Understanding Ethnic Differentials in Mortality in Central Asia: Evidence from Kyrgyzstan

Michel Guillot
University of Wisconsin-Madison
mguillot@ssc.wisc.edu

Natalia Gavrilova
University of Chicago
nsgavril@uchicago.edu

Tetyana Pudrovska
University of Wisconsin-Madison
tpudrovs@ssc.wisc.edu

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Introduction

The former Soviet republic of Kyrgyzstan has experienced considerable economic and social change during the second half 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 transition. In 1995, real GDP was only 50.6% of its 1990 value, and so far Kyrgyzstan has not recovered its pre-independence GDP levels (Kudabaev, 2004). With a gross national income per capita of 440 US dollars in 2005, Kyrgyzstan is the 28th 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; UNDP, 1998). 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^2) 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, the ethnic Kyrgyz represented 64.9% of the population, followed by the ethnic Uzbeks (13.8%) and the 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.

The initial motivation for this paper is the presence in Kyrgyzstan of surprising ethnic differentials in mortality at adult ages. Indeed, uncorrected mortality data from the National Statistical Committee of the Kyrgyz Republic show higher mortality among adult males of Slavic ethnicity (mostly Russians) relative to adult males of Central Asian ethnicity (mostly Kyrgyz and Uzbeks) [Figure 1]. This excess mortality among Russians is persistent throughout the late Soviet period (Darskii and Andreev, 1991; Dobrovolskaya, 1990). Moreover, the gap has increased since 1991, with Russians/Slavs experiencing larger mortality increases than Central Asians. Russian females were experiencing lower levels of adult mortality during the Soviet period, but the differential has reversed between 1989 and 1999.

This ethnic differential is surprising because it is well established that ethnic Russians/Slavs living in Central Asia have had higher socio-economic status than native ethnic groups. For example, Kahn (1993) finds that, in Kyrgyzstan in 1989, Russians were over-represented in managerial and high-skilled occupations, while the ethnic Kyrgyz were over-represented in the agricultural sector. Poujol (1995) qualifies the ethnic relations in Central Asia in terms of a "European" vs. "Indigenous" dichotomy of a colonial type, and makes a parallel between the Russians in Central Asia and the French and the British in their respective colonies before independence. A couple of years after the break-up of the Soviet Union, ethnic Russians (and

other Slavic ethnic groups) were still better-off than the Kyrgyz (or the Uzbeks), as evidenced by data from the 1993 Kyrgyzstan Multipurpose Poverty Survey (KMPS) [Table 1]. In populations around the world, subgroups with higher socio-economic status tend to have lower mortality. The fact that ethnic Russians in Kyrgyzstan experience higher adult mortality levels in spite of their higher socio-economic status could 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 most common explanation for the "Russian mortality paradox" is that deaths are better reported among ethnic Russians (Sinelnikov, 1988).

In this paper, we use unpublished, detailed census and vital registration data from Kyrgyzstan between 1959 and 1999 to evaluate the different explanations for the Russian mortality paradox: (1) data artifacts; (2) migration effects; (3) cultural effects.

The "data artifacts" explanation posits that the higher mortality among ethnic Russians is spurious, due to their better reporting of deaths (coverage and age reporting). According to this explanation, ethnic differentials in mortality between Slavs and Central Asians would be reversed in the absence of data errors.

The "migration effects" hypothesis posits that the large increase in adult mortality among Russians between 1989 and 1999 is due to selective migration out of Kyrgyzstan following the break-up of the Soviet Union. Indeed, one third of the Russian population has left Kyrgyzstan since 1991. Mortality trends among Russians would be affected by these migration flows if Russian migrants were healthier than the Russians who stayed (healthy migrant effect).

The "cultural effects" explanation posits that the differential in mortality is real and unexplained by differences in socio-economic status. Rather, the differentials would be explained by different cultural practices among various ethnic groups. Indeed, culture may affect mortality outcomes by shaping individual health and lifestyle behaviors (e.g., diet, smoking, alcohol, exercise, use of preventive care) and by shaping the nature of the individual's social environment (family structure and social networks) which, in turn, may affect stress levels and health outcomes.

Data artifacts

It is not possible to estimate the coverage of deaths by ethnicity for past decades, because deaths and migrants by ethnicity are not available on an annual basis. We are also unable to estimate the coverage of deaths between at ages 20-59, because inter-republic migration is too large at these ages, relative to mortality, and the data on migration is too poor, to allow any meaningful conclusions. However, using intercensal analysis, we were able to estimate the coverage of death registration at ages 60 and above, by urban/rural residence (Guillot, 2004). We estimate that, in urban areas, the coverage of deaths above age 60 reached 90% as early as the 1959-1970 intercensal period. Coverage in rural areas was much lower then (around 50%), but caught up

with urban areas by the 1980s. We estimate that, for the 1989-99 period, the coverage of deaths above age 60 was about 92% for Kyrgyzstan as a whole. These high rates of coverage above age 60 increase our confidence that the observed mortality levels at ages 20-59 are real, especially since deaths at adult ages tend to be better reported than deaths above age 60. Also, since the large majority of Russians live in urban areas and the large majority of Kyrgyz live in rural areas, differences in coverage by ethnicity would translate into differences in coverage by urban/rural areas. We did not find such differences for the 1989-99 period.

The conclusion that the observed ethnic differentials in mortality are real is also supported by the fact that urban areas, where the data can be regarded with more confidence, also exhibit higher mortality levels among Slavic males [Figure 2].

Migration effects

The migration effect hypothesis is contradicted by the fact that, throughout the period, levels of adult mortality among Russians living in Kyrgyzstan are very similar to those recorded in Russia [Figure 3]. The similarity holds for both males and females. Since mortality change in Russia cannot be explained by selective migration, this similarity suggests that selection may not be the main explanation for the observed mortality change among Russians in Kyrgyzstan. Rather, it seems that Russians in Kyrgyzstan have experienced real mortality increases between 1989 and 1999, for reasons similar to the ones explaining mortality increases in Russia.

The migration effect hypothesis is also contradicted by the fact that cohort-specific levels of educational attainment have not changed greatly between 1989 and 1999. For males [Figure 4], levels have decreased only slightly among cohorts aged 25-39 in 1989, but they have actually increased among cohorts aged 45 and older in 1989. This indicates that migration of Russians out of Kyrgyzstan have not been highly selective, at least on the basis of education, which is closely related to health.

Cultural effects

We evaluate the"cultural effects" hypothesis indirectly, by examining causes of death among ethnic groups for the period 1998-99. The strategy is to examine whether the causes of death that explain the ethnic differentials can be tied to the cultural practices of the corresponding ethnic groups. We thus compare age-standardized cause-specific mortality rates among ethnic groups (Central Asians vs. Slavs) at ages 20-59, and perform a decomposition of the partial life expectancy at age 20 (truncated at age 60). Mortality rates by age, sex, cause and ethnicity are calculated by combining 1999 census data (for exposure) with death registration data for the years 1998-99. These rates are based on about 2.2 million individual census records and 20,000 individual death certificates. We use the WHO European standard for the age-standardization.

