

Death and prices: The political economy of Russia's alcohol crisis

Most experts agree that alcohol abuse has been a major cause of Russia's soaring mortality rate. But why have ever more Russians been drinking themselves to death? Some attribute this to despair in the face of painful economic change. I present evidence that, in fact, the surge in alcohol-related deaths—and premature deaths in general—was fueled by a dramatic fall in the real price of vodka, which dropped 77 percent between December 1990 and December 1994. Variation in vodka prices—both over time and across Russia's regions—closely matches variation in mortality. Although market competition and weak excise collection help explain the fall in prices, the main reason appears to be populist price regulation during inflationary periods.

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1 Introduction

During the last 20 years, Russia's mortality rate has risen dramatically. In 1990, 11.2 of every thousand Russians died; by 2005, this had risen to 16.1 per thousand.¹ Experts agree that alcohol abuse is among the most important causes.² The increase in the death rate was accompanied by rapid growth in vodka sales and an upsurge of alcohol-related health problems. What is less clear is why such abuse should have risen so much during these years. Why—to put it bluntly—have growing numbers of Russians been drinking themselves to death?

The recent mortality spike coincided with the introduction of painful economic reforms and many have suggested a connection. Some attribute self-destructive drinking to the despair induced by rapid economic and social change. Russians, it is argued, sought in the vodka bottle an “escape of a sort from the increasing harshness and bewildering uncertainties of daily life” (Ryan 1995). While stress caused by the transition may have contributed, the evidence for this is mixed. Levels of anxiety and despair reported by survey respondents actually correlate negatively over time with the death rate. Mortality fell in years in which social tension and despondency were greatest and rose as the self-reported contentment of respondents increased. In surveys of individuals, those who were more anxious and dissatisfied did not report more frequent or heavier drinking. At least in the early 1990s, it was the more content Russians that drank to excess.

I identify another important but insufficiently appreciated cause of Russians' dangerous drinking. After price liberalization in January 1992, most prices—and eventually wages—soared. However, the real price of vodka fell precipitously. At the same time, less dangerous forms of

¹ I am grateful to Dora Costa, Sebastian Edwards, Tim Frye, Scott Gehlbach, Vladimir Gimpelson, Tim Groseclose, Al Harberger, Matthew Kahn, Daria Khalturina, Aleksandr Nemtsov, Jerry Nickelsburg, Andrei Shleifer, Jeff Timmons, Sergei Guriev and two anonymous referees for helpful comments.

² See, for example, Shkolnikov et al. (1998), Walberg et al. (1998), Leon et al. (1997), and Brainerd and Cutler (2005). One dissenting voice is Vlassov (1999), but his facts are challenged in replies by Notzon et al. (1999) and Leon and Shkolnikov (1999).

alcohol such as beer and wine became relatively more expensive. In December 1990, the average Russian monthly income would buy 10 liters of vodka; by December 1994, it was enough for almost 47 liters. I argue that this induced both a rise in alcohol consumption and a substitution of more lethal for less lethal forms.³ As numerous studies have shown, alcohol demand is sensitive to price: as real prices fall, consumption increases. Similar health crises have occurred as hard liquor became more affordable in Moldova, Kazakhstan, and, to a lesser degree, other former communist and developing countries.

Why did the real price of vodka fall so sharply in Russia in the early 1990s? I examine several possibilities. First, intense competition among legal and illegal spirits producers and traders might have held prices down as markets were liberalized. If vodka markets were more competitive than those for other goods, that might cause its relative price to fall. Second, in the early 1990s Russia's tax collection agencies were in disarray. An increasing failure to collect excises might have reduced vodka's retail price. In either of these cases, the underlying problem would be excessive market liberalization or weakness of the state. But a third hypothesis attributes low vodka prices not to too much market freedom but to misguided state interventions. Vodka was one of the commodities whose prices federal and regional governments continued to regulate in the early 1990s. Preventing too rapid a rise in the price of vodka was thought important for political reasons.

In Section 2, I review the evidence implicating alcohol abuse in Russia's mortality upsurge. Section 3 then explores why vodka consumption apparently rose so much during this period. Section 4 turns to the question why real vodka prices fell so sharply, and attempts to assess the roles of market competition, poor tax collection, and state price regulation. Section 5 concludes, comparing Russia's experience to that of some other countries.

³ It may also have stimulated some substitution from home-brew and industrial alcohol into ordinary vodka, but any health benefit from this was evidently overwhelmed by the increase in consumption.

2 Death in Russia

2.1 The role of alcohol

So far, Russia's mortality crisis has passed through four phases (see Table 1).⁴ Between 1990 and 1994, the crude death rate rose from 11.2 people per thousand to 15.7 per thousand; it then fell back to 13.6 per thousand in 1998, before rising to 16.4 per thousand in 2003.⁵ Finally, the rate moderated to 14.6 per thousand in 2007. For comparison, in recent years the crude death rate was 5.7 per thousand in Israel, 7.3 per thousand in Ireland, 9.2 per thousand in France and Spain, 10.3 per thousand in the UK, 13.9 per thousand in Serbia, 16.1 per thousand in Ukraine, 17.5 per thousand in Nigeria, and 18.4 per thousand in Rwanda.⁶

An obvious initial question is whether the reported changes are real or represent some statistical artifact. There are various reasons to worry about the accuracy of Russian vital statistics (Anderson et al. 1994). However, scholars who have tried to assess the quality of mortality data have concluded they are reasonably reliable (Gavrilova et al. 2000, Leon et al. 1997). Except for certain regions within Russia (the North Caucasus and Tuva), death reporting is believed to be high, although the cause of death reporting can be more problematic (Andreev 1999). The parallel shifts in the rates of death from different causes might seem to indicate some artifact in reporting such as errors in the population statistics, the denominator of the respective death rates. But the relative stability of cancer mortality in the early 1990s suggests this is unlikely (Leon et al. 1997).

The evidence connecting higher mortality in Russia to alcohol abuse—in particular binge

⁴ For an excellent review, see Brainerd and Cutler (2005). See also Shleifer and Treisman (2005).

⁵ The “crude” death rate measures the total number of deaths per 1,000 inhabitants. The “standardized” death rate is the number of deaths per 1,000 inhabitants, adjusted for differences across countries or across time in the age-composition of the population.

⁶ Figures for Israel, Ireland, France, Spain, the UK, Serbia, and Ukraine are for 2003, from WHO European Regional Office, European Health for All Database, <http://data.euro.who.int/hfad/>; for Nigeria and Rwanda, the figures are for 2000-05, from Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, *World Population Prospects: The 2006 Revision* and *World Urbanization Prospects: The 2005 Revision*, <http://esa.un.org/unpp>, downloaded April 28, 2007.

Table 1: Mortality rates in Russia, 1990-2007 (A. deaths per 1,000 people, B. deaths per 100,000 people)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
A. Standardized death rate, total	11.9	12	12.7	15	16.1	15.3	14.3	13.7	13.3	14.3	14.7	14.9	15.3	15.7	15	15.1	14	
Crude death rate																		
Total	11.2	11.4	12.2	14.5	15.7	15	14.2	13.8	13.6	14.7	15.3	15.6	16.2	16.4	16	16.1	15.2	14.6
Male	11.6	11.9	13.1	16.1	17.8	16.9	15.8	15	14.8	16.3	17.3	17.8	18.6	18.9	18.6	18.8	17.4	16.7
Female	10.9	11	11.4	13	13.8	13.3	12.8	12.7	12.6	13.4	13.5	13.6	14.1	14.1	13.7	13.8	13.3	12.9
By age, male																		
0-4	4.4	4.4	4.3	4.5	4.6	4.6	4.5	4.5	4.5	4.6	4.4	4.4	4.1	3.9	3.6	3.3	3	2.8
5-9	0.7	0.8	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.4	0.4
10-14	0.6	0.7	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5
15-19	1.6	1.7	1.8	2.1	2.1	2.4	2.2	1.9	1.9	2	2.1	1.9	1.8	1.7	1.7	1.6	1.6	1.5
20-24	2.6	2.7	3.2	3.8	4	4.3	4.2	3.9	4.1	4.5	4.9	4.4	4	3.9	3.9	3.8	3.4	3.2
25-29	3.3	3.5	4.2	5.1	5.5	5.4	5	4.6	4.6	5.2	6	5.8	5.7	5.9	6.1	6.5	6.2	6.7
30-34	4.3	4.5	5.5	7	7.7	7.4	6.6	5.9	5.8	6.5	7	7.1	7.3	7.5	7.8	8.2	7.8	7.4
35-39	5.6	5.9	7.1	9.3	10.6	10	8.6	7.7	7.5	8.4	9.1	9.4	9.9	10.2	10.2	10.3	9.1	8.5
40-44	7.6	8	9.8	13.3	15.2	14.1	12.2	10.6	10.2	11.5	12.7	13.1	13.9	14.4	14.2	14.3	12.4	11.4
45-49	11.7	11.6	13.5	17.8	20.8	19.3	17	14.8	14.4	16.2	17.9	18.7	19.6	20.1	19.5	19.4	16.7	15.3
50-54	16.1	16.5	19.4	25.3	29.1	27.3	23.7	20.4	19.5	22.3	24.4	25.7	26.9	27.9	26.8	26.9	23.6	21.3
55-59	23.4	23.3	25.3	31.3	36.2	34	31.1	29.5	28.6	31.5	33.4	33.9	34.7	35	34.4	34.4	31	28.6
60-64	34.2	34.6	36.9	45.3	51	47.1	43.1	40	38.1	42.5	44.5	46.4	49.4	49.7	47.5	46.9	41.7	39.1
65-69	46.6	47.3	49.4	59.4	64.2	61.3	58.3	56.9	55.3	59	59.5	59.9	61.2	60.6	59.2	58.8	55.1	53.6
70 or more	103.6	104	105.7	118.8	121.4	112	105.1	100	97	100.8	104	103.1	106.3	107.5	104.8	105.6	101.5	98.6
B. By causes																		
Diseases of circulatory system	617	620	646	769	837	790	758	751	749	816	846	865	907	928	895	908	865	834
Diseases of respiratory organs	59	56	58	75	81	74	68	64	57	65	70	66	70	71	65	66	58	55
Diseases of digestive organs	29	29	33	38	44	46	42	39	38	42	44	48	52	57	59	66	63	62
Alcohol poisoning	11	11	18	31	38	30	24	19	18	21	26	28	31	31	30	29	23	18
Suicide	26	27	31	38	42	41	39	38	35	39	39	40	38	36	34	32	30	29
Homicide	14	15	23	31	33	31	27	24	23	26	28	30	31	29	27	25	20	18

Sources: Goskomstat Rossii, *Rossiiskiy statisticheskiy yezhegodnik*, various years, *Demograficheskiy yezhegodnik Rossii* various years, GKS downloads, and *Current Statistical Survey*, 2007, 1. Standardized death rate is from WHO European Regional Office, European Health for All Database, <http://data.euro.who.int/hfad>.

drinking of spirits—is strong and has strengthened over time. First, the death rate rose particularly fast among groups known to engage in heavy drinking. The upsurge struck not the old or the young—usually the most vulnerable—but the middle-aged. Infant mortality *fell* from 17.4 deaths per 1,000 live births in 1990 to 11.0 per 1,000 in 2005. The death rate for children aged 0 to 14 was lower in 2005 than in 1990, and the rates for men and women aged over 70, although they jumped a little at first, quickly fell again in the mid-1990s and were below their 1990 level in 2006.⁷ By contrast, mortality for men and women aged 35-44 almost doubled between 1990 and 2005 (see Table 1). Total mortality has correlated very closely over time with that for working age males ($r = .97$ between 1960 and 2004) and closely with that for working age females ($r = .79$, same period) (see Figure 1). In Russia, men are far more likely to drink heavily than women (Nemtsov 2002). In line with this, the jumps have been much greater for men, whose crude death rate peaked at 17.8 per thousand in 1994 and then reached 18.9 per thousand in 2003.

