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# Mortality in Kyrgyzstan since 1958: Real Patterns and Data Artifacts

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## INTRODUCTION

The former Soviet Republic of Kyrgyzstan has experienced considerable economic and social change during the second half of the twentieth century. In a few decades, this republic has experienced rapid economic development and urbanization, and has achieved universal coverage of basic education and health care [World Bank, 1996].

Kyrgyzstan became independent in 1991, following the break-up of the Soviet Union. This led to rapid transformations of the country's political and economic systems, and coincided with an abrupt and severe economic crisis. In 1995, Kyrgyzstan's real gross domestic product was only 50.6% of its 1990 value, and so far Kyrgyzstan has not recovered its pre-independence levels [Kudabaev, 2004]. With a gross national income per capita of 440 US dollars in 2005, Kyrgyzstan is the 28<sup>th</sup> poorest country in the world [World Bank, 2006]. The country has also experienced significant increases in economic inequality since 1991, resulting in growing proportions of the population living

below poverty [World Bank, 2000]. In 2001, 48% of the population was below the national poverty line [World Bank, 2006].

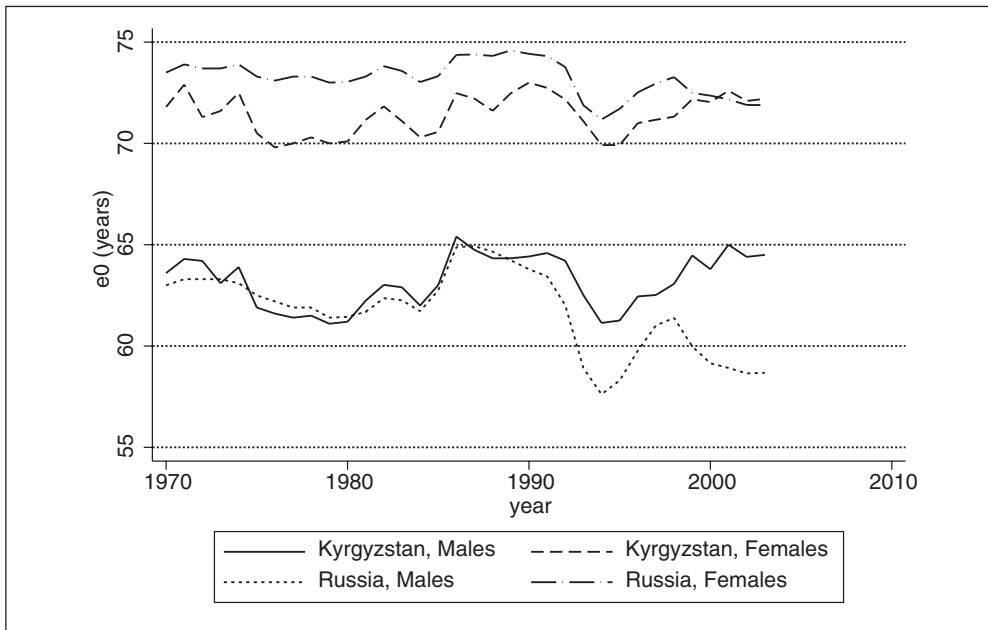
Among the five former Soviet republics of Central Asia (which include Kazakhstan, Tajikistan, Turkmenistan and Uzbekistan), Kyrgyzstan is the next to last in area (198,500 km<sup>2</sup>) and in population (5.2 million inhabitants in 2006, according to the National Statistical Committee of the Kyrgyz Republic). The population of Kyrgyzstan is composed of many ethnic groups. In 1999, ethnic Kyrgyz represented 64.9% of the population, followed by ethnic Uzbeks (13.8%) and ethnic Russians (12.5%). These ethnic groups differ in many respects, including language and religion. The main religion of the country, prevalent among ethnic Kyrgyz and Uzbeks, is Sunni Islam.

Little is known about the mortality trends that have accompanied the country's socio-economic changes of the last few decades. The official data, shown in Figure 1 together with official data for Russia, indicate that

life expectancy at birth ( $e_0$ ) in Kyrgyzstan was slowly worsening in the 1970s. This deterioration was then suddenly interrupted by significant improvements in the late 1980s, especially for males. This improvement, which occurred simultaneously in various Soviet Republics, has been attributed to Gorbachev's anti-alcohol campaign

[Shkolnikov, Cornia, Leon and Meslé, 1998]. Then, in the years following the break-up of the Soviet Union, abrupt declines in life expectancy occurred. Although life expectancy has been increasing again since 1995, official  $e_0$  estimates for 2003 indicate that pre-independence levels have barely been recovered.

Figure 1: Reported life expectancy at birth ( $e_0$ ) by sex, Kyrgyzstan and Russia, 1970-2003



Source: European Health for all Database <<http://www.euro.who.int/hfadb>>

Reported mortality trends in Kyrgyzstan require further scrutiny, because they present some singularities for which previous research has been unable to provide conclusive explanations. A first peculiarity is that reported mortality levels, especially male mortality levels, are relatively low considering the level of socio-economic development of the area. For example, during the late Soviet period, male life expectancy at birth was equivalent to levels recorded in Russia (Figure 1), in spite of the fact that Kyrgyzstan was a much poorer republic. Also, the declines in life expectancy recorded in Kyrgyzstan in 1991-95 were smaller than those recorded in Russia. For males, life expectancy at birth in Kyrgyzstan has become higher than in Russia, in spite of increasing disparities in standards of living between the two countries.

