30, 122-123; 126; 92-97; 158-159; 73, 75, 186-195	45-46, 52; 9-13, 43; 103-107, 110-114; 30, 122-123; 126; 92-97; 158-159; 73, 75, 186-195	56-57,65; 9-15, 54; 148, 150-155,160-164; 41-43,173-174; 178; 125-132; 226-228; 97-98, 229-238

Figure 1: age-standardized mortality rate, ${}_{40}M_{20}^{S}$, Kyrgyzstan and Russia, 1981-2006



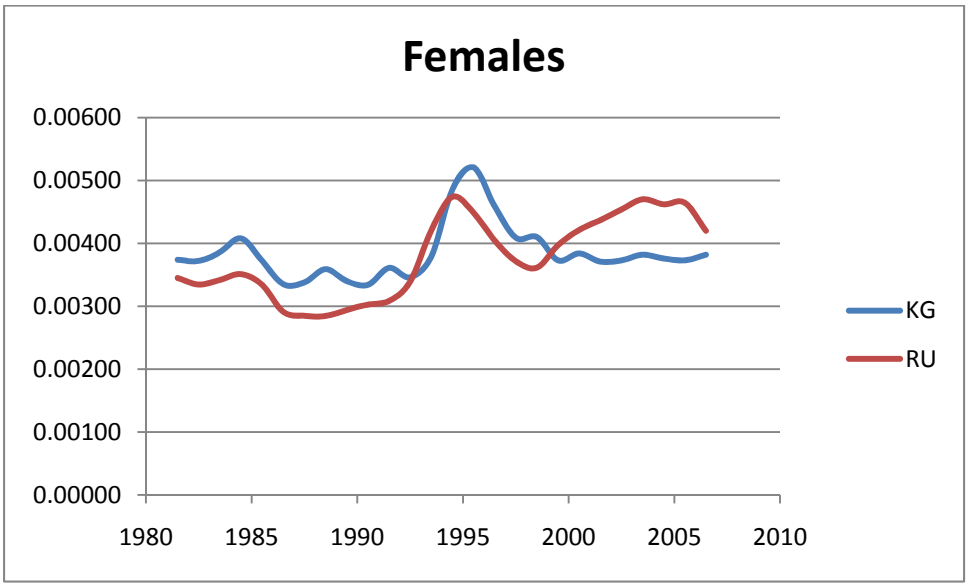
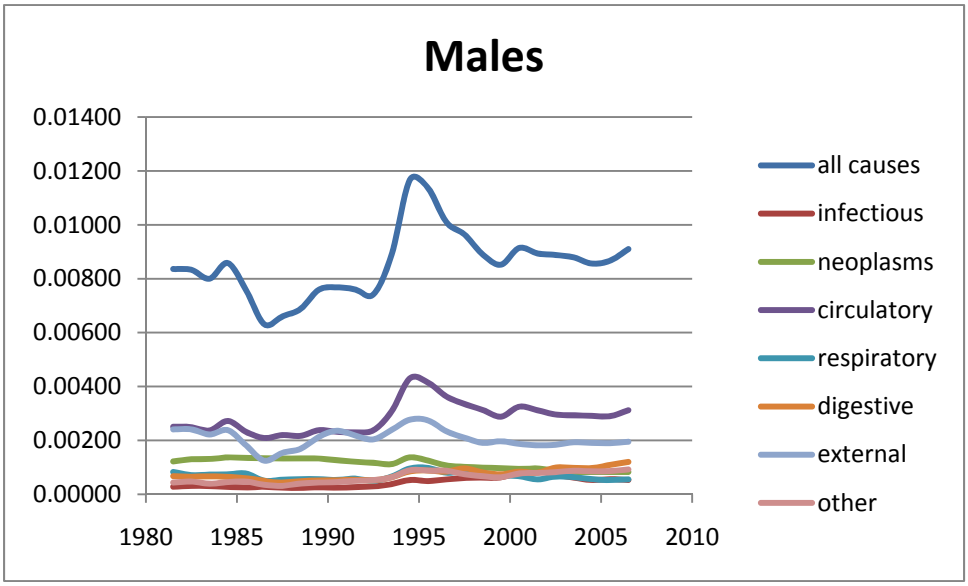


Figure 2: Age-standardized mortality rate, ${}_{40}M_{20}^{S}$, Kyrgyzstan, 1981-2006, all causes and 7 broad causes.