Second, most of the additional deaths were caused by diseases and conditions known to be associated with or exacerbated by heavy drinking. Of the 648,000 more deaths in 2005 than in 1990, 384,000 were attributed to diseases of the circulatory system. Research has established a link between heavy drinking of hard liquor—especially binge drinking—and various kinds of heart disease (Shkolnikov et al. 1997, McKee and Britton 1998). Annual cases of alcohol poisoning increased by 24,800. There were 6,900 more suicides and 14,500 more homicides in 2005, both of which are associated with alcohol in Russia, as well as 15,000 more deaths from alcoholic liver diseases and 4,500 more from “mental and behavioral disorders due to use of alcohol.” There were also 33,000 more deaths from pneumonia, susceptibility to which is known to be higher among alcoholics. (This fully accounts for the increase in deaths from respiratory diseases in Table 1.) These figures probably underestimate alcohol’s role because in Russia alcohol-related deaths are often certified as due to other causes (Moiseev and Ogurtsov 1995). By contrast, some non-alcohol-related causes of death fell impressively in this period. Annual deaths from cancers of digestive organs fell by 11,000. The rate of lung cancer also fell sharply during the 1990s (Brainerd and Cutler 2005).

⁷ Among 80-84-year-old men, the death rate was lower in 2005 than 1990 (Goskomstat RF 1996a, 2006).

Third, the temporal pattern of Russian mortality fits closely with changes in estimated alcohol consumption. Although statistics on alcohol consumption are notoriously unreliable in Russia because of home brewing and unofficial sales, and although the total amount drunk is less important than *how* it is drunk (in small quantities or in binges, in hard liquor or wine and beer), estimates suggest that total consumption fell sharply during Mikhail Gorbachev's anti-alcohol campaign in the mid-1980s but then rose dramatically in the early 1990s. Nemtsov (2002) estimates that the average Russian drank 14.2 liters of pure alcohol in 1984, 10.6 liters in 1987, 12 liters in 1990, and 14.6 liters in 1994, before moderately reducing the quantity until 1998. The decrease, increase, and then decrease in alcohol consumption coincide with parallel movements in mortality. These changes in the aggregate death rate reflected big changes in alcohol-related causes of death. Across Russia's regions, a larger improvement during Gorbachev's anti-alcohol campaign was typically followed by a larger deterioration after it ended (Shkolnikov et al. 1997). Figure 2 shows the pattern of change in estimated alcohol consumption and mortality for working age males.⁸

Based on both a cross-national regression on 22 postcommunist countries and a longitudinal analysis of deaths in the RLMS survey in Russia, Brainerd and Cutler (2005) estimate that alcohol consumption explains about one quarter of the increase in deaths in the 1990s. Given the likelihood that alcohol consumption—both national estimates and self-reports by survey respondents—is measured with considerable error in Russia, one might expect substantial attenuation bias, and so these estimates should probably be treated as lower bounds.⁹ From examining the detailed cause of death statistics, Nemtsov estimates that alcohol-related deaths were about 234,000 higher in 1994 than in 1984, representing about

⁸ The alcohol consumption estimates are from Nemtsov (2002), who averaged the estimates of three separate researchers for the years 1980-94, and updates from Nemtsov (2009).

⁹ For instance, Simpura et al. 1997 (quoted in Nemtsov 2002, p.1422), estimated that up to 60 percent of actual alcohol consumption was not captured in interviews and questionnaires in Russia. Another problem is that, according to Denisova (2009), the death rate for working age men in the RLMS is far lower than the actual national death rate for working age men (see below).

34.5 percent of the increase in deaths between those years.¹⁰ He calculates that between 1986 and 1991 the anti-alcohol campaign saved 1.22 million lives (Nemtsov 2002), and that between 1990 and 2001 some 400,000 to 700,000 people died prematurely because of alcohol (Tapilina 2007). Another recent study by Leon et al. (2007) estimated that in the city of Izhvsk in 2003-5, 43 percent of deaths of working age men could be traced to hazardous drinking.

Even at the micro level, the time trends of mortality and alcohol consumption match: deaths in Russia increase on weekends, when binge drinking is most common. Chenet et al. (1998) studied death certificates in Moscow in 1993-5, and found that deaths from alcohol poisoning, accidents, violence, and cardiovascular diseases were all significantly higher on Saturdays, Sundays, and Mondays. Among 35 to 39-year-olds, they found “almost 10 percent fewer deaths than would be expected on Tuesdays and almost 15 percent more deaths than expected on Saturdays” (Ibid. p.773).

Some alcohol-related diseases such as cirrhosis of the liver take years to become critical. So it might seem strange to see a relationship between increased heavy drinking and death within a single year—or even a weekend. Of course, a single binge may explain cases of homicide, suicide, accidents or alcohol-poisoning. Perhaps more surprisingly, recent research has established that binge drinking can lead to sudden death from myocardial infarction (Chenet et al. 1998). Bingeing is widespread in Russia. For instance, in Novosibirsk, Siberia, a survey in 1994-5 found that 51 percent of male respondents binged (i.e. drank at least 80g of pure alcohol at one sitting) at least once a month (Malyutina et al. 2001). For comparison, in the US in 1997, 24 percent of men were estimated to drink more than 60g of pure alcohol at least once a month (Ibid., p.993). Even with cirrhosis, an increase in heavy drinking by those whose livers are already compromised can turn a chronic condition into a life-threatening crisis.

Finally, geography offers additional evidence for the role of alcohol. Not all of Russia’s 89 regions experienced a large increase in mortality in the 1990s. The increase—and the mortality rate itself—were much lower in most predominantly Muslim regions, where the use of alcohol is culturally

¹⁰ Nemtsov (2002) estimates total alcohol related deaths in 1984 at 517,000 and in 1994 at 751,000. Total deaths increased between these years by 678,000.

discouraged. In Dagestan, for instance, the crude mortality rate actually fell from 6.2 per thousand people in 1990 to 5.9 per thousand in 2005, while the national rate was increasing from 11.2 to 16.1. Although one cannot infer directly from regional to individual level relationships, the change in mortality between 1990 and 2005 correlates negatively with the estimated proportion of Muslims in the region's population at $r = -.53$.

2.2 Other causes

A number of other factors may have contributed to higher mortality. Some have suggested that poverty and malnutrition after the Soviet collapse were the real causes. In 1999, the Communist faction in parliament tried to impeach Yeltsin for, among other things, "genocide against the Russian people by pursuing economic policies that impoverished the country."¹¹

On the role of poverty, the evidence is mixed. On one hand, there is a *negative* correlation over time ($r = -.46$) between the proportion of Russians in poverty and the death rate. In both 1993-94 and after 2000, the death rate soared as the poverty rate was falling. If poverty were responsible, one might expect to see the biggest jump in mortality among the most economically vulnerable groups, children and the elderly (Cutler et al. 2002). In fact, the largest increase was among Russians of working age. On the other hand, studies have identified an association between higher poverty and a higher mortality rate at the regional level, which I confirm below (Ivaschenko 2005). It is possible that poverty contributed, although other factors such as alcohol abuse were more important in determining the time trend and age breakdown.

However, there is little evidence that malnutrition had much to do with falling life expectancy. Far from deteriorating, surveys suggest the average nutrition of Russians improved during the 1990s. Using the nationally representative RLMS panel survey, researchers found no sign of serious malnutrition in Russia during the crisis years of 1992-3 (Shkolnikov, McKee, and Leon 2001, Stillman 2006). In fact,

¹¹ John Thornhill, "Russia: Zyuganov moves against Yeltsin," *Financial Times*, 10 May 1999.

the share of Russians whose body weight increased during these years exceeded the share who lost weight. Nor did this reflect a deterioration in the quality of diets: “In some ways, the nutrition was even healthier than before the reforms because of a decrease in fat consumption which was very high in the early 1980s” (Shkolnikov, McKee, and Leon 2001). Especially early on in the transition, consumption of fruit and vegetables fell, but only slightly. As of 1998-2000, only 5 percent of the population was undernourished—a lower rate than in Brazil (10 percent), Bulgaria (15 percent), Croatia (18 percent), or Venezuela (21)—and by 2001-3, Russia’s rate had dropped to 3 percent, on a par with Estonia (UN 2002, 2006a).

Some observers have blamed underfunding of Russia’s healthcare system (Rozenfeld 1996, DaVanzo and Grammich 2001). Since 1991, government spending on healthcare has ranged between about 2 and 3.25 percent of GDP. Given the fall in GDP during the early 1990s, this made for a large contraction in real terms in 1992 and then again right after the 1998 financial crisis. Chronic problems certainly afflict Russian healthcare. Even in 2003, one third of hospitals had no hot water, and nine percent had no running water at all. In panel regressions, some have found that regional government spending on healthcare correlates negatively with mortality (Ivaschenko 2005).

Still, some doubt that deteriorating healthcare explains much of the recent mortality changes (Shkolnikov et al. 1998; Gavrilova et al. 2002, p.9). Although hospitals are poorly equipped, in some ways they have improved: in 1995, even larger shares had no hot or running water (40 and 13 percent respectively). The number of doctors per person in Russia—already among the highest in the world—increased in the 1990s.¹² Various measures of healthcare performance improved. As noted, after an initial rise, infant mortality fell consistently. Rates of vaccination for tuberculosis, diphtheria and other diseases increased. As of 1999, Russia inoculated a larger share of one-year-olds against tuberculosis and measles than did France, Italy, Ireland, Greece, Korea, and Chile (96 and 97 percent respectively). The proportion

¹² However, some argue that they are narrowly and inappropriately trained (DaVanza and Grammich 2001).

of adults receiving scheduled medical checkups rose from 89 percent in 1990 to 92 percent in 2005 (Goskomstat RF 2006b, UN 2002b).

Emergency medicine might have been especially hard hit. If deteriorating acute care were the problem, one would expect to see more fatalities for a given number of heart attacks, strokes, and so on. However, “the fatality rate after an adverse health event seems to have changed little during the 1990s” (Brainerd and Cutler 2005, p.114). What increased was the number of adverse health events. Did these increase because patients could no longer afford their medications? Comprehensive data on this are not available. However, in the RLMS survey at least, the share of the population taking regular medications did not decrease (Ibid., p.115).

One might think to blame rising mortality on environmental degradation.¹³ However, most types of pollution have improved since 1990. Emission of pollutants into the air from stationary sources fell from 34 million tons a year in 1990 to 20 million tons in 2005. Although many more cars are on the roads, pollution from automobiles fell in the same period by about 27 percent. Discharges of sewage and industrial waste into rivers and estuaries decreased from 28 billion cubic meters in 1990 to 18 billion in 2005 (Goskomstat RF 2006b). Deaths of children from respiratory diseases have not increased (Shkolnikov et al. 1998, pp.2007-8).