Results indicate that, for males, the age-standardized mortality rate is higher among Slavs for all

seven major causes [Figure 5]. However, the size of the differential varies substantially by cause. The highest differential is for injuries, a cause for which the age-standardized death rate is almost four times higher among Slavs. Cardio-vascular diseases (especially ischaemic heart diseases) and infections (especially tuberculosis) also present substantial differentials, although not as large as for injuries. Decomposition analysis indicates that 54% of the difference in partial life expectancy at age 20 between Central Asians and Slavs is due to differences in mortality from injuries. With 16% and 12%, respectively, cardio-vascular diseases and infections make a much smaller contribution to the difference [Figure 6]. The most important detailed causes of death accounting for the ethnic differential in mortality from injuries are accidental poisoning by alcohol and suicide [Figure 7].

Females experience much lower levels of overall mortality and much smaller ethnic differentials than males in 1998-99. In fact, mortality is lower among Slavic females, compared to Central Asian females, for most causes [Figure 8]. The two exceptions are injuries and neoplasms. Injuries, in particular, is the most important cause of death accounting for the excess mortality among Slavic females, followed by neoplasms [Figure 9]. The most important detailed causes of death accounting for the ethnic differential in mortality from injuries are accidental poisoning by alcohol and homicide [Figure 10].

Because alcohol seems to be such an important explanation for the excess mortality of Slavic males and females, we calculated the age-standardized mortality rate for alcohol-related causes of death (chronic alcoholism, alcohol psychoses, alcohol cirrhosis of the liver, and accidental poisoning by alcohol) [Figure 11]. It appears that, when alcohol-related causes of death are combined, alcohol becomes the most important source of ethnic differential in mortality at ages 20-59, for both males and females.

Multivariate analysis of adult mortality

The importance of personal behaviors, such as alcohol consumption, in explaining mortality differentials between Slavs and Central Asians supports the “cultural” hypothesis, because such behaviors are closely tied to cultural and religious practices. Nonetheless, non-cultural factors, such as urban/rural residence and educational attainment, could also explain part of the observed differentials.

In order to examine whether ethnic mortality differentials remain once we account for other factors such as urban/rural residence and educational attainment, we conducted a multivariate analysis where mortality by sex and by cause is predicted as a function of age, ethnicity, residence and education. We compared the effect of ethnicity in this model (model 2) with the effect of ethnicity in a more simple model where mortality is predicted as a function of age and ethnicity only (model 1). The effects of these covariates on mortality was modeled using negative binomial regression. Methodological details and regression results are provided in the Annex.

Results show that ethnicity remains an important factor in predicting all-cause and cause-specific mortality, even after taking educational attainment and urban/rural residence into account [Figures 12 & 13]. This provides additional evidence for the cultural hypothesis, although many non-cultural factors (income, in particular) are missing from the model. Nonetheless ethnicity effects appear very robust, and it is unlikely that income would make a large difference, especially if, as we suspect, income levels are higher among Slavs.

There are two cases, however, where the effect of ethnicity becomes non-significant once we control for residence and education: infections and respiratory diseases among females. Education (and residence for respiratory diseases), however, are highly significant. This means that the lower rates of infections and respiratory diseases among Slavic females are explained by their higher educational attainment and their urban residence, rather than by ethnicity per se.

Discussion

We find that excess mortality among adult Slavs is not likely due to data artifacts or migration effects. Instead, we find that they are real and explained by important ethnic differences in cause-specific mortality. Among causes of death, we find that alcohol-related causes (for both males and females) and suicide (for males) play a major role. For the most part, ethnic-specific differences in all-cause and cause-specific mortality remain after taking differences in residence and educational attainment into account.

We emphasize the role of culture, because the personal behaviors that generate the existing mortality differentials in 1998-99 seem to be closely tied to cultural practices. Alcohol consumption, in particular, is closely related to culture. The "culture of alcohol" among Russians, and the impact of Islam among Central Asians, could explain in part differences in alcohol-related mortality, independently of socio-economic differences between these ethnic groups. It could be also hypothesized that stronger family ties and social support among Central Asians could play an important role in explaining lower rates of suicide and alcohol-related mortality among Central Asian adult males. Although we do not have precise information about these social networks and their impact on mortality, the 1989 and 1999 censuses show higher proportions of never-married or unmarried adults among Slavs than among Central Asians. However, we also need to further evaluate the relative socio-economic conditions of ethnic groups in Kyrgyzstan, and how these conditions may have changed as a result of the break-up of the Soviet Union.

Implications for understanding the health crisis in post-Soviet states

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. 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).) A deterioration of data quality problems in Central Asian republics is often invoked as a possible explanation (Becker et al., 1998). Indeed, a deterioration in the coverage of death registration in Central Asia since 1991 would produce mortality trends that are more favorable than in reality.

Although there is some indication of data quality deterioration in Central Asia (at infant/child ages, in particular), our research emphasizes the role of culture in explaining divergent trends among post-Soviet states. The differential evolution of mortality among ethnic groups in Kyrgyzstan since 1991, and the causes of death responsible for the mortality differentials in 1998-99, illustrate that the health crisis in post-Soviet states is likely to be highly context-, culture-, or ethnic-specific. As a result, the republics that have fared worse economically may not necessarily be the ones with the largest life expectancy declines. Cultural characteristics are likely to play an important role in mediating the negative impact of socio-economic changes.

The most important cultural characteristic explaining the different evolution of mortality in post-Soviet states is likely to be the presence or not of a "culture of alcohol". Ethnic groups where the "culture of alcohol" is more prevalent, and countries were these ethnic groups are the majority population, have indeed experienced much higher mortality increases than ethnic groups and countries were this cultural characteristic is less prevalent (Shkolnikov et al., 1998), regardless of the respective evolution of the material conditions of these populations. This stresses the fact that dramatic socio-economic changes in post-Soviet states may not necessarily lead to steady mortality increases. It is the combination of dramatic socio-economic changes and the culture of alcohol, rather than socio-economic changes per se, that may explain mortality increases in post-Soviet States.

References

ACKLAND Robert, FALKINGHAM Jane, 1997, "A Profile of Poverty in Kygyzstan", in J. Falkingham, J. Klugman, S. Marnie and J. Micklewright (eds.), *Household Welfare in Central Asia*, Houndmills, Basingstoke [England], Macmillan Press; New York, St. Martin's Press, pp. 81-99.

ANDREEV E.M, 2001, *Did the economic crisis cause the mortality fluctuation in Russia in the 1990s?* Paper presented at the IUSSP XXIVth General Population Conference, Salvador de Bahia.

BECKER Charles M., BIBOSUNOVA Damira I., HOLMES Grace E., IBRAGIMOVA, Margarita M., 1998, "Maternal Care vs. Economic Wealth and the Health of Newborns: Bishkek, Kyrgyz Republic and Kansas City, USA", *World Development* 11, pp. 2057-2072.

DARSKII L., ANDREEV E, 1991, "Vosproizvodstvo naseleniya otdel'nykh natsional'nostei v SSSR," [Population growth among different nationalities in the USSR] *Vestnik Statistiki* 6, pp. 3-10.

DOBROVOLSKAYA V.M., 1990, "Etnicheskaya Differentsiatsiya Smertnosti", [Ethnic mortality differentials], in *Demograficheskie Protsessy v SSSR* [Demographic Processes in the USSR], Moscow, pp. 150-66.