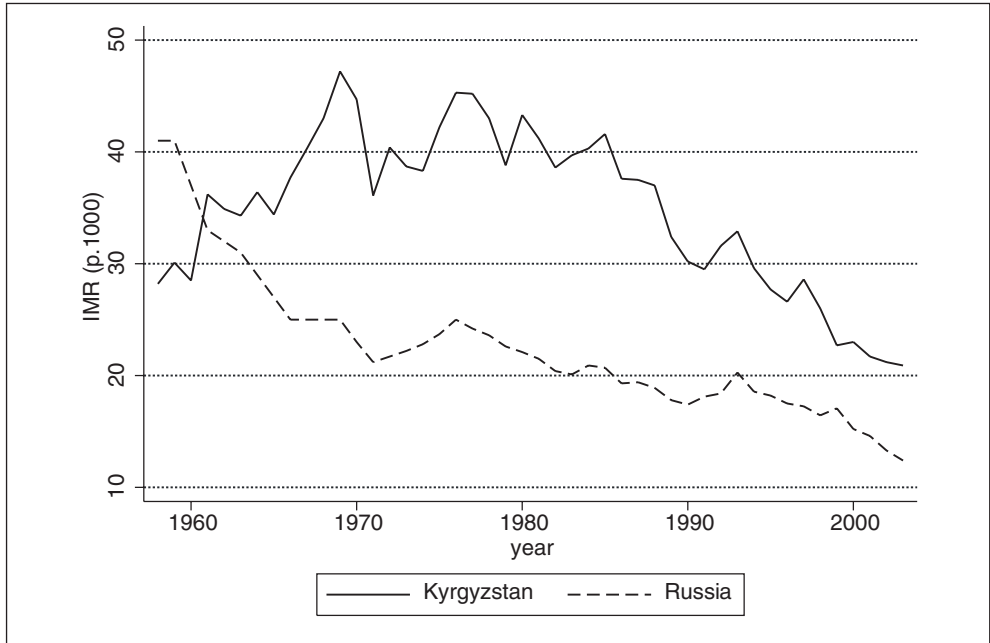
Relative levels of urban and rural mortality are another peculiar feature of mortality in Kyrgyzstan. Today, around the world, mortality levels, and particularly infant mortality levels, are commonly higher in rural areas [United Nations, 1982], and this is the case in most former Soviet Republics [Kingkade and Arriaga, 1997]. In Kyrgyzstan, however, reported mortality levels have been lower in rural areas in recent years.

Another source of puzzle pertains to levels and trends in infant mortality. In Kyrgyzstan, large increases in infant mortality were recorded in the 1960s and early 1970s (Figure 2). Such increases are not unique to Kyrgyzstan, as other parts of the Soviet Union also experienced increases during the period. Nonetheless, the increases recorded in Kyrgyzstan (and in other Central Asian Republics)

started much earlier and were much larger in scale than in other Soviet Republics, such as Russia. These increases have then been followed by steady declines. According to the reported information, Kyrgyzstan did not

experience significant increases in infant mortality after independence. The reliability of both Soviet and post-Soviet trends in infant mortality has been questioned [Anderson and Silver, 1986; Becker *et al.*, 1998].

Figure 2: Reported infant mortality rate (IMR), Kyrgyzstan and Russia, 1958-2003)



Source: European Health for all Database <<http://www.euro.who.int/hfadb>>

Reported ethnic differentials in mortality in Kyrgyzstan also present singularities. Using reported mortality rates, Dobrovolskaya (1990) estimated that in Kyrgyzstan in 1978-79, ethnic Kyrgyz enjoyed a higher life expectancy at age five than ethnic Russians. This is surprising because it is well established that, during the Soviet period, ethnic Russians had privileged positions in the social hierarchy of Central Asian societies [Kahn, 1993; Poujol, 1995]. Thus the higher socio-economic status (SES) of ethnic Russians, relative to ethnic Kyrgyz, does not appear to translate into better survival, as one would expect from the usual relationship between SES and mortality.

The peculiarity of these patterns leads one to wonder if they are real and can be explained by a distinct epidemiological profile for Central Asia [Murray and Bobadilla, 1997], or if they are due to data quality problems which may affect reported mortality

levels and trends in the country [Anderson and Silver, 1997; Anderson, Silver and Liu, 1989]. The aim of this paper is to address this question by taking advantage of unpublished tabulations of births, deaths and population obtained from the National Statistical Committee (NSC) of the Kyrgyz Republic. These tabulations pertain to lower levels of aggregation (by age, sex, urban/rural residence and ethnicity) than published indexes. Mortality indicators are calculated since 1958 to allow a long-term view on mortality change.

In this paper, all calculations are based on the raw data. The strategy is to distinguish real patterns from spurious ones on the basis of internal comparisons of uncorrected mortality indicators at low levels of aggregation. The analysis of these unpublished data provides a firmer basis for understanding mortality patterns in the area than previous research on the topic.

## INFANT MORTALITY, 1958-2003

Levels and trends in infant mortality in Republics of the former Soviet Union have been much discussed in the demographic literature. There is consensus that the reported levels are too low, and that the underestimation is particularly severe in Central Asian Republics [Aleshina and Redmond, 2003]. The underestimation of infant mortality, which existed throughout the Soviet period, appeared clearly when Demographic and Health Surveys (DHS) were conducted in Central Asia, producing precise, independent estimates of infant and child mortality. In Kyrgyzstan, for example, DHS has estimated an average infant mortality rate (IMR) of 66.2 per thousand for the period 1988-97 [Macro International, 1998, p. 97]. By contrast, the official mortality rate for the same period was 30.8 per thousand.

There are several reasons for the underestimation of infant mortality in Kyrgyzstan. The first reason stems from differences between the Soviet and the World Health Organization's (WHO) definitions of a live birth and a stillbirth [Anderson and Silver, 1986]. Some births that would be counted as live births under international standards are counted as stillbirths under Soviet standards. These differences in definition produce a downward bias in the infant mortality rate calculated in Soviet Republics. It is estimated that infant mortality rates in Soviet Republics would be higher by 20-25 percent if they were calculated according to international standards [Anderson and Silver, 1986]. After the breakup of the Soviet Union, newly-independent Republics progressively switched to the international standard. In Kyrgyzstan, the change occurred in 2004. (Recent estimates from the NSC indicate that this change of definition is generating a substantial increase in the reported IMR, from 20.9 per 1000 in 2003 to 29.7 per 1000 in 2005.)

Aleshina and Redmond (2003) list additional sources of bias which make reported rates in the area too low. These sources of bias include: the misreporting of infant deaths as stillbirths, even according to the Soviet definition; the misreporting of infant deaths as deaths occurring at age one or above; and the underregistration of infant deaths by parents.