Finally, some other widely noted health problems cannot explain the crisis. Although smoking is common in Russia and probably increased slightly during the 1990s, higher mortality was not caused by a rise in smoking related illnesses.¹⁴ Rates of and deaths from lung cancer have both fallen. New lung cancer diagnoses fell from 46 per 100,000 people in 1990 to 41 per 100,000 in 2004. The crude death rate from malignant tumors of the respiratory organs and thorax fell by 13 percent between 1990 and 2005 (Goskomstat RF 2005a, 2006a). Tuberculosis has been spreading in Russia and deaths from it have tripled since 1990 to 23 per 100,000 in 2005. But the rise still comprises less than three percent of the

¹³ Feshbach (1999) argued that: “Environmental issues lurk behind much of the public-health problem.”

¹⁴ Data from the Russian Longitudinal Monitoring Survey suggest the prevalence of smoking among men rose from 57 percent in 1992 to 63 percent in 2003 (from 7 to 15 percent for women) (Perlman et al. 2007).

total increase in deaths during these years. Although HIV infection is also spreading fast, the number of deaths from AIDS remains minute—about 2.5 per 100,000 people in 2007, or about 0.2 percent of the total.

3 Why the increase in dangerous drinking?

What can explain the rapid increase in alcohol abuse, especially among working age males, in the 1990s? It might be that Russians were driven to drink by the stress of economic transition. Gavrilova et al. (2000, p.415) argue that: “Social and economic instability, loss of social capital, and an uncertain future increased the level of aggression and anxiety in Russian society which led to an increase in alcohol consumption.” Walberg et al. (1998, p.317) quote Durkheim: “whenever serious readjustments take place in the social order, whether or not due to a sudden growth or to an unexpected catastrophe, men are more inclined to self destruction.”¹⁵ Some indirect evidence has been found linking economic change to higher death rates in cross-sectional regressions of Russian regions. Walberg et al. (1998) found that regions with greater job turnover had larger drops in life expectancy in the early 1990s. I confirm this below.

Some Russians undoubtedly sought relief from the hardships of transition in heavy drinking. However, a variety of evidence is at odds with the hypothesis that this was a major cause of increased alcohol abuse and death. The Russian Centre for Public Opinion Research (VCIOM), probably the country’s most respected polling organization, conducted regular nationally representative surveys between 1993 and the present.¹⁶ One question asked: “Which of the following statements most closely corresponds to the current situation? 1. Everything is not so bad, and it is possible to live. 2. It is difficult to live, but it is possible to endure. 3. It is no longer possible to endure our disastrous situation.” The frequency with which respondents chose the third answer seems a reasonable proxy for the level of stress and despair in society (at least among those not too despondent to participate). Figure 3 plots the share

¹⁵ See also Shkolnikov et al. (1998), Brainerd and Cutler (2005).

¹⁶ In 2003, the team from VCIOM moved to the so-called Levada Centre, which continued the surveys.

that picked this option. As can be seen, the proportion saying they could no longer endure their disastrous situation is strongly *negatively* correlated over time with mortality ($r = -.71$). The death rate actually fell in years when more people reported reaching the end of their endurance. Another question asked: “What would you say about your mood in recent days?” and gave the options “excellent,” “normal, balanced,” “tense, irritated,” and “fearful, melancholy.” The proportion picking “fearful, melancholy” also correlated negatively over time with mortality ($r = -.79$). By almost any indicator, public discontent and anxiety rose in the mid-1990s, peaking around 1998, and then fell sharply as economic recovery began and the Putin administration appeared to be restoring some aspects of social order. But the death rate from alcohol-related causes dropped in the mid-1990s, and then began rising again after 1998.

Some scholars recognize that mortality was falling in 1994-98, as unemployment rose, wage arrears accumulated, and strikes became relatively frequent. Gavrilova et al. (2000, p.415-6) account for this by arguing that although conditions might be objectively worse during these years, Russians were adapting to the changes: “The recent decline in mortality demonstrates the capacity of the Russian people to adapt to changes in life style and living standards.” Walberg et al. (1998, p.317) note that Durkheim expected self-destructive behaviors to recede once individuals repositioned themselves in the new social order. However, in surveys Russians deny that by the late 1990s they were adapting to the new realities. Since 1998, VCIOM and its offshoot, the Levada Center, included a question: “Have you and your family already adapted to the changes that happened in the country during the last ten years?” As of October 1998, only 28 percent said they and their family had adapted, and 40 percent insisted they would “never be able to adapt.”¹⁷ It was precisely in the period after 1999—as the mortality rate was rising sharply again—that growing numbers of respondents started to say they were adapting. As the death rate climbed, the share saying they “could never adapt” fell to 25 percent in December 2002.

Additional evidence on this comes in answers to several questions on the Russian Longitudinal Monitoring Survey, which interviewed a nationally representative sample of Russian households at yearly

¹⁷ VCIOM poll of 1,608 respondents, available at <http://sofist.socpol.ru>.

Table 2. Characteristics of heavy drinkers in Russia, from the RLMS

	Percent of respondents answering the question who reported...					
	Frequent drinking (drinking alcohol at least once a week during previous 30 days)			Bingeing (drinking 80 grams or more of vodka, home brew, or other hard liquor in one day)		
	1994	1998	2002	1994	1998	2002
<i>Among all respondents</i>	20	16	25	29	29	27
<i>Among respondents who were alone when answering survey</i>	19	18	24	30	29	27
<i>Among respondents judged to be "significantly more sincere and open than most respondents"</i>	19	15	23	29	26	22
<i>Gender</i>						
Male	35	28	41	45	40	40
Female	8	8	13	16	21	16
<i>Age</i>						
Over 50	15	12	18	29	31	28
20 – 50	25	21	32	47	42	40
<i>Residence</i>						
City, town, urban settlement	21	18	27	29	29	27
Countryside	17	13	20	30	29	25
<i>Income</i>						
Highest third	29	24	34	50	45	42
Middle third	15	13	19	31	31	27
Lowest third	17	13	22	32	29	17
<i>How satisfied are you overall with your life at present?</i>						
Completely satisfied	24	17	25	39	29	28
Completely dissatisfied	18	13	22	34	32	33
<i>How worried you may lose your job?</i>						
Very worried	22	19	28	44	44	42
Not worried at all	31	24	37	50	44	42
<i>"I cannot cope with my problems."^a</i>						
Completely agree			17			21
Completely disagree			29			34
<i>"I often feel helpless before the problems that arise in my life."^a</i>						
Completely agree			15			21
Completely disagree			33			35

Source: Author's calculations from Russian Longitudinal Monitoring Survey.

^a question only asked in 2002 survey.

intervals during the 1990s.¹⁸ As Table 2 shows, the proportion of respondents that said they drank alcohol at least once a week was 20 percent in 1994, had fallen to 16 percent by 1998, but then rose again to 25 percent in 2002. The share saying that during the previous month they had drunk 80 grams or more of liquor in one day, which I take as a working definition of “bingeing,” was relatively stable at around 27-29 percent.

Heavy or frequent drinking might carry a social stigma or provoke disapproval of family members, so one might worry that respondents did not give complete and accurate accounts. Although the time trend in self-reported drinking levels in the RLMS corresponds to the trend in other estimates—and to the mortality trend—measures of total alcohol consumption based on the RLMS are substantially lower than those derived using other methodologies (e.g. from sales data and estimates of underground sales and production) (Nemtsov 2004). Some other questions in the RLMS can serve as a rudimentary check on the reliability of respondents’ answers. First, interviewers noted whether the respondent answered the survey alone or in the presence of family members or friends. Second, interviewers recorded their impression of how sincere and open the respondent was. One might expect respondents who were interviewed alone and who seemed particularly open and sincere to give more accurate—and presumably higher—estimates of their drinking. However, this was not the case (see Table 2, rows 2 and 3). In fact, these respondents gave very similar reports of the frequency and amount of their drinking—and in some cases were less likely to report bingeing.¹⁹ This provides at least some reassurance about the reliability of answers.

As found in other surveys, both frequent drinking and bingeing were much more common

¹⁸ Information about the survey is at <http://www.cpc.unc.edu/rlms/>. Respondents were from a stratified sample of about 4,000 households. The total number of individuals was 11,284 in 1994, 8,701 in 1998, and 10,499 in 2002. Baltagi and Geishecker (2006) used the RLMS to test a model of rational alcohol addiction. They conclude that the data for women were not consistent with the predictions, and that those for men were only consistent if one assumed a negative discount rate.

¹⁹ It could be that bingers, while admitting to heavy drinking, tended to appear insincere answering other questions—for instance, how much they earned or spent on family necessities.

among men than women, and among the young and middle-aged than among the old. Drinking may have been more frequent, though not necessarily heavier, among urban than among rural respondents.²⁰ Those with higher income tended both to drink more frequently and to be more likely to report bingeing. That does not mean that a rich drinker typically consumed more than a poor drinker. In fact, Andrienko and Nemtsov (2005) show with data from the RLMS that the total amounts drunk by drinkers with different incomes describe a U-shape, with both the poor and the rich drinkers consuming more than their middle-income peers, and with the poor drinking even more than the rich, the difference made up of home-brewed spirits. It may be that more poor individuals do not drink at all, either by choice or by necessity. But among those that do, the quantities consumed are relatively high.

A number of questions concern respondents' mood. One asked: "How satisfied are you overall with your life these days?"; options ranged from "completely satisfied" to "completely dissatisfied." Those who were "completely dissatisfied" were slightly less likely to say they drank at least once a week than those who were "completely satisfied." In 1994, "completely dissatisfied" respondents were also less likely to report bingeing, but this pattern reversed in 1998 and 2002. Respondents who were "not worried at all" about losing their jobs were more likely to drink frequently than those who were "very worried," and in 1994 were more likely to binge. Finally, the 2002 survey asked some more detailed questions about respondents' psychological state. Those who completely agreed that they "could not cope" with and felt "helpless before" their problems reported drinking less often and less heavily than those who completely disagreed with these statements. In sum, the RLMS data do not suggest that it was disproportionately the more depressed and anxious Russians who were drinking to excess.

Regional opinion polls from the early 1990s were not available. However, one can get a rough idea of the regional pattern of anxiety caused by the economic crisis by examining the results of a national referendum held in April 1993. The referendum's second question asked: "Do you support the social-economic policies undertaken by the President and the Government of Russia from 1992?" A high

²⁰ Those in the countryside were more likely to report bingeing on home brew, although still only 11 percent of rural respondents acknowledged having done so recently in 2002.

regional “no” vote would suggest greater discontent about the course of transition. However, across regions there is a moderate negative correlation between the share of respondents voting “no” on this question and the regional increase in mortality in 1990-94 ($r = -.46$). In regions where more residents rejected the government’s radical reforms, the death rate rose more slowly. It might be that those driven to self-destructive behavior would not vote. But regional turnout in the referendum did not correlate with the change in mortality either.

It could still be, however, that in regions where reforms were proceeding fastest, causing the most dislocation, there were greater extremes of opinion—on the one hand, more supporters of reform, on the other more desperate losers from the transition. This would not explain the negative correlation between the national death rate and the level of reported stress over time. But some have presented indirect evidence for a cross-sectional effect. The pattern of job turnover across regions correlates in the early 1990s with the change in mortality rates. I will return to this.