GUILLOT, Michel, 2004, "Kachestvo demograficheskikh dannykh v Kyrgyzstane c 1958 g.," [The quality of demographic data in Kyrgyzstan since 1958], pp. 53-76 in Zarylbek I. Kudabaev, Michel Guillot and Mikhail Denissenko (eds.). *Naselenie Kyrgyzstana* [The Population of Kyrgyzstan]. Bishkek, Kyrgyz Republic: Natsional'ny Statistichesky Komitet Kyrgyzkoy Respubliki.

KAHN M, 1993, "Les Russes dans les ex-Républiques soviétiques", *Le Courrier des Pays de l'Est*, 376, pp. 3-20.

KUDABAEV, Zarylbek I., 2004, "Ekonomicheskoe razvitie Kyrgyzskoy Respubliki", [Economic Development in the Kyrgyz Republic], in Z. Kudabaev, M. Guillot, and M. Denissenko (eds), *Naselenie Kyrgyzstana* [The Population of Kyrgyzstan], Bishkek, pp.17-52.

PALLONI Alberto, ARIAS Elizabeth, 2004, "Paradox Lost: Explaining the Hispanic Adult Mortality Advantage," *Demography* 41(3), pp. 385-416.

POUJOL Catherine, 1995, "Minorites Exogènes ou Russes de l'Intérieur en Asie Centrale", *Revue d'Etudes Comparatives Est-Ouest*, 26(4), pp. 125-142.

SHKOLNIKOV Vladimir M., CORNIA Giovanni A., LEON David A., MESLÉ France, 1998, "Causes of the Russian mortality crisis," *World Development*, 26(11), pp. 1995-2011.

SILNELNIKOV A.B., 1988, "Dinamika Urovnia Smernosti v SSSR", [The Dynamics of the Level of Mortality in the USSR] in L. L. Rybakovskii (ed.), *Naselenie SSSR za 70 let [The Population of the USSR in the last 70 Years]*, Moscow, Nauka.

UNITED NATIONS DEVELOPMENT PROGRAM (UNDP), 1998, *Poverty in Transition?* New York, UNDP, Regional Bureau for Europe and the CIS.

WORLD BANK, 1996, *World Development Report 1996: From Plan to Market*, New York, Oxford University Press.

WORLD BANK, 2000, *Making Transition for Everyone: Poverty and Inequality in Europe and Central Asia*, Washington DC, The World Bank.
WORLD BANK, 2006, *World Development Indicators Database*, World Bank, 1 July 2006.

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.

Figure 1

Recorded trends in adult mortality ($_{40}q_{20}$)

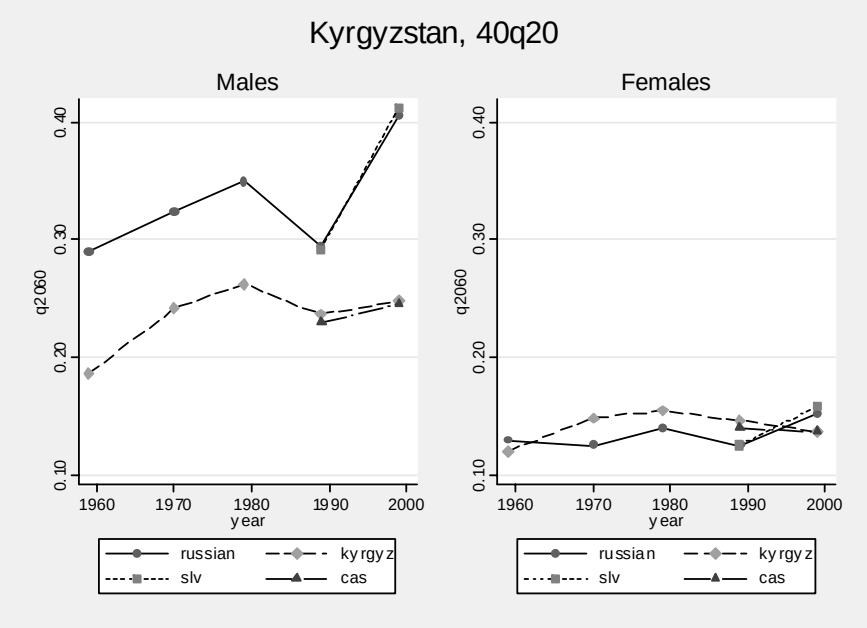


Figure 2

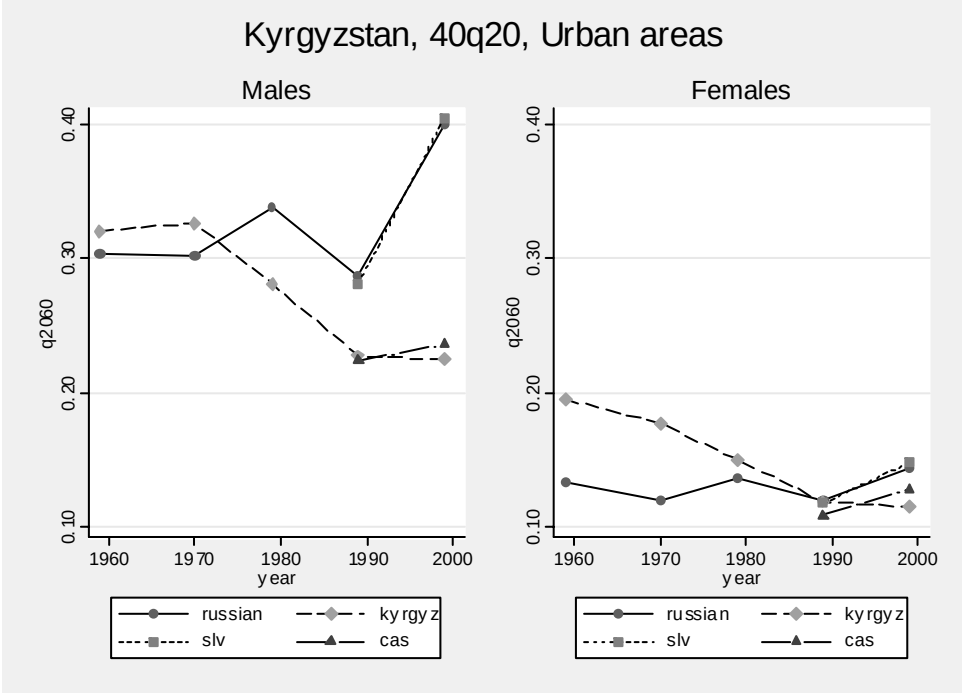


Figure 3

Health selection?