Although there is consensus that the reported IMRs are too low, there is much less certainty about the extent to which changes over time in reported rates are informative about the actual worsening or improvement in infant mortality. If the magnitude of the underestimation was constant over time, trends in reported rates would still be informative. However, it is possible that the magnitude of the biases have changed over time, and that trends, in addition to levels, are misleading. Two periods of changes in infant mortality have been debated in the literature. The first period is the pre-1975 period, during which the IMR increased in many Soviet Republics, including Kyrgyzstan. The second period is the post-1991 period, during which the infant mortality rate has declined steadily in Kyrgyzstan, except for a short increase in 1991-93. These two periods are examined successively.

### 1958-75 Period

As shown in Figure 2, the reported national-level IMR increased between 1958 and 1975. Similar IMR increases were found in the other Central Asian Republics, contributing significantly to the increase recorded at the Soviet level in the early 1970s. IMR increases in Central Asian Republics are puzzling, because they occurred at a time of large improvements in education and standards of living, and of greater availability of medical services [Velkoff and Miller, 1995]. These trends raised many concerns among both Soviet and Western researchers. Some scientists saw in this unusual peace-time deterioration of IMR a worrisome sign of economic and social decline [Davis and Feshbach, 1980; Eberstadt, 1981], whereas others emphasized data quality problems which could entirely explain the increase [Jones and Grupp, 1983; Anderson and Silver, 1986; Andreev and Ksenofontova, 1991]. Researchers supporting the improved-coverage scenario argued that reported levels of IMR in Central Asia in the 1950s were implausibly low. Indeed, before 1960, the reported IMR in Kyrgyzstan was lower than in Russia (Figure 2), which is dubious since Kyrgyzstan was throughout the period one of the poorest and least developed Soviet Republics

[Velkoff and Miller, 1995]. The implausibility of the IMR increases in Central Asia is also supported by the fact that there were no signs of major breakdown in the health care system in the region during that period [Jones and Grupp, 1983].

In order to examine this question, I calculated the infant mortality rate by urban/rural residence and ethnicity. I show here results for two broad ethnic groups: “Central Asians” (Kyrgyz, Uzbeks, Kazakhs, Tajiks and Turkmens), and “Slavs” (Russians, Ukrainians and Byelorussians). This merging of ethnic groups is justified by the fact that ethnic groups within each broad group exhibit similar infant mortality patterns. Moreover, the merging of ethnic groups that are culturally similar allows one to limit biases arising from the potential mismatch of ethnicity in birth and death certificates. Indeed, such mismatch is more likely to occur across ethnic groups that are culturally similar and where intermarriage is more common than across groups that are culturally more distant and where intermarriage is less common. These two broad ethnic groups cover between 90 and 95% of annual births during the period of analysis. The merging of ethnic groups also allows one to limit the amount of random fluctuation. (Indeed, absolute numbers of annual ethnic-specific infant deaths are small in a country like Kyrgyzstan, especially when considering urban and rural areas separately. In spite of this merging, important annual fluctuations remain.)

The estimation of infant mortality by urban/rural residence and by ethnicity (Figure 3) reveals that the much debated increase in infant mortality observed at the national level is entirely explained by an increase recorded among Central Asians living in rural areas. The low levels of infant mortality recorded for this population group around 1960, and the subsequent increase until 1975, are implausible for a number of reasons. First, the levels of IMR among rural Central Asians around 1960 are lower than among urban Central Asians. This is unlikely because, as said earlier, infant mortality rates are commonly higher in rural areas than in urban areas. Among Slavs, the urban/rural differential is in the expected direction. Second, levels of IMR among rural Central Asians around 1960 are lower than among rural Slavs (Figure 3b). This is also implau-

sible, because one would expect the Slavs, with their higher SES, to experience lower levels of infant mortality than the Central Asians. In fact, when rates by ethnicity are estimated for urban areas only (Figure 3a), the differential is in the expected direction. Third, the rural Central Asian subgroup is the only group that experiences increases in IMR during the period. Slavs in both urban and rural areas, and Central Asians in urban areas experience a continuous decrease. This is unlikely, because if there was indeed a deterioration of health services in Kyrgyzstan, it is difficult to explain why it would have affected the rural Central Asians only.

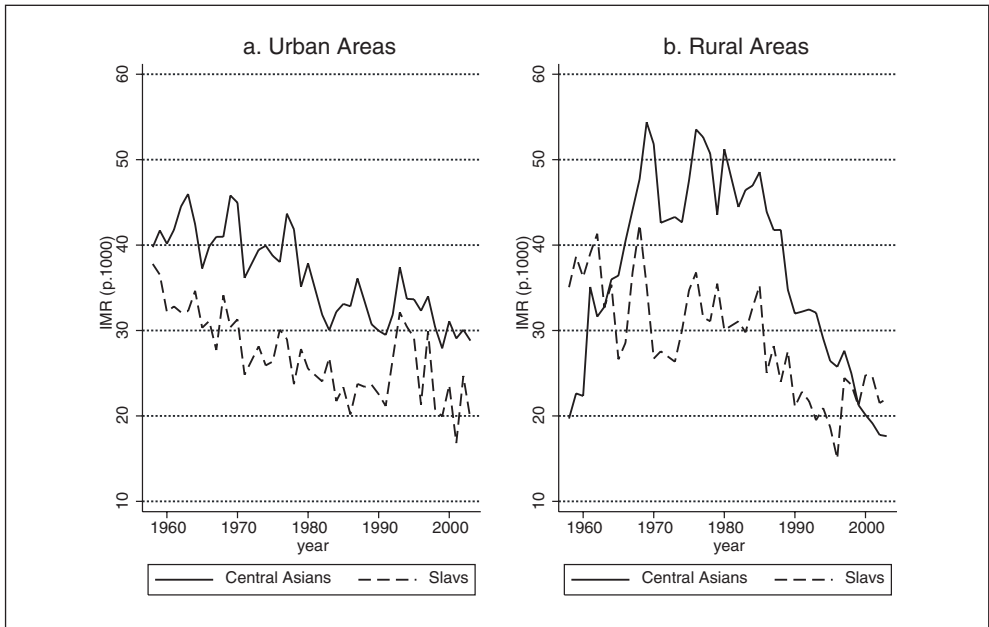
The implausibility of the trend among rural Central Asians is reinforced by the fact this is the population subgroup that is most likely to be affected by data quality problems. We expect data quality to be lower in rural areas (due to larger distances from registration offices and less incentive to register), and among Central Asians (due to their lower SES).