I argue here that the increase in heavy drinking of hard liquor in Russia, which explains much of the rise in mortality, resulted largely from an increase in the affordability of vodka. In December 1990, the average Russian monthly income would buy 10 liters of ordinary quality vodka; four years later, in December 1994, it would buy almost 47 liters. Initially, vodka became much more affordable because of a dramatic drop in its relative price. Price liberalization caused most prices to soar in the early 1990s. But the nominal price of ordinary quality vodka rose much more slowly. As a result, the real price fell sharply (see Figure 4).²¹ While the price of a liter of vodka rose by 465 times between December 1990 and December 1994, the consumer price index shot up by 2,041 times. The sharp drop in the real price of vodka reversed the upward trend of the 1970s and 1980s. Not only did vodka become much more affordable, it also became much cheaper relative to beer, the price of which was rising faster than the average wage. In 1990, one could buy 27 liters of beer for the price of a liter of vodka. By 1994, this had

²¹ Throughout the paper, the vodka prices I refer to are for “ordinary quality” domestic brands such as Russkaya or Moskovskaya, not imported or higher quality brands. Data on prices of vodka and other consumer goods are gathered by agents of the state statistical agency, Goskomstat, who monitor retail prices in traders of all ownership forms, including sales by individuals (Goskomstat RF 1996b, p.430).

dropped to just 4.5 liters of beer. Although data on alcohol sales are probably quite incomplete because of unofficial trade, recorded sales nevertheless changed as economic theory would predict. Officially registered vodka sales rose by 52 percent in 1990-94, while sales of beer fell by 12 percent.

In the years after 2000, the real vodka price dropped only slightly. Nevertheless, the affordability of vodka surged once again, mostly because of the rapid growth of incomes as the economy recovered. Real disposable income rose by 90 percent between 1999 and 2005.²² As a result, by December 2005 the average monthly income would buy almost 87 liters of ordinary vodka at the current price. The increase in mortality associated with this was less steep than before, however, because of increasing substitution into beer as its price fell a bit relative to that of vodka after 2002 and as tastes changed to favor more up-market beverages.²³ Figure 5 plots the affordability of vodka against the mortality rate for working age males.

A few years merit special attention. In 1991, the affordability of vodka rose sharply, but with little immediate effect on mortality. The explanation is simple. During 1991, prices were administratively set, the supply system remained largely under state ownership, and almost every consumer good—including vodka—was in short supply. Even in Moscow, a “land of plenty” compared to the provinces, vodka was being sold only with ration cards as of November 1991.²⁴ According to the city’s mayor, Gavriil Popov, the worst shortages were in vodka and sugar, a main ingredient of home-brewed liquor.

²² Calculated from Goskomstat information at http://www.gks.ru/free_doc/2007/b07_11/07-01.htm.

²³ During the 1990s, the alcohol content of Russian beer was increasing on average. Until 1994, Goskomstat Rossii used a figure for the average alcohol content of beer of 2.85 percent; from 1995-9, it used the figure 3.37 percent; then from 2000 it used 3.89 (I thank an anonymous referee for alerting me to this). This does not affect the arguments made about relative prices in the periods 1990-94 and after 2002, during which no adjustments to alcohol content took place. Looking at the entire period, the price of one ml of pure alcohol obtained in beer went from .52 of the price of one ml of pure alcohol obtained in vodka in 1990 to 2.6 times the price of one ml of pure alcohol obtained in vodka in 2002, before falling back to 2.1 times the price of one ml of pure alcohol obtained in vodka in 2006 (my calculations from Goskomstat Rossii data).

²⁴ See, e.g., Larisa Kislinskaya, “Control Bodies Warn Food Shortage Will Worsen in Moscow,” ITAR-TASS, November 13, 1991.

Muscovites were allowed to buy only one liter of vodka a month and 2 kg of sugar.²⁵ As a result, the greater affordability of vodka in theory did not prompt a corresponding upsurge in binge drinking, alcohol poisoning, accidents, or heart attacks. However, with price liberalization in 1992, vodka and other kinds of liquor became much easier to obtain, and mortality shot up, even though the plunge in the real vodka price was now partially offset by a drop in real incomes. In 1997-8, and again in 2006, the death rate was falling, even though the affordability of vodka was increasing. I do not have a good explanation for these years.²⁶ In far more of the years, the two trends were heading in the same direction.

The importance of the price of vodka is suggested also by panel regressions of regional mortality in the years 1995-2006. Vodka prices varied greatly across regions. In 1992, in the most expensive, Karachaevo-Cherkessia, a liter of vodka cost 4.5 times the price in the cheapest region, Mordovia. In 2006, the price still differed between the most expensive region, Chukotka, and the cheapest, Ingushetia, by a factor of 4.3. The coefficient of variation of the regional price fell from 1992 to 2000, only to start rising again to 2006.

Table 3, columns 1-2, shows panel regressions of the regional death rate for working age men on the number of liters of vodka that could be bought with the average regional monthly income. It is not clear a priori whether one should expect a linear relationship between the affordability of vodka and the death rate or a relationship in which a proportional change in one induces a proportional change in the other. I show models here in which both variables are logged, permitting one to interpret the coefficients as elasticities. I get similar results, although less statistically significant, with unlogged variables. Results for working age women are similar (see appendix Table A1).²⁷ I estimate the first model using OLS with panel corrected standard errors (Beck and Katz 1995) that correct for contemporaneous correlation and

²⁵ Sergei Shargorodsky, "Soviets Brace for Another Hard Winter, Food Shortages," Associated Press, September 10, 1991; Popov (1994, pp.100-101).

²⁶ In 2006, a temporary disruption to vodka supply may have played some role.

²⁷ The coefficients on the vodka price in logged models for women are similar to those for men (since they represent percentage changes), but in linear models they are much lower, since the base death rate is lower.

panel heteroskedasticity, including regional and year fixed effects to avoid bias due to omitted regional characteristics or common shocks.²⁸ In column 2, I estimate the model using the Arellano-Bond one-step dynamic panel GMM difference estimator (with robust standard errors). Columns 3-5 show otherwise identical models with the affordability variable broken down into the (logged) real price of vodka and (logged) real average income, both deflated by the regional CPI.²⁹ Besides the dependent variable, which is treated as endogenous in all the Arellano-Bond regressions, in column 2 I treat log liters of vodka per average monthly income as endogenous; in column 4, the log vodka price is modeled as endogenous, and in 5 both the log vodka price and the log of income are treated as endogenous; other variables are treated as predetermined. I experimented to find the most appropriate set of lags to use as instruments on the basis of the Arellano Bond second order correlation test and the Hansen test of exogeneity of the instruments. (Since too many instruments can inflate the probability values of the Hansen test, I followed

²⁸ Data were available for male and female working age mortality rates by region only from 1994-2006. (In a previous version of the paper, data were only available up to 2005; I have been able to update.) The data on the death rate were available for all of Russia's 89 regions except Chechnya (and, in 1994, neighboring Ingushetia). However, the vodka price, income, and consumer price index data were missing in some years for some or all of the 10 small autonomous okrugs, plus Chechnya and Ingushetia, as were data for some of the controls. Since data on regional health spending were only available from 1995, regressions could only start in that year. The Arellano-Bond regressions, since they require a lag of each endogenous independent variable, could only start from 1996. This explains why the number of observations drops in certain regressions.

²⁹ The income figures are averages for the year; since I only had data for end year vodka prices, I estimated the average price for the year by averaging the December price from the given year with the December price from the previous year. Results using the December price and the average income for the year are similar. I was reluctant to use December monthly income rather than average income for the year since end year bonuses mean that December income is often vastly higher than income in other months.

Table 3. Affordability of Vodka and Mortality in Russia's Regions, 1995-2005
(Dependent variable is log of deaths per 1,000 working age males)

	(1)	(2)	(3)	(4)	(5)
Log liters of vodka per avge. monthly income	.07** (.03)	.45** (.20)			
Log vodka price (avge. for year ^a , in 1992 rubles, deflated with CPI)			-.06* (.03)	-.21*** (.06)	-.12* (.07)
Log average income (1992 th. Rs, deflated with CPI)	.06 (.04)	-.32* (.19)	.13** (.05)	.13*** (.04)	.38** (.18)
Proportion of population Muslim	-1.97*** (.36)	-1.52** (.62)	-1.97*** (.36)	-1.18** (.53)	-1.31* (.70)
Unemployment (proportion of ec. active pop., end year)	-.04 (.06)	-.05 (.06)	-.04 (.06)	-.07 (.06)	-.07 (.06)
Job turnover (job gains + losses per worker, large and med. ents.)	.06* (.04)	.05** (.02)	.06* (.04)	.04* (.02)	.02 (.02)
Poverty rate (pop. share with income below min. subsistence)	.09** (.04)	.05 (.03)	.09** (.04)	.06*** (.02)	.13** (.05)
Inflation rate	.05 (.03)	-.03 (.03)	.05* (.03)	.03** (.01)	.06** (.03)
Lagged log regional budget health and sports spending (1992 rubles, deflated with non- food CPI)	.02*** (.001)	.03*** (.01)	.02*** (.001)	.02*** (.00)	.01* (.01)
Proportion of population above working age ^b	.99*** (.33)	.09 (.58)	.99*** (.33)	.28 (.43)	.08 (.57)
Proportion of employed pop. with higher education	.05 (.06)	.01 (.04)	.05 (.06)	.03 (.04)	.01 (.04)
Proportion of population urban	.05 (.09)	.08 (.11)	.05 (.09)	.16 (.13)	.13 (.13)
Lag of dependent variable		.38*** (.11)		.51*** (.08)	.50*** (.07)
1996	.66*** (.18)	.05 (.03)	.85*** (.14)	.04** (.01)	.08** (.03)
1997	.62*** (.18)	.05 (.05)	.82*** (.13)	.02 (.02)	.06** (.03)
1998	.56*** (.19)	-.14*** (.05)	.76*** (.14)	-.06** (.03)	.05 (.07)
1999	.63*** (.19)	.03 (.03)	.83*** (.14)	.05*** (.02)	.12*** (.05)
2000	.66*** (.19)	.05** (.03)	.86*** (.14)	.06*** (.02)	.12*** (.04)
2001	.66*** (.19)	.04* (.02)	.86*** (.14)	.05*** (.01)	.09*** (.03)
2002	.69*** (.19)	.05*** (.01)	.89*** (.14)	.07*** (.01)	.11*** (.03)
2003	.71*** (.19)	.06*** (.01)	.91*** (.14)	.06*** (.01)	.09*** (.02)
2004	.71*** (.19)	.05*** (.01)	.91*** (.14)	.06*** (.01)	.08*** (.02)
2005	.72*** (.20)	.06*** (.00)	.92*** (.15)	.06*** (.00)	.08*** (.02)
2006	.67*** (.20)		.87*** (.15)		
R-squared	.9992		.9992		
N / Number of groups	838 / 77	760 / 77	838 / 77	760 / 77	760 / 77
Method	OLS, PCSE	A-B	OLS, PCSE	A-B	A-B
Number of instruments		59		60	49
which lags used		3 rd and 4 th		2 nd and 3 rd	2 nd
Endogenous, besides dep. var.		Log liters per monthly income		vodka price	vodka price, income
Arellano-Bond test for AR(2), p		.65		.69	.39
Hansen test, p		.55		.69	.24

Sources: See appendix. Standard errors in parentheses. * p < .10, ** p < .05, *** p < .01. OLS regressions contain regional and year fixed effects, no constant; PCSE: panel-corrected standard errors (Beck and Katz 1995); Arellano-Bond regressions calculated with one-step difference GMM with robust standard errors, (using xtabond2 in Stata). ^a calculated as mean of Dec.price for previous and current year. ^b over 59 (men), over 54 (women).

the common rule of thumb of keeping the number of instruments less than the number of groups (Roodman 2007).) I used the third and fourth lags of the endogenous variables as instruments in column 2, the second and third lags in column 4, and just the second lags in column 5.