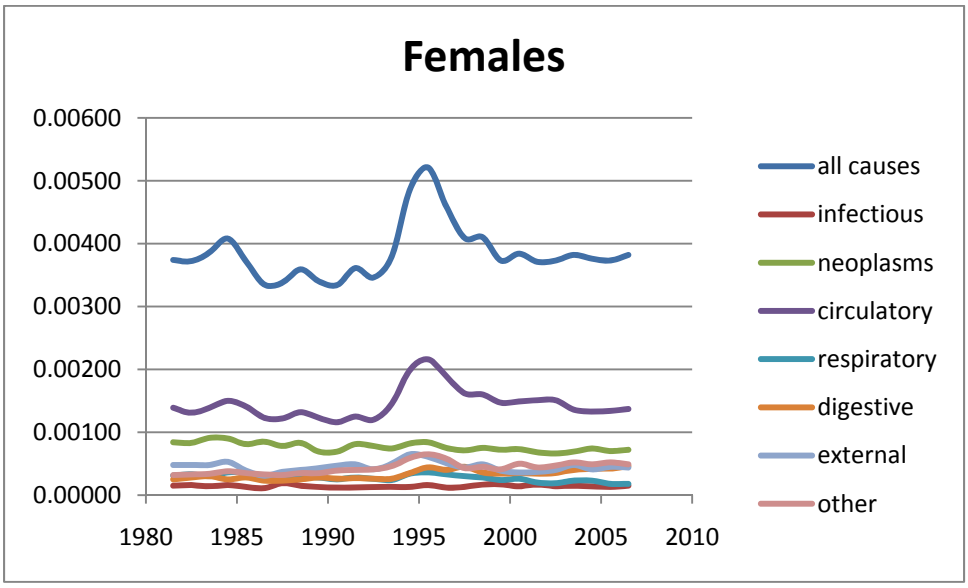
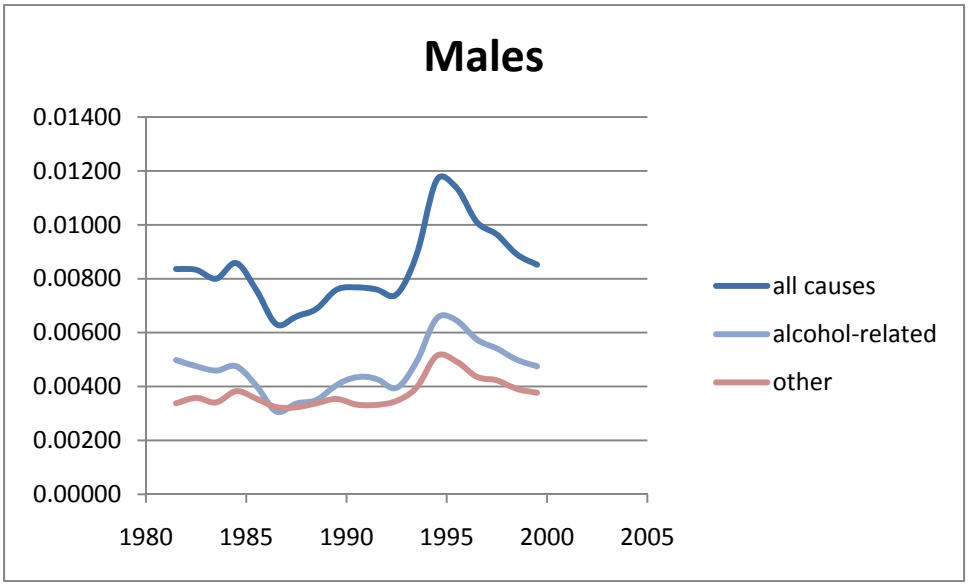


Figure 3: Age-standardized mortality rate, ${}_{40}M_{20}^{S}$, Kyrgyzstan, 1981-2006, all causes and strongly alcohol-related causes.