These patterns strongly support the conclusion that there was vast underreporting of infant mortality in Kyrgyzstan in the late 1950s and early 1960s, and that the increase observed at the national level between 1958 and 1975 is explained by large improvements in the coverage of vital registration during the period. A more plausible trend for the 1958-75 period is a steady decline in IMR in both urban and rural areas, and among both Slavs and Central Asians.

### **Post-Soviet period (1991-2003)**

An interesting pattern in Figure 2 is that there is no sustained increase in the reported IMR in Kyrgyzstan after 1991. There is a small increase between 1991-93, but the increase is short term and followed by substantial declines. A similar pattern was observed in Russia (though at lower levels), which led researchers to conclude that, in that country, the health crisis may not have been directly linked to a collapse of the health care system [Anderson, 2002]. Indeed, a deterioration of health facilities would have generated increases in communicable diseases, for which infants are particularly vulnerable, and would have produced IMR increases. However, in the case of Kyrgyzstan, another explanation has been proposed, i.e., that the decreases are likely to be artifactual, due to possible

Figure 3 : Infant mortality rate (IMR) by urban/rural residence and ethnicity, Kyrgyzstan, 1958-2003



Source: Author's calculations based on raw registration data

declines in the coverage of vital registration during the years following the collapse of the Soviet Union [Becker *et al.*, 1998].

Here also, the breakdown by urban/rural residence and by ethnicity allows one to assess the reliability of these IMR decreases (Figure 3). Like in the case of the 1958-75 increase, the post-Soviet decrease in infant mortality observed at the national level is entirely explained by a decrease recorded among rural Central Asians. This decrease is unlikely for the same reasons as the ones specified earlier about the 1958-75 increase. First, the decrease among rural Central Asians generates an implausible urban/rural cross-over. Indeed, starting in 1993, the IMR among rural Central Asians is lower than among their urban counterparts. This produces lower relative infant mortality in rural areas at the national level, which is implausible since the DHS estimates that infant mortality in rural areas is about 30% higher than in urban areas during the period 1988-1997. Second, the decrease among rural Central Asians generates an implausible ethnic differential. Starting in 2000, the reported IMR among rural Central Asians is lower than among rural Slavs (Figure 3b). In urban areas, such a cross-over does not occur, as the

IMR stays consistently higher among Central Asians (Figure 3a). This decrease among rural Central Asians produces a narrowing ethnic differential at the national level, with a Central Asian/Slavic IMR ratio declining from 1.7 in 1988 to about 1.0 in 2003. Here also, this reported ethnic differential is implausible, since the DHS estimates that the IMR among ethnic Kyrgyz and Uzbeks is about 2.5 times higher than among ethnic Russians for the period 1988-97. Third, rural Central Asians are the only group experiencing sustained decreases in IMR during the post-Soviet period. Slavs in both urban and rural areas, and Central Asians in urban areas experience some increase during the 1990s, and then a return to the levels recorded during the late Soviet period. Since the late 1990s, rates for these groups appear more or less constant. (In 1991-96, the IMR among rural Slavs declined to levels below those recorded among urban Slavs. While this urban/rural cross-over is implausible, it is difficult to derive strong conclusions from this pattern, because it is short in duration and based on only a small number of infant deaths (about 50 annual infant deaths). Indeed, very few Slavs have remained in rural areas since 1991.)

Further doubts about the veracity of the trends among rural Central Asians arise from the fact that, if there was any deterioration in the coverage of vital registration during the post-Soviet period, rural Central Asians would have been the most likely subgroup to be affected.

These patterns support the conclusion that the post-Soviet decrease in IMR at the national level is spurious, due to a possible decline in the coverage of vital registration

among rural Central Asians during post-soviet period. A more plausible trend is the one observed among the other subgroups: a short-term increase during the years following the collapse of the Soviet Union, followed by return to late 1980s levels, at which the IMR has remained more or less constant since late 1990s. This more plausible trend implies that the break-up of the Soviet Union would have put a halt to several decades of declines in infant mortality in Kyrgyzstan.

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## MORTALITY AT ADULT AGES, 1959-1999

Adult mortality is studied separately in this paper, for a number of reasons. First, adult mortality is affected by factors that are different from those affecting infant mortality, and thus is likely to have a distinct dynamics. Second, studies have stressed the importance of adult mortality in explaining fluctuations in life expectancy in former Soviet Republics. It is likely that adult mortality played a similar importance in Kyrgyzstan. Third, reported adult mortality in Kyrgyzstan presents some surprising patterns that require further scrutiny.

### Excess mortality among adult Russian males throughout the period

One of the most striking characteristics of reported mortality in Kyrgyzstan is that mortality at adult ages has appeared higher among ethnic Russians than among ethnic Kyrgyz. For example, the reported life expectancy at age 5 ( $e_5$ ) in 1978-79 among Russian males living in Kyrgyzstan is 58.6 years, compared to 63.3 years among Kyrgyz males [Dobrovolskaya, 1990]. Russian females also have lower reported life expectancy at age 5, though the ethnic differential is not as large as for males (68.7 years for Russian females in 1978-79, compared to 69.5 years for Kyrgyz females). Similar differentials between ethnic Russians and Central Asian ethnic groups have been observed in other Central Asian Republics [Dobrovolskaya, 1990].