I include a set of standard controls, first of all for various demographic variables that might affect the death rate—the proportions of the regional population that were urban and that were above the working age, and the share of the regional employed population with higher education. I also control for the proportion of the region’s population that was Muslim. Because of the Islamic proscription of alcohol, one would not expect the affordability of liquor to affect mortality as much within the Muslim population.³⁰ Previous analyses found that unemployment, and more generally job turnover, were associated with higher mortality, and interpreted this as showing the effects of psychological distress caused by economic transition. I therefore control for both the unemployment rate and the rate of job turnover (total job gains plus job losses per 100 workers in large and medium enterprises; data were unavailable for smaller firms). Following other studies, I control for the poverty rate, and, to capture differences in performance of the health system, the logged regional government spending per capita on healthcare (Walberg et al. 1998, Ivaschenko 2005, Kennedy, Kawachi, and Brainerd 1998).³¹ As in Ivaschenko (2005), I lag the healthcare spending variable by one year to reduce the risk of picking up an effect of mortality on healthcare spending rather than the reverse. I also control for the inflation rate to measure economic dislocation (Brainerd and Varavikova 2001).³² Remaining regional heterogeneity should be picked up by the regional fixed effects. Detailed variable definitions and sources are in the appendix.

³⁰ I used data from the 1989 and 2002 censuses and interpolated entries for the other years, assuming that the proportion Muslim changed linearly along the trend defined by the two census points.

³¹ The data are actually for “healthcare and sport”—a finer breakdown of regional spending was not available for all years. Spending on sport was relatively small. In a previous version of the paper, I also controlled for the crime rate; however, a referee has convinced me that the crime figures are too unreliable, reflecting regional differences in enforcement as much as underlying crime rates, so I have dropped this control.

³² I get similar results controlling for the square of the inflation rate, as in Brainerd and Varavikova (2001).

Although caution is merited in making cross-level inferences from ecological regressions, the results suggest that lower vodka prices were associated with statistically significant increases in mortality. The more liters of vodka one could buy in a given region with the average income, the more working age men died there.³³ It is hard to be certain about the size of the effect since estimates change depending on the model estimated. The Arellano-Bond estimations (columns 2, 4, 5), have the virtue of explicitly modeling the price and affordability of vodka as endogenous, which they very well may be. In column 5, income is also treated as endogenous. This results in considerably larger estimated elasticities than in OLS with regional and year fixed effects. The drawback of the Arellano Bond method is that results tend to depend somewhat on the instruments chosen, and tests of the exogeneity of the instruments are imperfect (Roodman 2008). Running the model in column 4 with different sets of lags as instruments, I found coefficients on the log vodka price that varied between about -.17 and -.24, almost always statistically significant. As expected, higher income—which increases the alcohol abuser’s purchasing power—was also associated with higher mortality. The elasticity is much higher in column 5, in which income is modeled as endogenous.³⁴ Bearing in mind all the caveats, it appears likely that the elasticities of male working age mortality to the relative price of vodka and to income are substantial. A 10 percent increase in the affordability of vodka would probably translate into a rise of several percent in the male working age death rate.

As expected, increases in the proportion of Muslims in a region were associated with decreases in mortality, consistent with the fact that Muslims tend to drink less. As in previous studies, there was some evidence that higher job turnover and more widespread poverty were associated with higher regional mortality. Inflation was sometimes significantly positive, consistent with the view that greater economic

³³ The same was true for women; see Table A1.

³⁴ Interestingly, the estimated effect of income in column 2, which already controls for the affordability of vodka, is negative. This is highly intuitive. Higher income has two effects on mortality. It permits greater alcohol consumption, which increases mortality, but it also may be associated with improvements in diet, preventive healthcare, and other factors that reduce mortality. In other countries, rising incomes have also often led eventually to substitution into higher status drinks such as wine and beer—beverages that cost more per unit of alcohol, and also have less severe health risks because it requires a greater volume of consumption to trigger heart failure or alcohol poisoning.

disruptions increase mortality. Somewhat surprisingly, the regional level of healthcare spending was positively related to mortality, suggesting that some reverse causation may have remained despite lagging the variable. A larger elderly population was also associated with higher working age male mortality in the OLS regressions; why this should be the case is not clear, and it disappears in the Arellano-Bond regressions.

In Table 4, I attempt to trace the path by which the prices of vodka and beer as well as income affected sales of alcohol, and then mortality. Were the data on alcohol sales reasonably reliable, it would have been logical to start with this. Unfortunately, data on alcohol sales are notoriously incomplete and inaccurate because of underground sales. Thus, I did not expect to find results as clear as those in Table 3. Another problem was that regional data on beer prices were only available from 2001, and for beer sales from 2000, so these regressions contain fewer years. In order to avoid losing one year of data, in the Arellano-Bond regressions I use here the system rather than the difference estimator, despite the somewhat more stringent assumptions required. I include the controls from Table 3 that are relevant to alcohol sales, adding one for the gender balance in the sales regressions.³⁵

Despite the data problems, the regressions do suggest that retail sales of both vodka and beer decreased when their prices were higher. There was also evidence (not always statistically significant) that sales of vodka increased when the price of beer rose and vice versa. As before, I do not suppose that these elasticities are measured with great precision, but the signs are as predicted by basic demand theory. The Arellano Bond models in columns 2 and 4 assume that the prices of vodka and beer are themselves endogenous, which results in somewhat larger estimated elasticities. The regressions in columns 5 and 6, which look for the relationship between alcohol sales and mortality, are a little less enlightening. In the OLS regression, the beer sales variable has the expected positive coefficient, but vodka sales have a

³⁵ I leave out regional health spending, since this was hypothesized to affect mortality by channels other than alcohol consumption; the gender balance does not seem relevant to regressions of the male mortality rate, but may be relevant to alcohol sales.

Table 4. Price of vodka, retail sales, and deaths

	Log retail sales of: vodka, liters per cap.		Log retail sales of: beer, liters per cap.		Log deaths per 1,000 working age males	
	(1)	(2)	(3)	(4)	(5)	(6)
Log average income (1992 th. Rs, deflated with CPI)	.15 (.11)	-.02 (.14)	-.17 (.11)	.34* (.20)	-.02 (.07)	-.01 (.01)
Log vodka price (avge. for year ^a , in 1992 rubles, deflated with CPI)	-.29** (.13)	-.31* (.18)	.54*** (.13)	.12 (.20)		
Log beer price (avge. for year ^a , in 1992 rubles, deflated with CPI)	.23** (.09)	.37 (.23)	-.18* (.10)	-.52** (.25)		
Log vodka sales, liters per capita					-.06*** (.02)	.05** (.02)
Log beer sales, liters per capita					.03*** (.01)	-.01 (.02)
Proportion of population Muslim	-2.35 (1.55)	.02 (.04)	.71 (1.01)	.00 (.05)	-1.58*** (.42)	-.03** (.01)
Unemployment (proportion of ec. active pop., end year)	-.47* (.24)	-.35** (.16)	.01 (.26)	-.02 (.16)	.02 (.06)	-.05 (.05)
Job turnover (job gains + losses per worker, large and med. ents.)	-.06 (.07)	-.03 (.04)	.07 (.08)	.12* (.07)	.01 (.03)	.02 (.01)
Poverty rate (pop. share with income below min. subsistence)	-.25*** (.07)	.12 (.14)	-.32*** (.08)	.21 (.15)	-.03 (.04)	.00 (.02)
Inflation rate	.07 (.15)	.08 (.15)	.01 (.15)	.12 (.17)	-.05 (.06)	-.05 (.05)
Lagged log regional budget health and sports spending (1992 rubles, deflated with non-food CPI)					.03*** (.01)	.02*** (.01)
Proportion of population above working age ^b	.32 (.96)	-.25 (.23)	2.03** (1.00)	.01 (.28)	-.03 (.23)	.09 (.06)
Proportion of employed pop. with higher education	-.13 (.15)	-.07 (.09)	-.01 (.14)	-.03 (.10)	-.04 (.04)	-.06** (.03)
Proportion of population urban	.30 (.30)	.09 (.06)	.04 (.36)	-.05 (.08)	-.20* (.12)	-.02 (.02)
Proportion of population female	-10.16*** (2.4)	.29 (.40)	-1.36 (2.18)	.49 (.51)		
Lag of dependent variable		.90*** (.07)		.79*** (.13)		.91*** (.03)
Constant		.04 (.18)		.29 (.25)		-.00 (.03)
2000					1.35*** (.18)	.08*** (.01)
2001	7.09*** (1.47)	.04 (.04)	.96 (1.49)	.06 (.05)	1.35*** (.19)	.05*** (.01)
2002	7.11*** (1.48)	.03 (.04)	1.03 (1.49)	.05 (.04)	1.38*** (.19)	.08*** (.01)
2003	7.11*** (1.48)	.02 (.03)	1.08 (1.49)	.03 (.03)	1.40*** (.19)	.06*** (.01)
2004	7.12*** (1.49)	.04* (.02)	1.12 (1.50)	.02 (.02)	1.40*** (.19)	.05*** (.00)
2005	7.14*** (1.49)	.06*** (.01)	1.14 (1.50)	-.02 (.02)	1.41*** (.20)	.06*** (.00)
2006	7.08*** (1.49)		1.19 (1.51)		1.36*** (.20)	
R-squared	.9973		.9986		.9995	
N / Number of groups	461 / 77	461 / 77	461 / 77	461 / 77	537 / 77	537 / 77
Method	OLS, PCSE	A-B	OLS, PCSE	A-B	OLS, PCSE	A-B
Number of instruments		56		41		66
which lags as instruments		3rd, 4th		3rd		3 rd , 4th
Endogenous, besides dep. var.		Vodka price, beer price		Vodka price, beer price		Vodka sales, beer sales
Arellano-Bond test for AR(2), p		.14		.23		.18
Hansen test, p		.62		.69		.23

Sources: See appendix. OLS regressions contain regional and year fixed effects, no constant; * p < .10, ** p < .05, *** p < .01. PCSE: panel-corrected standard errors (Beck and Katz 1995); Arellano-Bond regressions calculated with one-step system GMM with robust standard errors, (using xtabond2 in Stata). ^a calculated as mean of Dec. price for previous and current year; first year for beer is just the December value; ^b over 59 (men), over 54 (women).

surprising negative coefficient. My best guess is that this reflects correlation between the variables in the presence of measurement error and endogeneity. In the Arellano Bond model (column 6), which models vodka and beer sales as both endogenous, vodka sales have the expected significant positive coefficient, but beer sales are no longer significant.

The negative price elasticities of demand for vodka and beer in Table 4, estimated at the regional level, are consistent with—although smaller than—those computed at the individual level by Andrienko and Nemtsov (2005), analyzing the RLMS data. They also report negative own-price elasticities for vodka and beer consumption and positive cross-price elasticities. They are able to incorporate home-brewed alcohol into the analysis, using the RLMS questions on this; it is a weakness of this study that I have no data on home-brewed alcohol at the regional level. Andrienko and Nemtsov report a positive cross-price elasticity between vodka and homebrew: when the vodka price increases, homebrew consumption also increases. Consumption of home brew and various kinds of denatured and industrial alcohol is particularly dangerous and remains a widespread problem (Leon et al. 2007). It is a question for further research how to reconcile this with the finding here that, at the regional level, higher vodka prices were associated with lower working age male mortality. Apparently the substitution into more unhealthy forms of liquor was not large enough to overwhelm the benefit from reduced vodka consumption. Or perhaps the cost or difficulty of obtaining the other forms of alcohol was also rising.