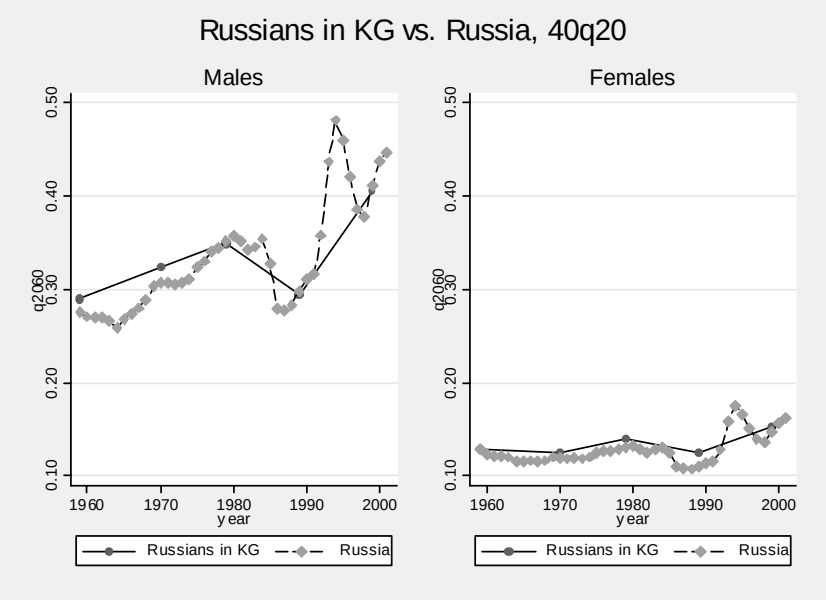


Figure 4

Cohort-specific changes in educational attainment, 1989-99

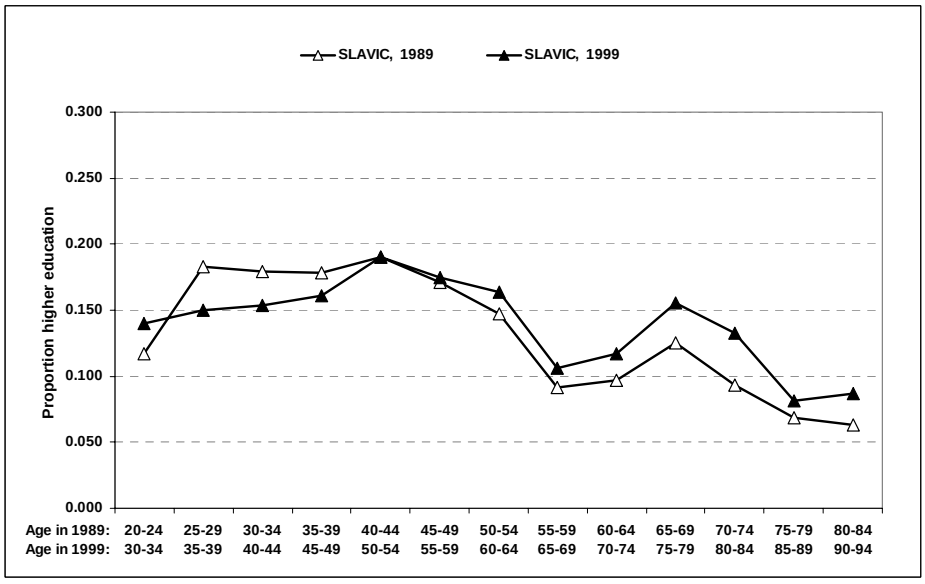


Figure 5

Age-standardized Death Rates, $_{40}M_{20}x10^5$, 1998-99, by cause and ethnicity, Males

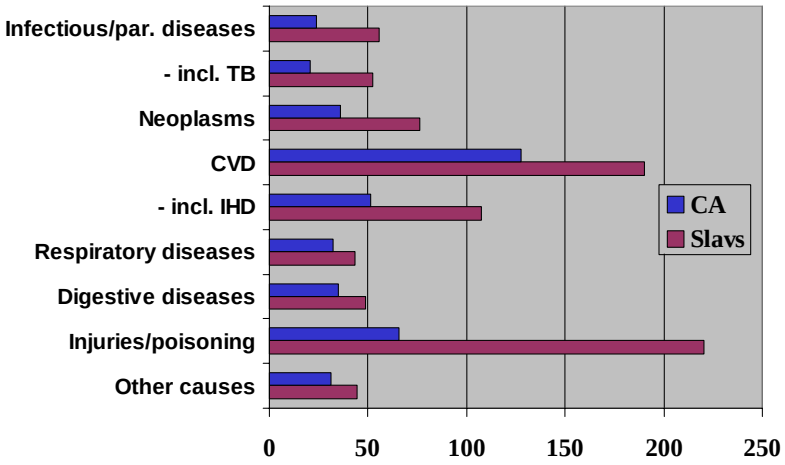


Figure 6

Contribution of causes of death to $_{40}e_{20}$(CA) - $_{40}e_{20}$(Slav)
Males (total difference = 2.90 years)

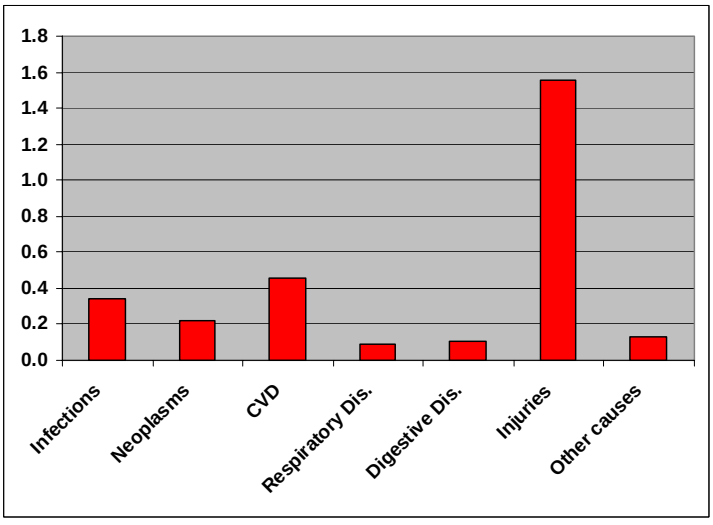


Figure 7

Age-standardized Death Rates, $_{40}M_{20}x10^5$
Detailed Injuries, Males

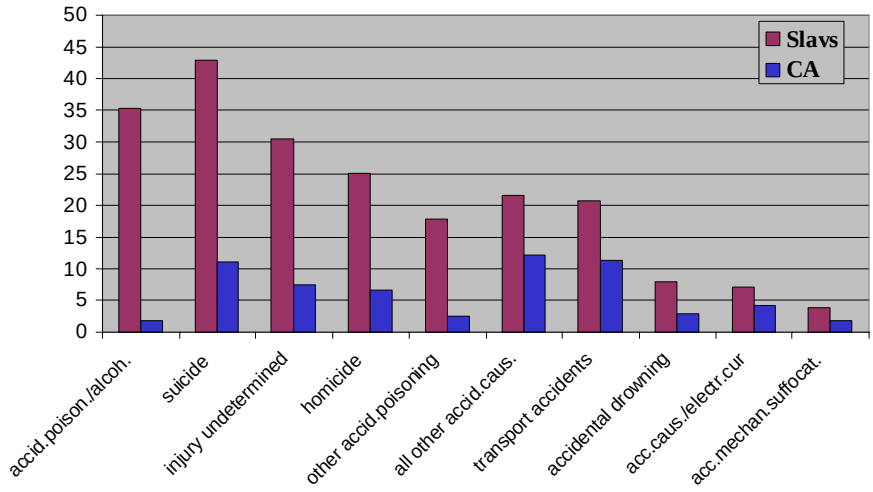


Figure 8

Age-standardized Death Rates, $_{40}M_{20}x10^5$,
1998-99, by cause and ethnicity, Females