This ethnic differential is surprising because, as said earlier, ethnic Russians living in Central Asia had higher socio-economic status than titular ethnic groups during the

Soviet period [Kahn, 1993; Poujol, 1995]. This advantage continued after the break-up of the Soviet Union, at least until 1993, date at which the World Bank conducted the Kyrgyzstan Multipurpose Poverty Survey (KMPS). Indeed, data from the 1993 KMPS (Table 1) show that ethnic Russians (and other Slavic ethnic groups) are less likely to live in poverty or high-poverty than ethnic Kyrgyz (or Uzbeks) [Ackland and Falkingham, 1997]. In 1993, 28.6% of ethnic Russians are poor, while 52.7% of ethnic Kyrgyz are poor. Lower poverty levels among ethnic Russians are not entirely an artifact of their greater propensity to live in urban areas, since these differences also hold for urban and rural areas separately.

In populations around the world, subgroups with higher socio-economic status tend to have lower mortality. The fact that Russian males in Kyrgyzstan have experienced higher adult mortality levels in spite of their higher socio-economic status can be termed the "Russian mortality paradox". (In the US, the term "Hispanic mortality paradox" is used to refer to the lower mortality of Hispanics, compared to non-Hispanics whites, in spite of their lower socio-economic status [Palloni and Arias, 2004].) The Russian mortality paradox has been attributed to possibly lower levels of alcohol consumption and lower levels of industrial employment among the indigenous groups [Darskii and Andreev, 1991]. It has also been attributed in part to the tradition whereby the youngest son remains with his parents to take care of them in old age [Sinelnikov, 1988]. Others, however, have emphasized the role

**Table 1: Proportion of individuals that are poor or very poor, by ethnicity of household head and urban/rural residence (%), Kyrgyzstan, 1993**

	Urban areas			Rural Areas			Urban and Rural Areas		
	Poor	Very Poor	All	Poor	Very Poor	All	Poor	Very Poor	All
Kyrgyz	31.4	12.1	100.0	58.1	31.9	100.0	52.7	27.8	100.0
Russian	26.0	6.4	100.0	34.0	13.5	100.0	28.6	8.7	100.0
Other Slavic	30.5	8.4	100.0	44.7	17.5	100.0	35.9	11.9	100.0
Uzbek	38.1	13.1	100.0	40.6	19.8	100.0	39.4	16.6	100.0
All Ethnic groups	30.8	10.1	100.0	52.1	26.8	100.0	45.0	21.2	100.0

Source: Ackland and Falkingham, 1997, p.90

Note: The poverty line is calculated using an absolute poverty approach, based on a minimum subsistence basket. Households are assigned to poverty categories on the basis of their expenditure. Households fall in the “very poor” category if their expenditure is below half of their household specific poverty line. For more details, see Ackland and Falkingham (1997), p. 85.

of underregistration of deaths among indigenous ethnic groups [Dobrovolskaya, 1990]. (A less complete coverage of ethnic Russians in censuses, relative to ethnic Kyrgyz, could also produce the observed mortality differentials. However, this source of bias is not typically discussed among the possible explanations, because death registration coverage is considered more serious a problem than census coverage for the estimation of mortality in former Soviet Republics, at least in the adult age range. Also, lower census coverage among ethnic Russians is less plausible an explanation than lower death registration coverage among ethnic Kyrgyz.)

The analysis of more detailed mortality data allows one to examine whether the reported ethnic differentials in mortality are real or due to bad data. In order to minimize data quality problems, I calculated an adult mortality measure that does not include older ages. Indeed, mortality data at older ages tend to be of lesser quality, because of both of undercount and age misreporting. I chose  ${}_{45}q_{15}$  (i.e., the period life table probability that an individual aged 15 will die before age 60), which is a common summary index of adult mortality.

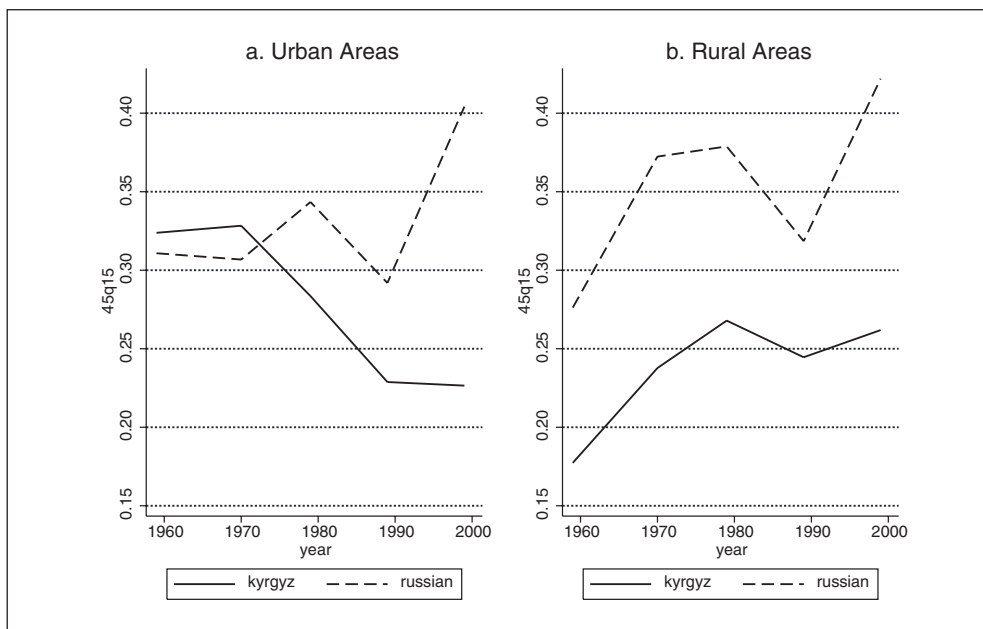
Unlike infant mortality, annual estimates of adult mortality by ethnicity are not possible in Kyrgyzstan, because ethnic-specific age distributions of the population have been tabulated only during census years. Nonetheless, combining these population age distri-

butions with age distributions of deaths for the two years surrounding the census date, I was able to calculate life tables by ethnicity and urban/rural residence that pertain to two-year periods, centered at each census date (1959, 1970, 1979, 1989 and 1999). This merging of deaths from two adjacent calendar years conveniently reduces the extent of random variation in the resulting life table estimates. (Soviet censuses were conducted in January, which conveniently falls in the middle of two calendar years. The 1999 census was conducted in March, which is not exactly in the middle of the 1998-99 period, but the two-month difference is not likely to produce major biases.) I present here estimates of  ${}_{45}q_{15}$  for ethnic Kyrgyz and ethnic Russians only, since these are the only two ethnic groups for which it was possible to estimate life tables for every census since 1959. These estimates are shown in Figure 4 for males, and Figure 5 for females.