Denisova (2009) also analyzes the RLMS data, using it to study not demand for alcohol but the determinants of mortality. Although binge drinking sharply increases the odds of death, she does not find any relationship between the local price of vodka and mortality, controlling for many other characteristics of the individual. There are various reasons why Denisova's results might differ from those reported here, but probably the most likely is one that she alludes to in the paper—the crude death rate for working age males surveyed in the RLMS is just 4 in 1,000,

whereas the actual death rate for working age males in the national statistics is 13 per 1,000.³⁶ In other words, more than two thirds of the deaths are missing. It is very likely that many of the alcohol abusers for whom the price of vodka is a constraint were simply left out—or fell out—of the RLMS sample.

Additional evidence of the importance of vodka prices is provided in Table A2 in the appendix, where I regress the mortality rates for working age males from three different causes on the same explanatory variables.³⁷ I chose two categories of causes that are known to be associated with alcohol abuse—diseases of the circulatory system and deaths from external causes—as well as one that is more rarely associated with alcohol—neoplasms, or cancers. As one would expect, a higher vodka price was associated with lower death rates from circulatory diseases and from external causes, usually significant at $p < .10$. The coefficient on the vodka price in the neoplasms regressions, however, was smaller than in the corresponding regressions for the other causes of death, and not statistically significant.

Figure A1 in the appendix illustrates the results of Table 3 with graphs showing the pattern of change in vodka prices and mortality for four Russian regions. The inverse relationship is clearly visible in the Northern port region of Murmansk, the metropolis of St Petersburg, and the southern industrial region of Samara. By contrast, in the mostly Muslim Dagestan, as expected, there is no relationship between the two; despite an enormous drop in the relative price of vodka, the death rate—very low to begin with—stays roughly constant and then falls slightly.³⁸

³⁶ These figures are from Denisova (2009, p.5). It is not clear to which year the 13 per 1,000 refers. Looking at Figure 1, one might expect an average of about 11 per 1,000 for the period since 1992—still vastly higher than 4 per 1,000. As a general matter, one might wonder whether the 4 per 1,000 working age men who died in the RLMS are representative of the other 7-9 per 1000 who died outside it.

³⁷ The groupings of causes are those provided in the Russian statistical manuals. It proved necessary in some of these regressions—as in one in Table A1—to control for additional lags of the dependent variable to eliminate remaining 2nd order autocorrelation, as picked up by the Arellano-Bond tests. In the OLS regressions, I included panel specific AR1 processes in the model to reduce the autocorrelation.

³⁸ The sharp drop in mortality during Gorbachev's anti-alcohol campaign during the late 1980s also provides strong evidence of the link between alcohol abuse and mortality (Nemtsov 2002). For the most part, alcohol consumption was lowered then by supply restrictions rather than pricing. It would, of course,

Finally, skeptics sometimes contend that consumption of addictive products such as alcohol is insensitive to price. In Russia, some opinion poll evidence suggests otherwise. In November 2006, the Levada Center asked a representative sample of 1,598 Russian adults whether anyone in their family drank hard liquor and if so, at what price they could afford to buy a half-liter bottle of vodka. The answers are in Table 5. While 70 percent said someone in their family drank hard liquor, only 26 percent said they would be able to buy vodka at 120 rubles a half-liter. The price in the average region in late 2006 was 88 rubles a half-liter, or roughly \$3.30. Based on these answers, one would certainly expect a fall in sales were the price to rise sharply.³⁹

Table 5. Proportion of respondents who said they could afford to buy a half-liter bottle of vodka at given prices, Russia, November 2006

Price in rubles	Percent of respondents
120	26
100	41
80	53
60	62
less than 60	70
No one in the family drinks hard liquor	28
Difficult to answer	2

Source: Levada Center. Figures adjusted to give total (rather than marginal) proportion that could afford at that price. Source: <http://sofist.socpol.ru>.

4 Why did the relative price of vodka fall?

If a decline in the relative price of vodka was an important contributor to Russia’s mortality crisis, what caused the price to fall in the early 1990s? There are several possibilities, which may have worked simultaneously. I discuss these in turn.

be interesting to study the dynamics of consumption at the regional level during this period. Unfortunately, the relevant data are not available broken down by regions before the early 1990s.

³⁹ In this regard, Russia is no different from other countries, in which, according to one recent survey: “Substantial evidence exists that heavy drinkers are, like other drinkers, affected by taxes and prices of alcoholic beverages” (Room, Babor, and Rehm 2005, p.526.)

4.1 Intensified market competition

In the early 1990s, markets in Russia were liberalized—including that for alcoholic beverages. A presidential decree of January 1992 permitted all Russians to engage in trade. A second decree in June 1992 abolished the existing state monopoly on the production and trade of alcohol. This decree stayed in effect until mid-1993, when Yeltsin signed yet another one reversing the demonopolization. Some have suggested that intense competition among vodka producers and traders, legal and illegal, forced real prices down. For instance, Korotaev and Khalturina (2006) argue that: “The main stimulus to the growth of alcohol consumption and alcohol-related death in Russia in the 1990s was the liberalization of the alcohol sector and the resulting increase in the availability of strong alcoholic drinks and spirits. On June 7, 1992, Boris Yeltsin abolished the state monopoly on vodka, with the result that its relative price fell by several times.”

Competition may have played a role. However, some evidence does not fit well with this hypothesis. A first issue has to do with timing. By far the largest drop in the real price of vodka came during 1991, before Yeltsin’s decree liberalizing trade and long before the demonopolization (see Figure 4). In 1991 alone, the real price of vodka fell by 52 percent. The second largest fall in the index of the relative vodka price occurred between January and May 1992, when the index fell by 44.4 percent of the December 1991 level. By contrast, in the year from June 1992 to June 1993 while the state monopoly was abolished, the index fell by just 28.8 percent of the December 1991 level. Looking at the price dynamic in Figure 4, this period does not stand out. A second question concerns why competition in production and trade of vodka would have been so much more intense than that for most other products. Between December 1991 and December 1995, the average nominal price of vodka increased by 895 times. The change for other foods and drinks ranged from 362 times for oranges and mandarins (which had previously been sold at free prices in farmers’ markets) to 1,475 times for carrots, 3,262 times for domestic beer, 3,808 for macaroni, and 5,013 times for sour milk products. Finally, the large,

persistent differences in prices of vodka across Russia's regions suggest that if the market was highly competitive, it was competitive within rather than across regions. Governors often controlled exports of spirits from and imports into local markets. The extent of regional variation, as measured by the coefficient of variation, was falling as one would expect if market competition were intensifying, during the years 1992-2000. However, between 2000 and 2006 the extent of regional variation increased quite sharply. Clearly, there were significant obstacles to competition in the market for vodka.

4.2 Drop in real alcohol taxes

A second reason for the drop in the relative vodka price might be a progressive decrease in the effective tax on vodka. Excises and VAT are levied on vodka production and sales. However, collecting these taxes was extremely difficult in the 1990s. The state statistical agency estimated that about half of alcohol sales went undeclared. In the mid and late 1990s vodka producers claimed to be operating at only 20 to 30 percent of capacity.⁴⁰ Nevertheless, the number of licensed vodka producers rose from 423 in January 1997 to 828 in October 2000 (Panskov 2001). Some were eager to get into the business despite the appearance of overcapacity.

Besides the problem of collecting the taxes, the rate of the excise fell in real terms during the last decade. From 1992 until late 1997, excises were assessed as a percentage (80 or 85) of the cost of production. In late 1997, the system changed to one in which a fixed nominal tax was charged per liter of pure spirits produced. Although these fixed amounts were periodically adjusted for inflation, this required Finance Ministry officials to butt heads with the populists in the Duma as well as the Russian alcohol producers lobby. The real value of the excise seems to have dropped sharply over the subsequent decade. The excise per liter of pure spirits rose from 45 (redenominated) rubles in October 1997 to 162 rubles in early 2007. However, the consumer

⁴⁰ See, e.g., "O rynke alkohol'noi produktsii," *Statisticheskyy Biulleten*, May 1999.

price index rose much faster, resulting in a 44 percent drop in the real rate of the excise (deflated by the CPI). And nominal incomes rose even faster than the CPI. A rough calculation suggests that had the excise risen in line with the average nominal income since October 1997, ordinary vodka would have cost 315 rubles per liter in March 2007 instead of 171 rubles per liter. The average monthly income would have bought only 35 rather than 64 liters.⁴¹

4.3 Regulation of vodka prices

However, as Figure 4 shows, most of the drop in the real price of vodka did not occur in the decade after 1997, but much earlier. A third possible explanation is that the fall was caused not by fierce market competition or weakness of the state, but by misguided policy—specifically the imposition of regulations to prevent the price rising too rapidly. The Soviet leadership had certainly learned from Gorbachev’s anti-alcohol campaign in the mid-1980s that trying to take away Russians’ vodka bottle would elicit loud protest. Throughout the period from 1990, officials at different levels repeatedly tried to prevent the price of vodka from rising in a way they feared would be politically unpopular. This contrasted with the policies of the Soviet leadership *before* 1991, when the price of vodka had been increased in relative terms during the 1970s and 1980s (see Figure 4). It was in the age of early democratization and populist politics that the policy reversed.

The first—and most significant—occasion came in 1991, before the Soviet collapse. As of early 1991, most prices were still administratively set. In April, the Soviet prime minister,

⁴¹ The excise on one liter of vodka (40% proof) in October 1997 was 18 (redenominated) rubles (i.e. 0.40 liters of pure spirits times 45 R/liter). Between October 1997 and March 2007, the average monthly income rose from 944 to 10,950 redenominated rubles (Goskomstat RF 2003, 2007b)—i.e., an increase of 11.6 times in nominal terms. Had the excise risen at the same rate, it would have been 209 rubles. In fact, it was 0.40 times 162 R/liter = 65 rubles. The current price of a liter of vodka was 171, which thus included 65 rubles of excise and 106 rubles of cost and profit. Had the excise kept pace with current incomes (and been 209 instead of 65 rubles), the price of a liter of vodka would have been 106 + 209 rubles = 315 rubles, about 144 rubles higher than the current price of 171 rubles per liter.

Valentin Pavlov, introduced a reform that raised the retail prices of about 55 percent of goods by 60 percent on average, while allowing another 30 percent of goods to be sold at market prices. However, the price of lower-grade vodka was frozen at its previous level.⁴² President Gorbachev signed the decree, which applied to all Soviet republics. To compensate the public, Pavlov simultaneously increased salaries and benefits by 60 rubles a month per person.

As might have been expected, the rise in state prices along with the large rise in incomes set off a burst of inflation in the small market-price sector. By the end of the year, consumer prices were 2.6 times their level as of December 1990. The result was a huge increase in the relative affordability of vodka, which remained price-controlled. As of December 1991, the average money wage would buy 38 liters of vodka, compared to 10 liters at the start of the year. As already discussed, however, the insensitivity to demand and increasing dislocation of the state supply system meant that vodka could not be obtained in many parts of the country at any prices, and was rationed in Moscow. The effect on health was consequently delayed.