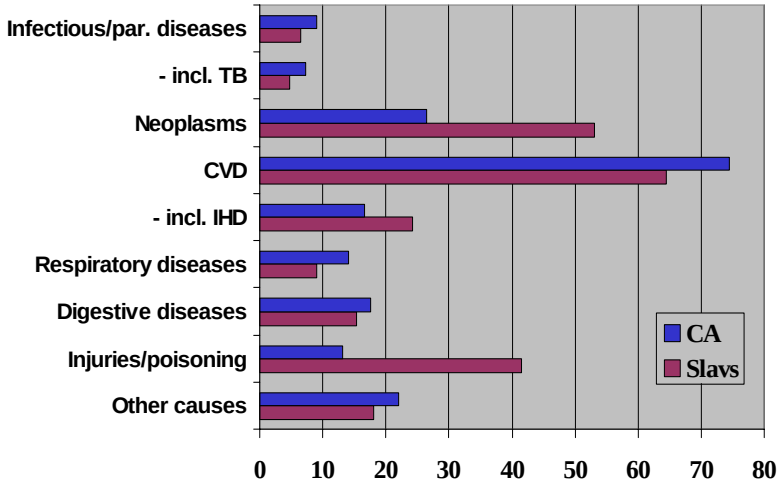


Figure 9

Contribution of causes of death to
$_{40}e_{20}$(CA) - $_{40}e_{20}$(Slav)
Females (total difference = .28 years)

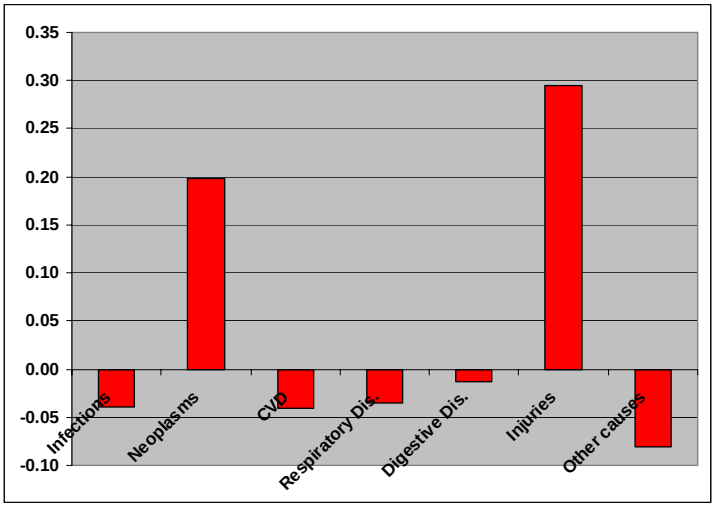


Figure 10

Age-standardized Death Rates, $_{40}M_{20}x10^5$
Detailed Injuries, Females

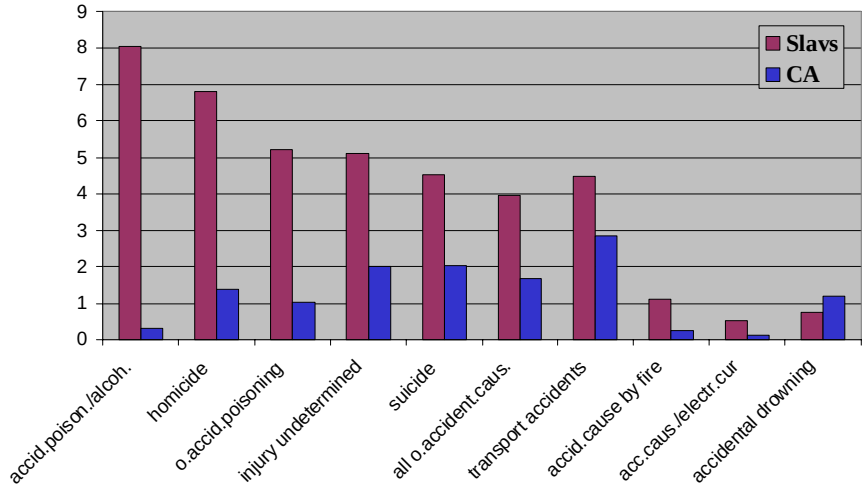


Figure 11

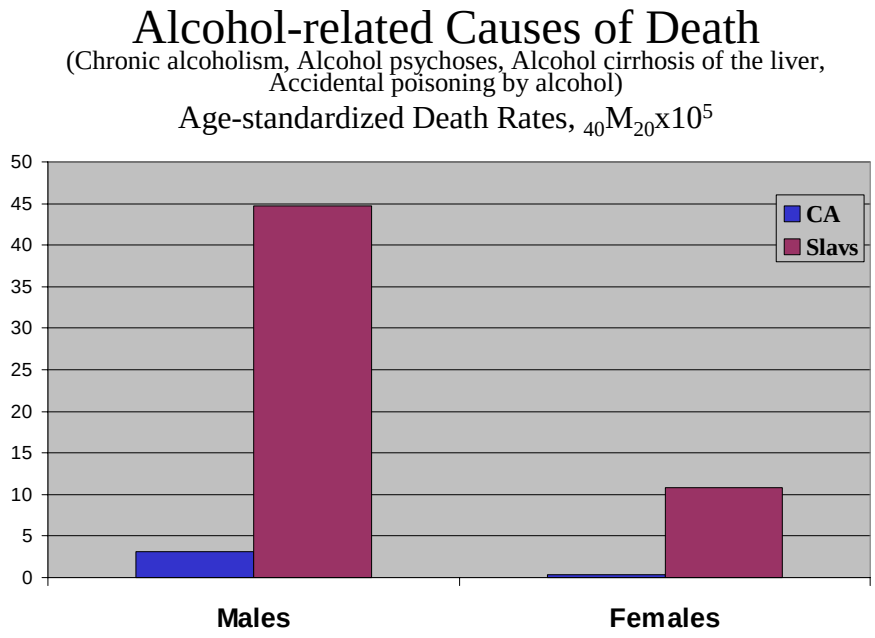

Alcohol-related Causes of Death
(Chronic alcoholism, Alcohol psychoses, Alcohol cirrhosis of the liver, Accidental poisoning by alcohol)
Age-standardized Death Rates, $_{40}M_{20}x10^5$
50
45
40
35
30
25
20
15
10
5
0
CA
Slavs
Males
Females