Figure 4 shows that, for males, the excess adult mortality of ethnic Russians is ubiquitous. It is present in both urban and rural areas. It is also present during most of the period of analysis. Except in 1959 and 1970 in urban areas, where  ${}_{45}q_{15}$  is slightly higher among ethnic Kyrgyz, the differential is established during the Soviet period, and continues after the break-up of the Soviet Union. Of course, the data on Figure 4 should be regarded with caution, especially in rural

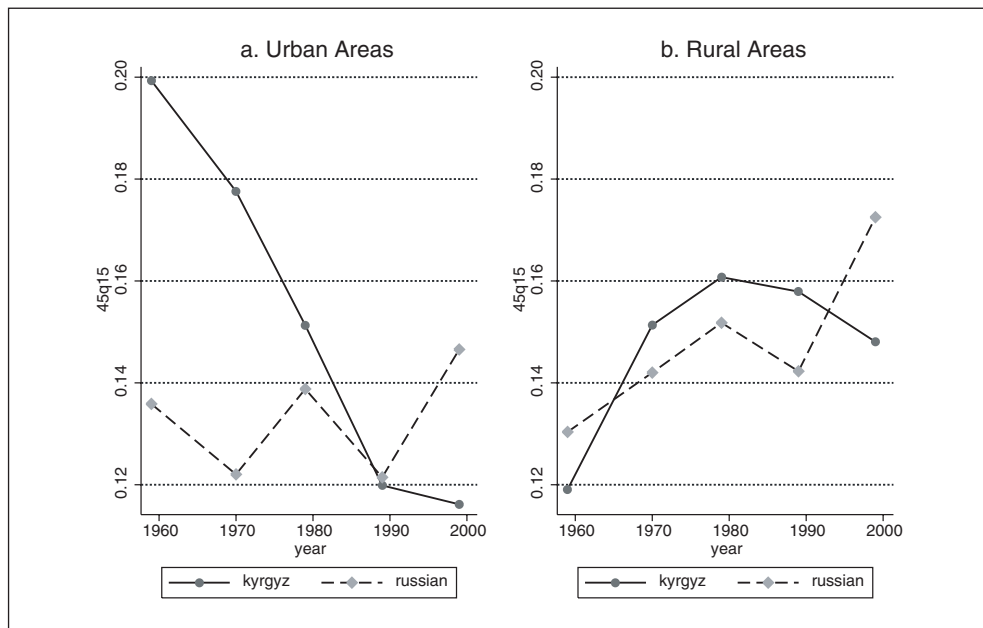


Figure 4: Probability of dying between ages 15 and 60 ( ${}_{45}q_{15}$ ) by urban/rural residence and ethnicity, Kyrgyzstan, Males, 1959-1999



Source: Author's calculations based on raw vital registration data

Figure 5: Probability of dying between ages 15 and 60 ( ${}_{45}q_{15}$ ) by urban/rural residence and ethnicity, Kyrgyzstan, Females, 1959-1999



Source: Author's calculations based on raw vital registration data

areas at the beginning of the period. Levels of  ${}_{45}q_{15}$  in rural areas in 1959 for Russian males and in 1959-1979 for Kyrgyz males are lower than in urban areas, which is implausible. Nonetheless, the pervasiveness of higher adult mortality levels among Russian males, not only in rural areas, but also in urban areas where the data can be regarded with more confidence, supports the hypothesis that the mortality disadvantage of adult Russian males is real.

This hypothesis is also supported by data on health behaviors among ethnic groups in Kyrgyzstan. Indeed, if the excess mortality of adult Russian males is real, we should expect some of the most important determinants of adult male mortality – cigarette smoking and alcohol consumption, in particular – to vary

greatly by ethnicity. Data on these health behaviors have been collected in the 1993 KMPS. These data show large ethnic differentials in cigarette and alcohol consumption (Table 2). The age-standardized mean number of cigarettes smoked per day is about twice as large among Russian males than among Kyrgyz males. The age-standardized mean number of alcoholic drinks per month is about 40-50% higher among ethnic Russians. Although levels of cigarette smoking and alcohol consumption tend to be higher in urban areas, the ethnic differentials do not vary much by urban/rural residence. Data by type of drink (not shown here) indicate that the most common alcoholic beverage is vodka. About 60% of drinkers report drinking vodka only, a proportion which does not vary by ethnicity.

**Table 2: Mean number of cigarettes per day (0-60) and alcoholic drinks per month (0-28), unstandardized and age-standardized, by ethnicity and residence, Kyrgyzstan, Males aged 15-59, 1993**

	Urban areas			Rural Areas			Urban and Rural Areas		
	Slavic	Kyrgyz	Uzbek	Slavic	Kyrgyz	Uzbek	Slavic	Kyrgyz	Uzbek
Number of cigarettes per day	8.27 (7.66)	4.48 (4.40)	5.47 (5.11)	7.77 (8.54)	3.81 (3.87)	4.45 (4.55)	8.10 (7.79)	3.96 (3.97)	4.92 (4.85)
Number of alcoholic drinks per month	2.59 (2.36)	1.80 (1.70)	1.00 (0.94)	1.85 (1.58)	1.24 (1.32)	0.45 (0.53)	2.34 (2.12)	1.36 (1.40)	0.70 (0.69)

Source: Author's calculations based on the 1993 Kyrgyzstan Multipurpose Poverty Survey (KMPS)

Note: n=2079. Age-standardized means are in parentheses.