A second key decision came in the decree by which President Yeltsin freed most prices in Russia as of January 2, 1992. Along with some kinds of bread, milk, baby food and a number of other products and services, vodka was included on the list of essentials whose prices would remain regulated by the state. The rise in the retail price of vodka and spirits (but not beer) was limited to 4.5 times. These federal limits were removed in mid-1992. However, regional governments were still permitted to restrict increases in vodka prices, and many did. The government's Center of Analysis of the Economic Situation conducted surveys of retail price regulation in a sample of 70 cities nationwide from 1993 to 1996. The proportion of the cities in which the price of vodka was regulated increased from 38 percent in early 1993 to 57 percent in the third quarter of 1994, before gradually falling to 17 percent in early 1996 (see Table 6).

⁴² *Izvestia*, 14 March, 1991.

As of November 1992, the Moscow City Government limited the price for vodka to 296 rubles per liter. That this was far below the market-clearing level is suggested by the fact that inspectors found some private shops charging 500 rubles or more, despite the risk of being fined.⁴³ This also casts some doubt on the market competition hypothesis; at least at this time in Moscow, private traders were not undercutting state sellers but charging much higher prices.

Table 6. Percentage of cities sampled in which vodka price was regulated

-----1993-----				-----1994-----				-----1995-----				-----1996-----	
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
38	24	18	44	53	48	57	55	53	41	22	12 ^a	17 ^a	17 ^a

Source: Center of Analysis of Economic Situation, cited in Serova (1999). ^a all liquors

As is clear from Figure 4, these periods of intensive price regulation—1991 and early 1992—were precisely those in which the relative price of vodka fell most sharply. In 1996, the government began setting an obligatory minimum price for vodka. The real price began working its way upward in 1997 and 1998, but another drop occurred in late 1998, simultaneously with the financial crisis and devaluation of the ruble. Again, the price of vodka rose by considerably less than that of other consumer goods. In part, producers' costs were lowered by the fact that the excise rate of 20 rubles per liter of 40 percent proof liquor remained fixed until the end of the year. In part, regional governments probably also held down rises in vodka prices for fear of public unrest as the effects of the financial crisis rippled across the country.

Governments may have been right to think they would be punished at polls if they raised vodka prices. In April 1996, as the country's presidential campaign was heating up, VCIOM asked poll respondents whether knowing the Communist candidate, Gennady Zyuganov, had promised to raise the tax on spirits would affect their vote. While 23 percent said this would make

⁴³ L. Nechiporuk, *Moskovskaya Pravda*, November 12, 1992, pp.1,7.

them more likely to vote for him, 34 percent said they would be less likely to do so. Forty-two percent said it would not affect their vote.⁴⁴

5 Conclusion: Russia in comparative perspective

Excessive drinking of hard liquor, especially by middle-aged men, has been a major cause of Russia's soaring mortality in recent years. I presented evidence that the rise in such drinking resulted from a sharp drop in the price of vodka relative to those of other goods, including beer. As repeated studies in many countries have shown, "alcohol is no exception to the economic law of downward-sloping demand. The price level of alcoholic beverages influences per capita consumption levels of ethanol, as well as the incidence of alcohol abuse and its health-related consequences" (Cook and More 2002, p.130). The fall in the relative vodka price may, in turn, have resulted partly from greater competition along with the failure of government to tax the sector effectively. However, the evidence suggests another cause was far more important. Eighty-five percent of the drop in the real price of vodka between December 1990 and December 2005 occurred during two early periods (1991 and January-May 1992) during which state price regulation was holding down the nominal vodka price while other prices were allowed to rise substantially. In the face of such regulation, the relative price of vodka had no choice but to fall.

Such price limits were apparently motivated—in both cases—by populism and a fear of prompting political opposition. The largest drop in the real vodka price was the work of the last communist administration, of Mikhail Gorbachev and Valentin Pavlov. Under their leadership, the price ratio of vodka to beer fell from 27:1 to 14:1 in a single year. Ironically, the Russian drinker was saved from himself in 1991 by the failing Soviet planning and distribution system. Low priced vodka was in short supply and often purchaseable only with ration cards. But these very low real prices were the baseline the Yeltsin government inherited. And, like the last

⁴⁴ Russian Center for Public Opinion Research poll, 25-9 April 1996, 1,599 respondents, results at <http://sofist.socpol.ru>.

communist government, the first government of economic liberals apparently also feared the wrath of the Russian drinker. Limits on the rise in vodka prices were imposed in the decree that freed most other prices in January 1992. Finally, Russia's regional governors, who took over regulating vodka prices from mid-1992, bear a share of responsibility. From mid-1992 to February 1995, the real price of vodka fell to its lowest point, as regional governments imposed their own limits on price rises for hard liquor.

In the period from 1995, the price dynamic changed. The real vodka price recovered somewhat until 1999, after which point the trend turned down again. After 1998, alcohol-related deaths increased as well. Excise rates were not indexed sufficiently to keep up with inflation. And other restrictive policies that might have cut down on alcohol abuse and sped up the substitution of beer and wine for hard liquor were not introduced, at least until much later. The Putin administration, if it did not create the situation, did little initially to address it.

Russia's alcohol-driven health crisis has been particularly extreme, but the syndrome is not unique to Russia. Many countries have suffered severe health problems as the affordability of alcohol increased before appropriate policies were developed. West European countries faced this in the 1950s and 1960s, as average incomes rose faster than nominal alcohol prices. Between the early 1950s and the early 1970s, estimated per capita alcohol consumption more than doubled in West Germany, Norway, Finland, and Denmark, and more than quadrupled in the Netherlands. Mortality from cirrhosis of the liver also climbed alarmingly: the rate for men and women aged 35-64 increased by 328 percent in Sweden, 192 percent in Canada, 184 percent in West Germany, 124 percent in New Zealand, 115 percent in Finland, and 102 percent in Denmark (Munoz-Perez and Nizard 1998). The impact on the aggregate death rate was offset, however, by other improvements in health care. Since the 1970s, effective alcohol policies and shifts in tastes from liquor to wine have cut consumption levels and related health problems in Western Europe.

Alcohol-related health crises have been quite common in the former communist world.

Between the 1950s and 1990s, Hungary suffered a massive increase in drinking and deaths caused by cirrhosis of the liver. Estimated total liquor consumption rose from 4.7 liters of pure alcohol per capita in 1950-54 to 16.2 liters in 1990-94—higher than Russia has ever achieved (Munoz-Perez and Nizard 1998). The death rate from liver cirrhosis for men and women aged 35-64 rose by more than ten times, from 13 to 134 per 100,000. Among post-Soviet republics, Moldova and Kazakhstan (which contains a large Slavic population, and where, despite Muslim heritage, the indigenous population also drinks) had records similar to or worse than Russia's in the 1990s (see Figure 6). Moldova's liver cirrhosis mortality rate tracked its total death rate quite closely. By 2002, Moldova had the highest age-standardized death rate from liver cirrhosis of any of the 191 countries in the World Health Organization's data.⁴⁵

Not all the former Soviet Republics had such a sharp jump in deaths. Azerbaijan—with a largely Muslim population—had much lower mortality. Estonia's experience offers an interesting comparison. Initially, deaths rose and fell in parallel to Russia's (see Figure 6). But from 1998, the paths diverge. At least in part, the explanation probably lies in a major substitution from vodka into beer that appears to have occurred in Estonia in the 1990s. Of course, abusing any kind of alcohol is harmful, but it is much more difficult to drink sufficient beer in one sitting to die of alcohol poisoning or of sudden cardiac arrest than it is to do the same drinking pure spirits. The World Health Organization's *Global Status Report on Alcohol* country profile report on Estonia shows estimated consumption of alcohol in spirits falling sharply in the 1990s, while consumption of alcohol in beer rises (WHO 2004). The corresponding profile report for Russia

⁴⁵ A number of other former Soviet republics had paths of mortality similar to Russia's in the 1990s, suggesting there may have been a common cause. Although I have not been able to obtain data to do similar analyses, it is known that most of them underwent price liberalization around the same time, and in many of them price regulation was retained temporarily for vodka. Thus, the relative prices of vodka in other former Soviet republics are likely to have fallen as in Russia. It is also true that lower prices in the early 1990s coincided with weaker quality controls, as adulterated brands were marketed across the transition economies. Thus, the rise in vodka consumption coincided with a reduction in the quality.

shows consumption of alcohol in spirits rising sharply in the 1990s, while consumption of alcohol in beer is mostly flat, rising slightly.⁴⁶

More recently, there is some evidence that Russia may have started to follow Estonia's path. Officially registered sales of alcohol in Russia rose from 8 liters of absolute alcohol per capita in 2000 to 9.8 liters in 2008.⁴⁷ However, sales of vodka fell from 215 to 181 million dekaliters, while sales of beer doubled, from 525 to 1,138 million dekaliters. In part, this reflected a growing taste for beer among young consumers (while tv ads for hard liquor are banned, those for beer are not). But in part, it probably also reflected the relative price change. Whereas in 2000 one could buy 4.2 liters of beer for the price of a liter of vodka, in 2008 one could buy 5.0 liters of beer.⁴⁸

Table 7. Excise rate on spirits (40% proof), per liter, in Euros, July 2006

Sweden	21.5	Luxembourg	4.2
Ireland	15.7	Austria	4.0
UK	11.5	Estonia	3.9
Finland	11.3	Portugal	3.7
Malta	9.3	Lithuania	3.7
Denmark	8.0	Latvia	3.6
Belgium	7.0	Czech Republic	3.6
Netherlands	6.0	Hungary	3.5
France	5.8	Spain	3.3
Germany	5.2	Italy	3.2
Thailand	4.8 ^a	Slovak Republic	2.9
Taiwan	4.7 ^b	Slovenia	2.8
Poland	4.6	Cyprus	2.4
Greece	4.4	Russia	1.9

Source: Calculated from Cnossen (2006). For Russia, author's calculations from excise of 159 Rs per liter of pure alcohol, July 2006. ^a for Thailand, 2005, from Richupan (2005, p.37), converted at 2005 rate of about 50 Baht/Euro. ^b for Taiwan, from Richupan (2005, p.31), converted at 2005 rate c. 39.5 T\$/Euro.

A country's susceptibility to an alcohol-related mortality crisis such as the one that struck Russia clearly depends on many factors besides sheer affordability. Among these are the

⁴⁶ See also Brunovskis and Ugland (2002, p.14), which also shows a sharp decrease in consumption of spirits and increase in beer consumption in Estonia.

⁴⁷ Goskomstat RF 2009. Of course, what happened to consumption of underground alcohol and home brew is much less clear; Nemtsov estimates total alcohol consumption per capita in 2000 at around 14 liters per capita.

⁴⁸ And there was no noted change in the average alcohol content of beer during this period.

country's traditionally favored form of alcoholic beverage (liquor vs. wine or beer), religious tradition (Muslim or other), and, of course the public policy context (regulations limiting the number of outlets and times of sale). Still, the evidence that affordability matters extends beyond Russia. In a panel study of US states in 1970-2000, Cook, Osterman and Sloan (2005) found clear evidence that higher excises on alcohol were associated with reductions in the all-cause death rate. Other analyses of state level panel data have found relationships between alcohol availability and highway fatalities and suicides.⁴⁹ Across the European countries, the affordability of spirits and low spirits prices relative to those of beer both correlate with higher standardized death rates (see Figures 7 and 8). Given the importance of affordability, it is encouraging to note that—at least compared to other European countries, including some of its postcommunist neighbors to the West—Russia's tax policy has plenty of room to move on this dimension. As Table 7 shows, its current excise on vodka is unusually low.

⁴⁹ See the many citations in Cook, Osterman and Sloan (2005).