Figure 12

Risk Ratio Slavs/CA
Males

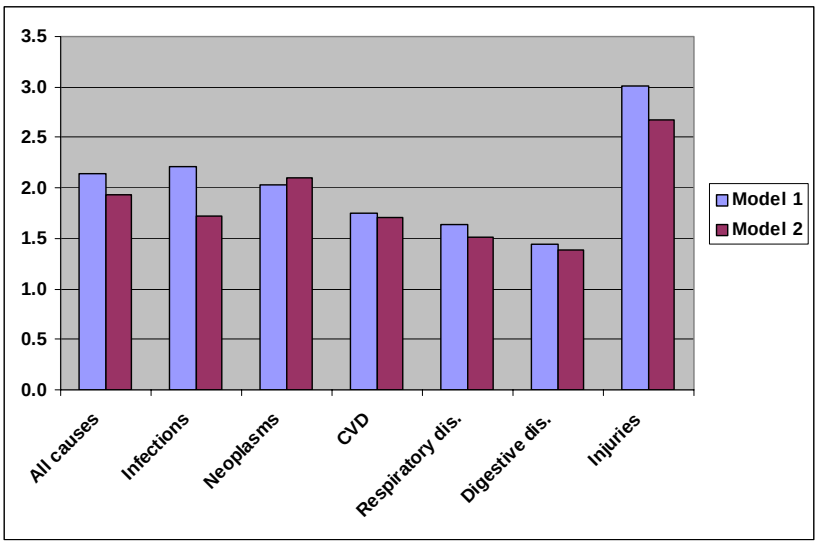
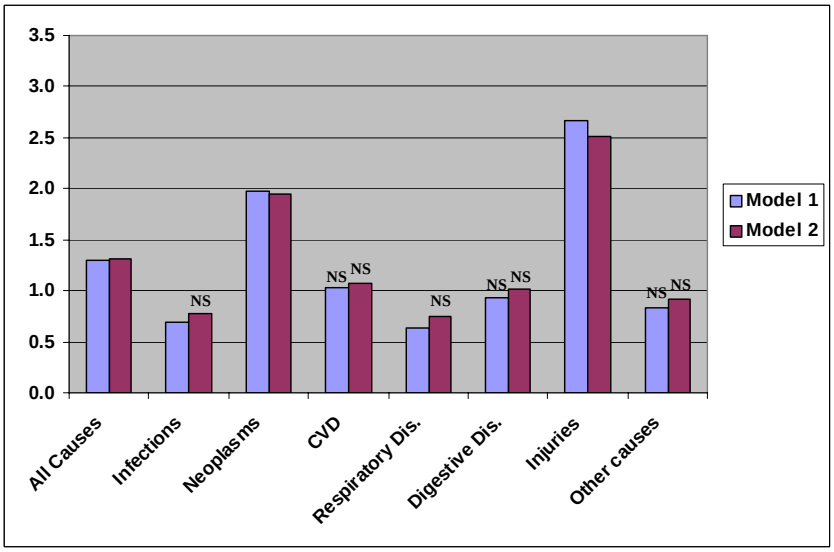


Figure 13

Risk Ratio Slavs/CA
Females



ANNEX

We model age, residence, education and ethnicity effects using a series of dummy variables. Our model runs for each sex separately because ethnic mortality differentials and cause of death structure is different in males and females.

We model mortality process using negative binomial regression. The hypothesis that mortality data were Poisson-distributed was rejected for mortality from all causes and injuries for males.

To compare effects of education and residence on ethnicity we applied two nested models. The first model included age and ethnicity:

$$D_{ij} = \exp\{\ln N_{ij} + \beta_i X_i + \beta_j X_j + \varepsilon_{ij}\}$$

Where
D_{ij} - Number of deaths in age group i and ethnic group j;
N_{ij} - Number of person-years of exposure at age i and ethnic group j;
X_i - Dummy variable indicating membership in age group i;
X_j - Dummy variable indicating membership in ethnic group j;
ε_{ij} -Error term whose exponential is gamma distributed;
β_i , β_j - coefficients indicating estimated effect of variable on mortality.

The second model included age, ethnicity (Slavs/CA/other ethnic groups), residence (urban/rural) and education (higher and incomplete higher/secondary and secondary specialized/below secondary):

$$D_{ijkl} = \exp\{\ln N_{ijkl} + \beta_i X_i + \beta_j X_j + \beta_j X_k + \beta_j X_l + \varepsilon_{ijkl}\}$$

Where
D_{ijkl} - Number of deaths in age group i and ethnic group j;
N_{ijkl} - Number of person-years of exposure at age i and ethnic group j;
X_i - Dummy variable indicating membership in age group i;
X_j - Dummy variable indicating membership in ethnic group j;
X_k - Dummy variable indicating residence (urban/rural);
X_l - Dummy variable indicating membership in educational group l;
ε_{ijkl} -Error term whose exponential is gamma distributed;
β_i, β_j, β_k, β_l - coefficients indicating estimated effect of variable on mortality.

Coefficients of the models were estimated using Stata v.9.1.

The results of the analyses for all causes of death and deaths from 7 groups of causes of death are presented in the Tables below.

Stata output of the models.

All causes of death. Males.

Covariates	Model 1		Model 2	
	Risk Ratio	Std. error	Risk Ratio	Std. error
Age Groups				
15-19 (Ref)				
20-24	1.7046	0.2035	1.8452	0.2064
25-29	2.5426	0.2979	2.8129	0.3093
30-34	3.7060	0.4273	4.1019	0.4443
35-39	4.6691	0.5268	5.1525	0.5439
40-44	6.1344	0.6829	6.8750	0.7170
45-49	8.8504	0.9753	10.0518	1.0384
50-54	10.7799	1.2014	12.2265	1.2764
55-59	17.0912	1.8596	19.5604	1.9963
Ethnicity				
Central Asians (Ref)				
Slavs	2.1420	0.1205	1.9286	0.1030
Others	1.8981	0.1107	1.6937	0.0957
Residence				
Rural (Ref)				
Urban			1.1991	0.0533
Education				
Higher/incomplete higher (Ref)				
Secondary/secondary specialized			1.7811	0.1059
Below secondary			1.9988	0.1261

Infectious Diseases. Males.

Covariates	Model 1		Model 2	
	Risk Ratio	Std. error	Risk Ratio	Std. error
Age Groups				
15-19 (Ref)				
20-24	5.7868	1.9114	6.9513	2.0715
25-29	12.3979	3.9324	15.8961	4.5503
30-34	16.4381	5.1803	19.8267	5.6614
35-39	15.5424	4.8851	19.3459	5.4996
40-44	20.3152	6.3337	26.7305	7.5568
45-49	16.9314	5.3671	22.5123	6.4744
50-54	17.3091	5.6221	23.0852	6.8385
55-59	19.1202	6.2031	24.0828	7.1065
Ethnicity				
Central Asians (Ref)				
Slavs	2.2135	0.2903	1.7252	0.1950
Others	3.5644	0.4607	2.4904	0.2941
Residence				
Rural (Ref)				
Urban			1.8774	0.1768
Education				
Higher/incomplete higher (Ref)				
Secondary/secondary specialized			3.0560	0.5111
Below secondary			6.8452	1.1749

Neoplasms. Males.

Covariates	Model 1 Risk Ratio	Std. error	Model 2 Risk Ratio	Std. error
Age Groups				
15-19 (Ref)				
20-24	1.8882	0.5199	1.8394	0.5000
25-29	2.3043	0.6295	2.2057	0.5960
30-34	2.7849	0.7512	2.6811	0.7160
35-39	6.6569	1.6113	6.5921	1.5782
40-44	9.1212	2.1846	9.1664	2.1713
45-49	20.060	4.6580	20.3655	4.6739
50-54	32.022	7.4612	33.4559	7.6940
55-59	72.4029	16.3762	75.1008	16.7241
Ethnicity				
Central Asians (Ref)				
Slavs	2.0284	0.1607	2.0934	0.1661
Others	1.5096	0.1734	1.5406	0.1743
Residence				
Rural (Ref)				
Urban			0.9189[†]	0.0649
Education				
Higher/incomplete higher (Ref)				
Secondary/secondary specialized			1.6132	0.1618
Below secondary			1.3463	0.1564

[†] Not significant at the p=.05 level

Cardiovascular Diseases. Males.