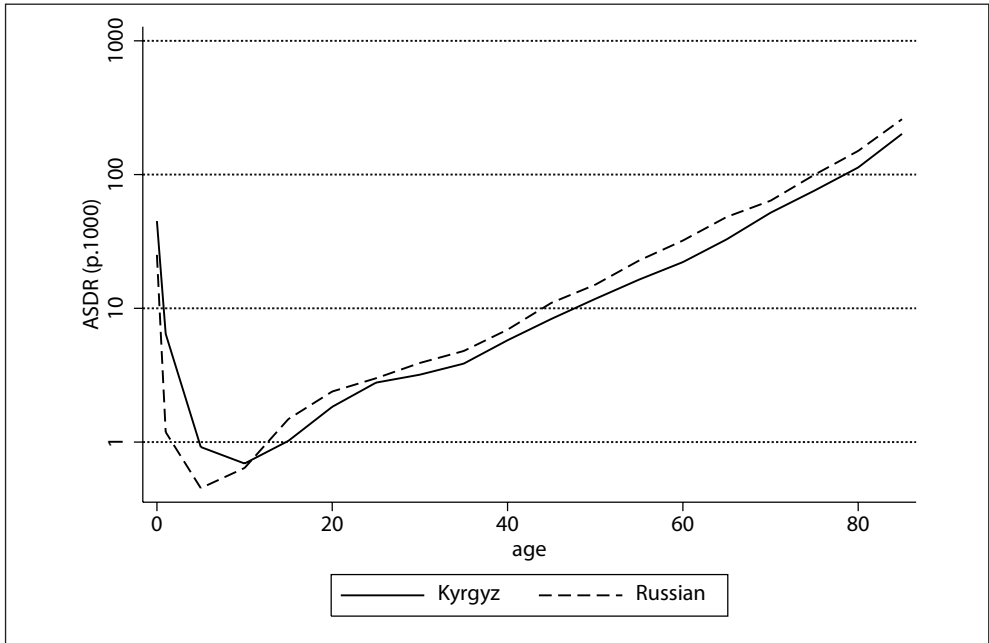
These results need to be interpreted with caution. Indeed, Muslim Kyrgyz may be more reluctant to declare real levels of alcohol consumption than Russians. Nonetheless, these reported data are consistent with overall higher mortality among Russian males throughout the period.

One can note here that the “Russian mortality paradox”, which we find among males throughout the period, is present at adult ages only. Ethnic differentials in infant mortality are in the expected direction, with a lower IMR among Russians. (The ethnic differential in IMR is at the advantage of the Kyrgyz in rural areas before 1963 and after 2000, but, as said earlier, I have strong doubts about the veracity of the rural data during these two time periods.) This points out the particular age-specific mortality profile of these two ethnic groups, shown in Figure 6

for 1989. According to these data, Russian males exhibit more favorable mortality at younger ages, consistently with their higher SES, but then lose their advantage later in life, perhaps in part because of higher levels of smoking and alcohol consumption among them. As a result, their life expectancy at birth (64.09 years) is similar to that of Kyrgyz males (64.77 years).

Russian females, unlike their male counterparts, do not exhibit excess mortality at adult ages during the Soviet period (Figure 5). (One exception is 1959 in rural areas. However, as for the case of males, the data from rural areas at the beginning of the period should be regarded with particular caution.) The “Russian mortality paradox” mentioned above appears to be prevalent among males only. The situation changes, however, during the post-Soviet period, as discussed in the next section.

Figure 6: Age-specific death rate (ASDR) by ethnivity, Kyrgyzstan, Males, 1989



Source : Author's calculations based on raw vital registration data

### Divergent paths for ethnic Kyrgyz and ethnic Russians since 1991

A puzzling pattern of mortality trends in Central Asian Republics is that decreases in life expectancy at birth have not been as severe as in Russia, as illustrated on Figure 1 for Kyrgyzstan. This is puzzling, because the economic crisis has been even more severe in Central Asian Republics than in Russia. (In 1990, the gross national income per capita in Russia was about 6.5 times greater than in Kyrgyzstan. In 2004, it was about 10 times greater [World Bank, 2006].)

Data quality problems are sometimes invoked as a possible explanation [Shkolnikov *et al.*, 1998]. Indeed, a decrease in the coverage of death registration would produce mortality trends that are more favorable than in reality. We saw earlier that a decrease in the coverage of vital events since 1991 was in fact a likely explanation for the recorded declines in infant mortality in Kyrgyzstan during the post-Soviet period. Thus one wonders whether recorded trends in adult mortality were also affected.

The calculation of  ${}_{45}q_{15}$  by ethnicity and urban/rural residence in Kyrgyzstan reveals that the mortality increases recorded at the

national level during the post-Soviet period are not equally experienced by the two main ethnic groups. Among males (Figure 4), while ethnic Russians experience a dramatic increase in  ${}_{45}q_{15}$  between 1989 and 1999, ethnic Kyrgyz experience levels of adult mortality in 1999 that are equivalent to those recorded in 1989 (with a slight increase in rural areas). As a result, the mortality disadvantage of adult Russian males, which was already large in 1989, becomes even larger by 1999. Russian females (Figure 5) also experience increases in  ${}_{45}q_{15}$  between 1989 and 1999, though not as dramatic as for Russian males. Nonetheless, these increases are large enough that, by 1999, adult Russian females lose the mortality advantage that they were experiencing during the Soviet period. The Russian mortality paradox, which prevailed among males only during the Soviet period, is found among both males and females in 1999.

While I can't completely rule out the possibility that the divergent trends between Kyrgyz and Russians are an artifact of the data, I believe that they are real for two reasons. First, these trends are based on  ${}_{45}q_{15}$ , a mortality indicator that does not involve the

ages at which underreporting and misreporting are most problematic (i.e., infant and older ages). Second, the divergence between Kyrgyz and Russians is ubiquitous. It is recorded among both males and females, and in both urban and rural areas. The existence of this pattern in urban areas, in particular, where we expect the data to be of higher quality, supports the actuality of the divergence.