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Appendix

**Table A1. Affordability of Vodka and Mortality in Russia's Regions, 1995-2005, women
(Dependent variable is log of deaths per 1,000 working age females)**

	(1)	(2)
Log vodka price (avge. for year ^a , in 1992 rubles, deflated with CPI)	-.06** (.03)	-.09** (.04)
Log average income (1992 th. Rs, deflated with CPI)	.13* (.07)	.04 (.06)
Proportion of population Muslim	-2.81*** (.29)	-1.79*** (.54)
Unemployment (proportion of ec. active pop., end year)	-.06 (.07)	.05 (.09)
Job turnover (job gains + losses per worker, large and med. ents.)	.05 (.04)	.03 (.03)
Poverty rate (pop. share with income below min. subsistence)	.12** (.05)	.03 (.03)
Inflation rate	.07** (.03)	.01 (.03)
Lagged log regional budget health and sports spending (1992)	.02** (.01)	.01 (.01)
Proportion of population above working age ^b	.62 (.41)	1.39** (.57)
Proportion of employed pop. with higher education	-.003 (.09)	.13** (.05)
Proportion of population urban	-.10 (.13)	.27* (.14)
Lag of dependent variable		.51*** (.09)
2 nd Lag of dependent variable		.16*** (.04)
1996	.40* (.21)	-.07*** (.02)
1997	.38* (.21)	-.07*** (.02)
1998	.34 (.21)	-.09** (.04)
1999	.42** (.21)	-.00 (.02)
2000	.46** (.21)	.01 (.02)
2001	.48** (.21)	.00 (.01)
2002	.50** (.22)	.01 (.01)
2003	.52** (.22)	.02*** (.01)
2004	.52** (.22)	-.00 (.00)
2005	.52** (.22)	
2006		
R-squared	.9957	
N / Number of groups	761 / 77	683 / 77
Method	OLS, PCSE	Arellano Bond
Number of instruments		74
Arellano-Bond test for AR(2), p		.62
Hansen test, p		.30

Sources: See Table A3. Standard errors in parentheses. * p < .10, ** p < .05, *** p < .01. OLS regression contains regional and year fixed effects, no constant; PCSE: panel-corrected standard errors (Beck and Katz 1995). Arellano-Bond regression calculated with one-step difference GMM with robust standard errors, (using xtabond2 in Stata), treating log female death rate as endogenous and other variables as predetermined. All lags greater than L2 of log female death rate used as instruments. It was necessary to include second lag of dependent variable to reduce autocorrelation. ^a calculated as mean of December price for previous and current year. ^b over 59 (men), over 54 (women).

Table A2. Vodka and Mortality from different causes in Russia's Regions, 1995-2005
(Dependent variable is log of deaths per 1,000 working age males)

	Circulatory diseases		External causes		Neoplasms	
	(1)	(2)	(3)	(4)	(5)	(6)
Log vodka price (avge. for year ^a , in 1992 rubles, deflated with CPI)	-.05 (.03)	-.17* (.11)	-.07* (.04)	-.15* (.09)	-.01 (.03)	-.10 (.08)
Log average income (1992 th. Rs, deflated with CPI)	.01 (.05)	.44*** (.17)	.14** (.06)	.20*** (.07)	.01 (.04)	.03 (.06)
Proportion of population Muslim	-1.71*** (.47)	-2.01** (.90)	-1.58*** (.50)	-1.03 (.75)	-1.11*** (.26)	-.18 (.55)
Unemployment (proportion of ec. active pop., end year)	-.18*** (.06)	-.15 (.09)	-.00 (.06)	-.02 (.07)	-.02 (.05)	-.02 (.09)
Job turnover (job gains + losses per worker, large and med. ents.)	.02 (.03)	.04 (.03)	.07* (.03)	.05 (.04)	-.03 (.03)	-.05* (.03)
Poverty rate (pop. share with income below min. subsistence)	.03 (.03)	.13* (.06)	.06** (.02)	.10** (.05)	-.03 (.02)	-.01 (.04)
Inflation rate	.01 (.03)	.08* (.04)	.03 (.03)	.05** (.03)	.02 (.04)	-.02 (.02)
Lagged log regional budget health and sports spending (1992 rubles, deflated with non-food CPI)	.02*** (.01)	.01 (.01)	.02** (.01)	.01 (.01)	.02*** (.01)	.02** (.01)
Proportion of population above working age ^b	.61 (.38)	-.21 (.90)	.62 (.46)	1.04 (1.10)	1.55*** (.37)	.36 (.46)
Proportion of employed population with higher education	.03 (.05)	.01 (.06)	.05 (.05)	.06 (.07)	.02 (.07)	.04 (.06)
Proportion of population urban	-.21 (.13)	-.34** (.17)	.08 (.14)	.53** (.21)	.14 (.10)	.25 (.17)
Lag of dependent variable		.44*** (.11)		.33*** (.10)		-.02 (.11)
2 nd lag of dep. var		-.03 (.05)		.14** (.16)		
1996	2.70*** (.21)	.06 (.04)	2.51*** (.20)	.08*** (.02)	1.72*** (.16)	.07*** (.02)
1997	2.67*** (.21)	.04 (.04)	2.46*** (.21)	.05** (.02)	1.70*** (.16)	.05** (.02)
1998	2.62*** (.20)	.01 (.07)	2.43*** (.21)	.01 (.04)	1.66*** (.16)	.00 (.04)
1999	2.68*** (.20)	.09* (.05)	2.50*** (.20)	.10*** (.02)	1.67*** (.16)	.01 (.02)
2000	2.72*** (.21)	.10** (.04)	2.53*** (.20)	.12*** (.02)	1.66*** (.16)	-.00 (.02)
2001	2.73*** (.21)	.08** (.04)	2.53*** (.20)	.10*** (.02)	1.63*** (.16)	-.03** (.01)
2002	2.78*** (.21)	.10*** (.03)	2.54*** (.21)	.10*** (.01)	1.65*** (.16)	-.02* (.01)
2003	2.81*** (.21)	.09*** (.02)	2.53*** (.21)	.08*** (.01)	1.65*** (.16)	-.02** (.01)
2004	2.82*** (.21)	.08*** (.02)	2.52*** (.21)	.07*** (.01)	1.66*** (.16)	-.01 (.01)
2005	2.85*** (.21)	.09*** (.01)	2.51*** (.21)	.06*** (.01)	1.67*** (.16)	.00 (.00)
2006	2.80*** (.22)		2.45*** (.21)		1.67*** (.16)	
R-squared	.9998		.9997		.9998	
N / Number of groups	838 / 77	760 / 77	838 / 77	760 / 77	838 / 77	760 / 77
Method	OLS, PCSE	A-B	OLS, PCSE	A-B	OLS, PCSE	A-B
Number of instruments		59		50		60
which lags used		2 nd		2 nd		2 nd , 3 rd
Endogenous, besides dep. var.		vodka price, income		vodka price		vodka price
Arellano-Bond test for AR(2), p		.38		.22		.58
Hansen test, p		.47		.38		.14

Sources: See Table A3. Standard errors in parentheses. * p < .10, ** p < .05, *** p < .01. OLS regressions contain regional and year fixed effects, no constant; PCSE: panel-corrected standard errors (Beck and Katz 1995); Arellano-Bond regressions calculated with one-step difference GMM with robust standard errors, (using xtabond2 in Stata). ^a calculated as mean of December price for previous and current year. ^b over 59 (men), over 54 (women). Models in columns 1 and 3 with panel-specific AR1 term to reduce autocorrelation.

Table A3. Variable definitions and sources

Variable	Definition	Sources
Death rate, working age males	male working age (16-59) deaths per 1000 working age males	Goskomstat RF, <i>Demograficheskiy yezhegodnik</i> RF, various years.
Death rate, working age females	female working age (16-54) deaths per 1000 working age females	" " "
Death rates, working age males, particular causes:	deaths per 100,000 working age males, from Russian health classifications: 1. diseases of circulatory system; 2. external causes; 3. neoplasms.	" " "
Log vodka price	Log10 of 1 + average price of a liter of ordinary vodka, (such as Russkaya, Moskovskaya), average for year in regional capital, 1992 Rs, deflated by the CPI. Average constructed as mean of price in December of current and previous year.	Goskomstat RF, <i>Tseny v Rossii</i> 1996, pp.102-4; <i>Srochnoe Soobshchenie ob izmenenii tsen na prodovolstvennie tovari po sostoyaniyu na 30 dek</i> 1996, 1996; <i>Srednie tseny na prodovolstvennie tovari v dekabrya</i> , various years. Because of missing data, Dec 2000 = Feb 2001; Dec 2002 = Jan 2003; Dec 2003 = Jan 2004. Goskomstat RF downloads.
Log average income	Log10 of average monthly money income of the population, thousand 1992 Rs, deflated by CPI.	Goskomstat RF, <i>Regiony Rossii</i> 1999, 2006, 2007.
Log liters of vodka per avge. monthly income	Log10 of (average income divided by vodka price).	
Log retail sales of vodka	Log10 of retail sales of vodka and liquors in liters per capita	Goskomstat RF, <i>Torgovlia v Rossii</i> 1999, 2001, 2005
Log retail sales of domestic beer	Log10 of retail sales of beer in liters per capita	Goskomstat RF, <i>Torgovlia v Rossii</i> 2001, 2005, <i>Regiony Rossii</i> various years.
Log average price of domestic beer	Log10 of average price of a liter of domestic beer, end year in regional capital, 1992 Rs, deflated by the CPI.	Downloaded from Goskomstat RR web site and reports on prices.
Percent of population Muslim	Proportion of population of predominantly Muslim ethnic groups, as classified by Heleniak (2006), based on 2002 and 1989 censuses; proportion is linearly interpolated from the proportions given in the 1989 and 2002 censuses; scaled 0-1.	Heleniak (2006),
Unemployment	Unemployment rate as percent of economically active population, from household surveys	Goskomstat RF, <i>Regiony Rossii</i> , various years.
Job turnover	sum of job gains and losses per 100 workers in large and medium enterprises	Goskomstat RF, <i>Rossiiskiy statisticheskiy yezhegodnik</i> , 1995, 1994, <i>Trud i Zaniatost v Rossii</i> , various years
Poverty rate	Share of population with income below the minimum subsistence income (scaled 0-1).	Goskomstat RF, <i>Regiony Rossii</i> 2006,
Inflation rate	inflation rate of CPI	<i>Rossiiskiy statisticheskiy yezhegodnik</i> , 2000.
Regional budget health and sports spending	regional budget health and sports spending per capita, in 1995 rubles, deflated by non-food CPI.	Goskomstat RF, <i>Regiony Rossii</i> , various years.
Percent of population above working age	Percent of population consisting of men older than 64 and women older than 59.	regional budget spending from Ministry of Finance reports on execution of regional budgets, various years, (some downloaded from budgetrf.ru), CPI non-food from <i>Regiony Rossii</i> , various years.
Percent of employed pop. with higher education	Percent of employed population with higher professional education.	non-food from <i>Regiony Rossii</i> various years.
Percent of population female	Percent of population female	Goskomstat RF, <i>Demograficheskiy yezhegodnik</i> RF, various years.
Urbanization	Percent of population urban	Downloaded from Goskomstat RF, www.qks.ru , August 2009
		Goskomstat RF, <i>Demograficheskiy yezhegodnik</i> RF, various years.
		Goskomstat RF, <i>Regiony Rossii</i> , various years.