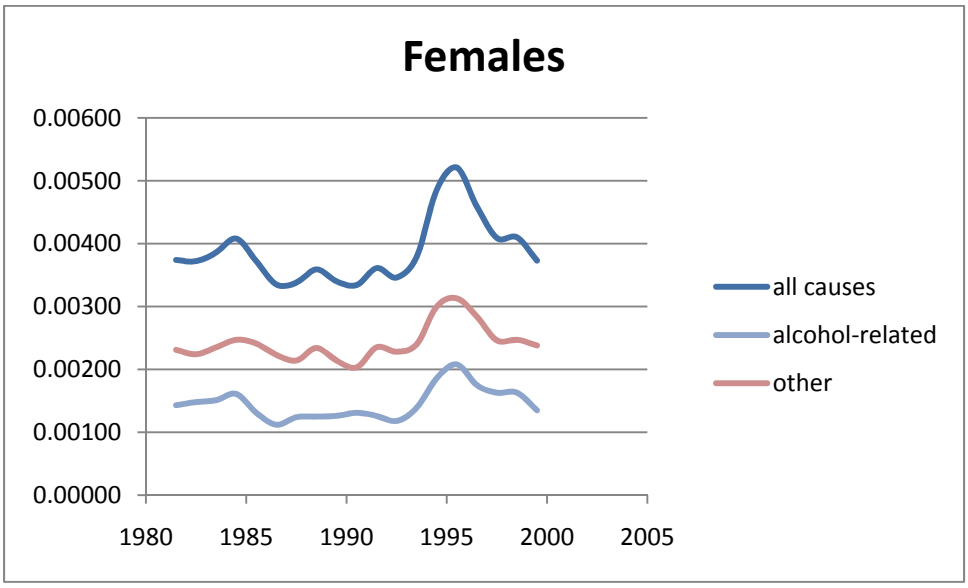
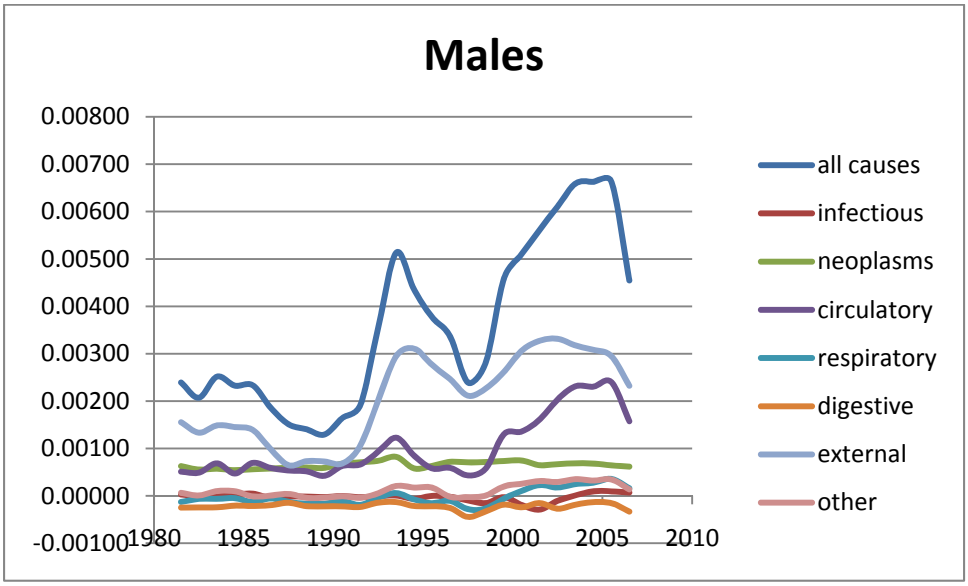


Figure 4: ${}_{40}M_{20}^{S}$(Russia) – ${}_{40}M_{20}^{S}$(Kyrgyzstan), 1981-2006, all causes and 7 broad causes.



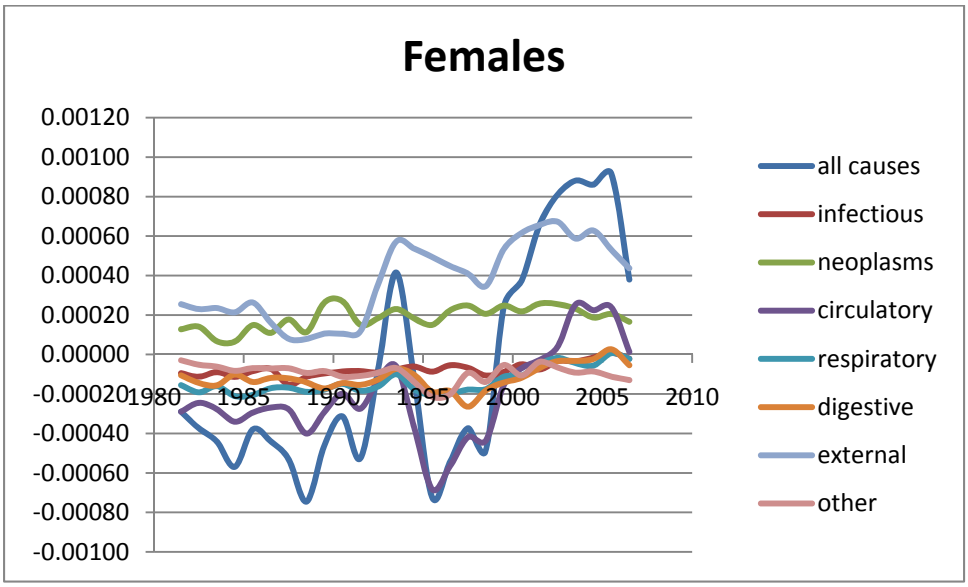


Figure 5: ${}_{40}M_{20}^{S}$(Russia) – ${}_{40}M_{20}^{S}$(Kyrgyzstan), 1989-1999, all causes and strongly alcohol-related causes.