Covariates	Model 1 Risk Ratio	Std. error	Model 2 Risk Ratio	Std. error
Age Groups				
15-19 (Ref)				
20-24	2.1729	0.4752	2.2197	0.4782
25-29	4.5895	0.9412	4.7204	0.9543
30-34	7.6701	1.5251	7.9910	1.5675
35-39	14.024	2.6472	14.9967	2.7889
40-44	24.5300	4.5436	26.5223	4.8385
45-49	44.4910	8.1633	48.8763	8.8455
50-54	67.9608	12.4675	74.3320	13.4202
55-59	111.7965	20.1962	122.4265	21.7403
Ethnicity				
Central Asians (Ref)				
Slavs	1.7498	0.1185	1.7028	0.1137
Others	1.3919	0.1110	1.3502	0.1060
Residence				
Rural (Ref)				
Urban			0.9257[†]	0.0520
Education				
Higher/incomplete higher (Ref)				
Secondary/secondary specialized			1.5667	0.1148
Below secondary			1.5355	0.1254

[†] Not significant at the p=.05 level

Respiratory Diseases. Males

Covariates	Model 1 Risk Ratio	Std. error	Model 2 Risk Ratio	Std. error
Age Groups				
15-19 (Ref)				
20-24	1.4575†	0.4156	1.7135	0.4537
25-29	2.0092	0.5554	2.4025	0.6159
30-34	3.0606	0.8130	3.7381	0.9188
35-39	5.0499	1.2577	6.4238	1.4765
40-44	6.4015	1.5829	8.2015	1.8713
45-49	12.7347	3.0439	16.6615	3.6885
50-54	19.7216	4.7563	25.2933	5.6462
55-59	38.3534	8.8702	47.1149	10.0452
Ethnicity				
Central Asians (Ref)				
Slavs	1.6360	0.1913	1.5110	0.1610
Others	1.5565	0.2140	1.4549	0.1874
Residence				
Rural (Ref)				
Urban			0.8565†	0.0760
Education				
Higher/incomplete higher (Ref)				
Secondary/secondary specialized			3.4892	0.5641
Below secondary			4.8638	0.8262

† Not significant at the p=.05 level

Digestive Diseases. Males.

Covariates	Model 1 Risk Ratio	Std. error	Model 2 Risk Ratio	Std. error
Age Groups				
15-19 (Ref)				
20-24	1.3337†	0.3321	1.3549†	0.3342
25-29	1.7473	0.4242	1.7744	0.4274
30-34	3.4761	0.7742	3.5756	0.7906
35-39	6.8648	1.4310	7.1529	1.4820
40-44	10.6165	2.1729	11.1900	2.2767
45-49	16.7343	3.3762	17.8326	3.5735
50-54	15.6724	3.3069	16.8733	3.5308
55-59	24.7900	5.0578	26.6349	5.3553
Ethnicity				
Central Asians (Ref)				
Slavs	1.4401	0.1302	1.3838	0.1259
Others	1.3236	0.1576	1.2823	0.1519
Residence				
Rural (Ref)				
Urban			1.0425†	0.0807
Education				
Higher/incomplete higher (Ref)				
Secondary/secondary specialized			1.6458	0.1760
Below secondary			1.5194	0.1887

† Not significant at the p=.05 level

Injuries. Males.

Covariates	Model 1 Risk Ratio	Std. error	Model 2 Risk Ratio	Std. error
Age Groups				
15-19 (Ref)				
20-24	1.4496	0.2294	1.5424	0.2338
25-29	2.0189	0.3158	2.1799	0.3284
30-34	2.7075	0.4191	2.9027	0.4334
35-39	2.7713	0.4237	2.9587	0.4348
40-44	2.7410	0.4207	2.9465	0.4351
45-49	2.9677	0.4581	3.2248	0.4792
50-54	3.0088	0.4838	3.2319	0.5004
55-59	2.9628	0.4801	3.1516	0.4921
Ethnicity				
Central Asians (Ref)				
Slavs	3.0133	0.2491	2.6804	0.2173
Others	2.7528	0.2387	2.4544	0.2138
Residence				
Rural (Ref)				
Urban			1.4370	0.0985
Education				
Higher/incomplete higher (Ref)				
Secondary/secondary specialized			1.8464	0.1753
Below secondary			1.7567	0.1803

Other Causes. Males.

Covariates	Model 1 Risk Ratio	Std. error	Model 2 Risk Ratio	Std. error
Age Groups				
15-19 (Ref)				
20-24	1.4354†	0.2736	1.6523	0.2960
25-29	1.5816	0.2982	1.9305	0.3430
30-34	2.0344	0.3788	2.5368	0.4469
35-39	2.4347	0.4366	3.1357	0.5320
40-44	3.4698	0.6139	4.4012	0.7367
45-49	3.9363	0.7038	5.0458	0.8552
50-54	3.7014	0.7129	4.8419	0.8865
55-59	5.8312	1.0598	7.2161	1.2398
Ethnicity				
Central Asians (Ref)				
Slavs	1.4947	0.1503	1.4020	0.1358
Others	1.2099†	0.1558	1.1194†	0.1399
Residence				
Rural (Ref)				
Urban			0.9850†	0.0788
Education				
Higher/incomplete higher (Ref)				
Secondary/secondary specialized			2.6374	0.3617
Below secondary			3.5455	0.5193

† Not significant at the p=.05 level

All Causes of Death. Females

Covariates	Model 1		Model 2	
	Risk Ratio	Std. error	Risk Ratio	Std. error
Age Groups				
15-19 (Ref)				
20-24	1.5017	0.1912	1.6872	0.1929
25-29	2.1605	0.2668	2.4881	0.2762
30-34	2.6942	0.3256	3.1688	0.3438
35-39	3.6639	0.4274	4.3405	0.4532
40-44	4.6220	0.5298	5.5554	0.5703
45-49	7.4439	0.8369	8.9702	0.9014
50-54	10.581	1.1975	12.5261	1.2678
55-59	20.179	2.2057	22.9371	2.2278
Ethnicity				
Central Asians (Ref)				
Slavs	1.2964	0.0747	1.3060	0.0671
Others	1.3824	0.0902	1.3301	0.0796
Residence				
Rural (Ref)				
Urban			0.9553[†]	0.0409
Education				
Higher/incomplete higher (Ref)				
Secondary/secondary specialized			1.9691	0.1195
Below secondary			2.2630	0.1510

[†] Not significant at the p=.05 level

Infectious Diseases. Females.