One potential explanation for the divergent mortality trends among adult Kyrgyz and Russians is selective migration. Many ethnic Russians left Kyrgyzstan following the break-up of the Soviet Union. As a result, the population of ethnic Russians in Kyrgyzstan declined by about one-third between 1989 and 1999. It could be hypothesized that the Russians who left Kyrgyzstan were healthier

than the ones who stayed, and that this selective migration had a negative impact on the adult mortality trends for the Russians in Kyrgyzstan. However, this explanation is contradicted by the fact that, in 1989 and 1999, levels of  ${}_{45}q_{15}$  among Russians living in Kyrgyzstan are very similar to those recorded in Russia, as shown in Table 3. The similarity holds for both males and females. Since mortality change in Russia cannot be explained by selective migration, the similarity suggests that selection may not be the main explanation for the observed mortality change among Russians in Kyrgyzstan. Rather, it seems that adult Russians in Kyrgyzstan have experienced real mortality increases between 1989 and 1999, for reasons similar to the ones explaining mortality increases in Russia.

**Table 3: Period life table probability that an individual aged 15 will die before age 60 ( ${}_{45}q_{15}$ ) among Russians living in Kyrgyzstan, and in Russia, by sex, 1989 and 1999**

Sex	Year	Russians in Kyrgyzstan	Russia
Males	1989	0.300	0.304
	1999	0.410	0.417
Females	1989	0.127	0.114
	1999	0.155	0.151

Source: Author's calculations based on raw census and vital registration data (Russians in Kyrgyzstan); Human Mortality Database <<http://www.mortality.org>> (Russia)

In Russia, detailed analyses of adult mortality by cause has led to the conclusion that the mortality increase was not due to absolute deprivation, collapse of the health system or environmental pollution [Shkolnikov *et al.*]. Instead, it is found that the major explanation was likely to be “psychological stress caused by the shock of an abrupt and severe economic transition (...) mediated in part by the adverse health effects of excessive alcohol consumption [Shkolnikov *et al.*, 1998, p. 1995].” The similarity between adult mortality trends in Russia and those of Russians in Kyrgyzstan suggests that both populations share similar explanations. The collapse of the Soviet system of state paternalism, sudden changes in the labor market, and rising unemployment are likely to have caused “mass psychological stress” [Shkolnikov *et al.*, 1998]. Like in Russia, the stress may have resulted in large increases in alcohol consumption among Russians in Kyrgyzstan. One can add that Russians living

in Central Asian Republics also experienced specific sources of uncertainty, related to their new status of ethnic minority. As Central Asian Republics became independent and developed new national identities, Russians living in those republics faced uncertainty about their access to citizenship, their access to employment as member of an ethnic minority, the language policy towards the Russian language, and the general societal attitudes towards Russians and other ethnic minorities [Poujol, 1995].

Without detailed cause-of-death data, I can only hypothesize about the reasons explaining why the ethnic Kyrgyz have not experienced increases in adult mortality similar to those experienced by ethnic Russians. The most obvious explanation is that, for cultural or religious reasons, alcohol consumption has not been as common among ethnic Kyrgyz. (We saw in Table 1 that reported alcohol consumption was lower among ethnic Kyrgyz in 1993.) Consequently, while facing

dramatic changes in economic and social conditions, the Kyrgyz may not have increased their alcohol consumption as much as the Russians. This may have resulted in more favorable mortality trends among them. It can also be noted that, in Kyrgyzstan, the collapse of the Soviet Union did not have the same significance for ethnic Kyrgyz and ethnic Russians. While both groups experienced a severe economic crisis, for the Kyrgyz the

independence of Kyrgyzstan also involved a rise in national pride, political empowerment and cultural revival. Differences in prospects could have influenced health behavior patterns among ethnic groups and perhaps explain in part their divergent mortality trends. These are only hypotheses, and only more detailed mortality studies will allow a better understanding of the causes of the divergent mortality trends among adult Kyrgyz and Russians.

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## CONCLUSIONS

Four patterns emerge from this analysis of the raw mortality data in Kyrgyzstan. First, the increase in the national-level reported IMR between 1958 and 1975 is likely to be spurious, due to improvements in the coverage of vital registration among rural Central Asian ethnic groups. Rural Central Asians are the only population group for which the reported data show an increase in infant mortality during the period, and is the one that is most likely to be affected by underreporting at the beginning of the period. A more plausible IMR trend for the 1958-75 period is a steady decline. Second, the infant mortality data by urban/rural residence and ethnicity raise doubts about IMR decreases recorded at the national level since 1991. A more plausible trend is a short-term increase followed by constancy at levels similar to those recorded in the late 1980s. Third, there appears to be excess adult mortality among adult Russian males, relative to their Kyrgyz counterparts, during both the late Soviet and post-Soviet periods. This excess mortality does not appear to be an artifact of the data, because it is found in urban areas where data quality can be regarded with more confidence, and also because it is consistent with data on risk factors (smoking and alcohol consumption) by ethnicity. The excess mortality of adult Russian males, which is unexpected given their higher socio-economic status, suggests the presence of a "mortality paradox". Fourth, ethnic Russians seem to have experienced greater increases in adult mortality than ethnic

Kyrgyz since the break-up of the Soviet Union. This conclusion applies to both males and females.

These conclusions have implications for the interpretation of the recorded trends in life expectancy at birth in Kyrgyzstan shown in Figure 1. First, the decreases in  $e_0$  recorded in Kyrgyzstan before 1975 are likely to be explained in part by improvements in vital registration among infants. While Russia was experiencing real declines in  $e_0$ , Kyrgyzstan was probably still experiencing some progress. Second, the similarity between the life expectancy at birth of males in Kyrgyzstan and Russia during the late Soviet period, in spite of Kyrgyzstan's lower levels of development, is likely to be real. It appears to be due to the relatively low levels of adult mortality experienced by ethnic Kyrgyz, which compensate for their relatively high mortality at infant and child ages, and produce levels of life expectancy at birth that are comparable to those experienced in Russia or among ethnic Russians living in Kyrgyzstan. Third, the relatively small declines in life expectancy at birth in Kyrgyzstan after 1991, compared to Russia, and the subsequent divergence in  $e_0$  between the two countries, are likely to be real. Although this divergence may be accentuated by spurious declines in reported infant mortality in Kyrgyzstan, it results to a large extent from smaller increases in adult mortality experienced by ethnic Kyrgyz, compared to those observed in Russia or among ethnic Russians living in Kyrgyzstan.

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