Covariates	Model 1		Model 2	
	Risk Ratio	Std. error	Risk Ratio	Std. error
Age Groups				
15-19 (Ref)				
20-24	1.7753†	0.5365	1.9523	0.5666
25-29	3.7235	1.0329	4.0604	1.0898
30-34	3.2351	0.9192	3.7649	1.0300
35-39	2.8158	0.8134	3.3328	0.9290
40-44	3.5018	1.0106	4.1060	1.1445
45-49	3.9476	1.1718	4.5832	1.3170
50-54	4.1997	1.3757	4.9812	1.5789
55-59	7.1790	2.1398	7.9332	2.25394
Ethnicity				
Central Asians (Ref)				
Slavs	0.6971	0.1215	0.7693†	0.1322
Others	1.0835†	0.2347	1.0821†	0.2302
Residence				
Rural (Ref)				
Urban			0.8562†	0.1064
Education				
Higher/incomplete higher (Ref)				
Secondary/secondary specialized			6.0230	1.9562
Below secondary			5.3724	1.8722

† Not significant at the p=.05 level

Neoplasms. Females.

Covariates	Model 1 Risk Ratio	Std. error	Model 2 Risk Ratio	Std. error
Age Groups				
15-19 (Ref)				
20-24	1.7777†	0.6125	1.6730†	0.5781
25-29	3.3208	1.0515	3.1320	0.9957
30-34	7.9629	2.3305	7.5414	2.2184
35-39	11.9149	3.3944	11.3454	3.2488
40-44	17.9127	5.0544	17.1056	4.8526
45-49	28.8522	8.0705	27.9494	7.8445
50-54	43.4128	12.1963	42.7232	12.0208
55-59	60.7811	16.9136	61.0491	16.9601
Ethnicity				
Central Asians (Ref)				
Slavs	1.9789	0.1458	1.9542	0.1492
Others	1.6318	0.1831	1.6370†	0.1849
Residence				
Rural (Ref)				
Urban			1.0494†	0.0735
Education				
Higher/incomplete higher (Ref)				
Secondary/secondary specialized			1.2274	0.1105
Below secondary			1.0097	0.1139

† Not significant at the p=.05 level

Cardiovascular Diseases. Females.

Covariates	Model 1 Risk Ratio	Std. error	Model 2 Risk Ratio	Std. error
Age Groups				
15-19 (Ref)				
20-24	1.9957	0.5275	2.2522	0.5677
25-29	3.2852	0.8309	3.7142	0.8998
30-34	5.1656	1.2434	6.1303	1.4086
35-39	8.4781	1.9668	9.9433	2.1997
40-44	13.2536	2.9984	15.9351	3.4359
45-49	27.9978	6.1938	33.7135	7.1098
50-54	46.7527	10.3238	54.4457	11.4356
55-59	102.4157	22.1671	115.6487	23.7845
Ethnicity				
Central Asians (Ref)				
Slavs	1.0265†	0.0879	1.0680†	0.0832
Others	1.0741†	0.1112	1.0739†	0.1044
Residence				
Rural (Ref)				
Urban			0.8084	0.0523
Education				
Higher/incomplete higher (Ref)				
Secondary/secondary specialized			2.1998	0.2162
Below secondary			2.5446	0.2735

† Not significant at the p=.05 level

Respiratory Diseases. Females.

Covariates	Model 1 Risk Ratio	Std. error	Model 2 Risk Ratio	Std. error
Age Groups				
15-19 (Ref)				
20-24	1.3834†	0.4430	1.8277	0.5494
25-29	1.3244†	0.4310	1.9049	0.5859
30-34	2.8470	0.8317	4.0284	1.1031
35-39	2.8035	0.8157	3.9847	1.0946
40-44	3.8357	1.1040	5.2730	1.4333
45-49	7.0697	1.9675	9.2327	2.4123
50-54	9.9322	2.8348	12.2824	3.2912
55-59	19.8436	5.2733	21.2284	5.2689
Ethnicity				
Central Asians (Ref)				
Slavs	0.6372	0.1026	0.7468†	0.1133
Others	0.8916†	0.1863	0.8731†	0.1769
Residence				
Rural (Ref)				
Urban			0.7348	0.0877
Education				
Higher/incomplete higher (Ref)				
Secondary/secondary specialized			2.7976	0.6488
Below secondary			4.6730	1.1443

† Not significant at the p=.05 level

Digestive Diseases. Females.

Covariates	Model 1 Risk Ratio	Std. error	Model 2 Risk Ratio	Std. error
Age Groups				
15-19 (Ref)				
20-24	1.0761†	0.3140	1.1055†	0.3187
25-29	1.1666†	0.3425	1.2170†	0.3540
30-34	1.7890	0.4896	1.8918	0.5136
35-39	3.5769	0.8747	3.8549	0.9339
40-44	5.5642	1.3262	5.9986	1.4171
45-49	6.4644	1.5667	6.9887	1.6755
50-54	9.1574	2.2819	9.9417	2.4419
55-59	21.0224	4.8133	22.2071	4.9439
Ethnicity				
Central Asians (Ref)				
Slavs	0.9380†	0.1162	1.0128†	0.1262
Others	0.9576†	0.1707	0.9834†	0.1741
Residence				
Rural (Ref)				
Urban			0.8588†	0.0886
Education				
Higher/incomplete higher (Ref)				
Secondary/secondary specialized			2.2372	0.3773
Below secondary			2.0253	0.3848

† Not significant at the p=.05 level

Injuries. Females.

Covariates	Model 1 Risk Ratio	Std. error	Model 2 Risk Ratio	Std. error
Age Groups				
15-19 (Ref)				
20-24	1.1137†	0.2312	1.2175†	0.2470
25-29	1.5122	0.3022	1.7094	0.3343
30-34	1.3843†	0.2813	1.6047	0.3207
35-39	1.7451	0.3381	2.0215	0.3851
40-44	2.0404	0.3941	2.3282	0.4411
45-49	2.3969	0.4658	2.7398	0.5214
50-54	1.8770	0.4133	2.1147	0.4558
55-59	3.3214	0.6614	3.5693	0.6900
Ethnicity				
Central Asians (Ref)				
Slavs	2.6660	0.2937	2.5157	0.2737
Others	3.3148	0.4109	2.9922	0.3685
Residence				
Rural (Ref)				
Urban			1.3984	0.1311
Education				
Higher/incomplete higher (Ref)				
Secondary/secondary specialized			2.1515	0.3118
Below secondary			2.4139	0.3884

† Not significant at the p=.05 level

Other Causes. Females.

Covariates	Model 1 Risk Ratio	Std. error	Model 2 Risk Ratio	Std. error
Age Groups				
15-19 (Ref)				
20-24	2.2569	0.4650	2.8007	0.5557
25-29	2.6608	0.5447	3.3852	0.6704
30-34	2.7763	0.5691	3.6130	0.7187
35-39	3.4728	0.6837	4.6276	0.8865
40-44	2.6179	0.5436	3.5105	0.7110
45-49	4.0418	0.8237	5.2442	1.0376
50-54	5.5725	1.1837	6.7292	1.3849
55-59	7.9157	1.5972	8.6891	1.6860
Ethnicity				
Central Asians (Ref)				
Slavs	0.8390†	0.0966	0.9145†	0.1023
Others	1.0401†	0.1499	1.0232†	0.1450
Residence				
Rural (Ref)				
Urban			0.8381	0.0728
Education				
Higher/incomplete higher (Ref)				
Secondary/secondary specialized			1.7636	0.2394
Below secondary			2.6922	0.4031

† Not significant at the p=.05 level