

# Vodka and Violence: Alcohol Consumption and Homicide Rates in Russia

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In Russia, rates of alcohol consumption and homicide are among the highest in the world, and already-high levels increased dramatically after the breakup of the Soviet Union. Rates of both, however, vary greatly among Russia's 89 regions.

We took advantage of newly available vital statistics and socioeconomic data to examine the regional covariation of drinking and lethal violence. Log-log models were employed to estimate the impact of alcohol consumption on regional homicide rates, controlling for structural factors thought to influence the spatial distribution of homicide rates. Results revealed a positive and significant relationship between alcohol consumption and homicide, with a 1% increase in regional consumption of alcohol associated with an approximately 0.25% increase in homicide rates.

In Russia, higher regional rates of alcohol consumption are associated with higher rates of homicide. (*Am J Public Health*. 2002;92:1921–1930)

We examined the covariation of aggregate alcohol consumption and rates of homicide in Russia. Rates of both alcohol consumption and lethal violence in the country are among the highest in the world. Although the social, political, and economic changes of the 1990s led to increased rates of alcohol consumption in Russia, a high level of alcohol use has been a perennial problem in the country. The same is true of violence: already-high homicide rates were exacerbated by the shocks of the 1990s.<sup>1</sup>

Many scholars agree that the Russian public health crisis of the 1990s was due largely to the massive social and economic changes in the country.<sup>2</sup> Figure 1 shows the annual rates of alcohol use and homicide from 1965 to 1996. These statistics demonstrate similar trends during this time. Furthermore, alcohol-related deaths and deaths from external causes (including violence) were the leading causes of the fluctuation of mortality rates in Russia during the 1990s.<sup>3</sup> It is generally accepted in the literature that policy and structural factors are partially responsible for the changing rates of alcohol consumption in Russia and that these changes have likely had an impact on overall and violent mortality rates.<sup>2,4–6</sup>

Aside from this temporal perspective, there may also be a cross-sectional component to the relationship. That is, although levels of

both alcohol consumption and homicides rose after the dissolution of the Soviet Union, the increase was not uniform in either case, and there is tremendous variation throughout the nation.<sup>1,7</sup> Furthermore, Walberg et al.<sup>6</sup> showed that higher levels of alcohol consumption in a region are associated with a decline in life expectancy. McKee<sup>8(p824)</sup> argued that “collectively, this evidence suggests the importance of alcohol in explaining the Russian mortality crisis,” and the main hypothesis we tested is that regional variation in the level of aggregate alcohol consumption is also important in explaining the regional differences in homicide.

## WHAT, HOW, AND WHERE RUSSIANS DRINK

The following review of the theoretical and empirical literature outlines the potential reasons for expecting a relationship between alcohol consumption and homicide rates. A few prominent Russia-specific cultural issues, however, deserve brief attention here. Some researchers have suggested that it is the nature of alcohol consumption in Russia—a large proportion of alcohol is consumed in the form of distilled *spirits* (mainly vodka) and drunk in *binges*,<sup>7,8</sup> often in unregulated settings—that is responsible for alcohol's unique impact on the incidence of various types of alcohol-

related mortality (e.g., alcohol poisoning) and violence.

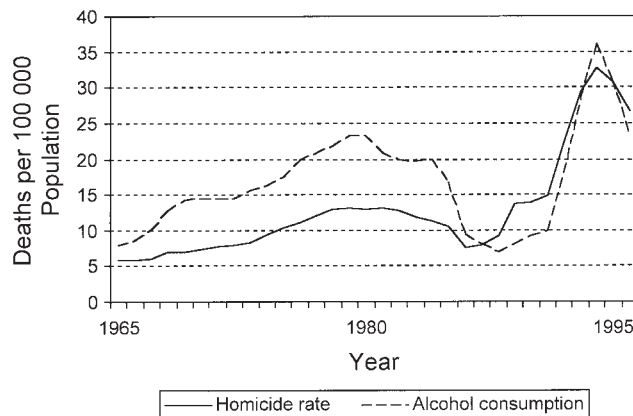
Binge drinking is defined as consuming 5 drinks in a single sitting for men (4 for women) or 80 g (roughly 6 standard US drinks) of ethanol at 1 sitting.<sup>9,10</sup> Survey data from Bobak et al.<sup>7</sup> reveal that nearly one third of Russian males drink at least a quarter liter of vodka (which contains 78.5 g of ethanol) at 1 sitting at least once per month. This pattern of heavy episodic drinking, together with the consumption of distilled spirits that result in faster and stronger intoxication and have been shown to be related to homicide elsewhere,<sup>11</sup> likely influences self-control in potentially violent situations.

Aside from the loss of self-control, the lack of direct formal and informal social control may play a role as well. In Russia, drinking in public places is common and likely becoming more so with the privatization of alcohol outlets and alcohol production and distribution. However, the most common situation is drinking together with family, friends, and/or acquaintances in the home or some other private or semiprivate setting. Regulation by police officers, bar bouncers, other security personnel, or even passersby on the street is thus lacking, thereby potentially allowing low-level arguments to escalate into violent situations. Thus the potential disinhibition due to the binge drinking of vodka may be magnified by limited social control because of the unregulated setting in which drinking most often occurs, thereby creating situations that increase the risk of violence.

## LITERATURE REVIEW

### Alcohol Consumption During the Political-Economic Transition of the 1990s

The disintegration of the Soviet Union led to large-scale political, economic, and social transformation. Along with these sweeping so-



Note. The proxy for alcohol consumption is the rate of deaths due to alcohol poisoning (see discussion of this measure in Methodology section).

**FIGURE 1—Annual rates of (proxy) alcohol consumption and homicides in Russia, 1965–1996.**

cial changes came a public health crisis, including sharp increases in rates of alcohol consumption and lethal violence.

Direct measures of alcohol consumption during this period are difficult to estimate, especially because the anti-alcohol campaign during the mid- to late 1980s led to increased production of homemade alcohol and thus higher rates of unregistered consumption. Regardless of the proxy employed, however, there appears to be widespread agreement that alcohol consumption rose sharply after the anti-alcohol campaign ceased, peaked in 1993 or 1994, and then declined slightly during the late 1990s (Figure 1).

The Russian Longitudinal Monitoring Survey, for example, shows self-reported daily alcohol usage increasing in the early 1990s and then decreasing from 1994 to 1998.<sup>12</sup> These self-reports are accompanied by similar changes in the rate of deaths due to alcohol poisoning.<sup>13</sup> Furthermore, although Trembl<sup>14</sup> has disputed earlier claims of the success of the anti-alcohol campaign provided by Nemtsov,<sup>15</sup> both his estimates for the 1990s and those of Nemtsov are generally consistent with the rise and fall described here, even though the 2 researchers used unrelated measures. Trembl, for example, used various sources of official data (including those related to sugar usage, assumed to be employed to produce homemade vodka) to estimate the

total (i.e., recorded plus unrecorded) consumption of alcohol, whereas Nemtsov used measures of alcohol-related harm (i.e., blood alcohol–positive accidental and violent death rates) to estimate levels of consumption. Outside Russia, other scholars have also used indicators of harm and/or mortality as a way to estimate unrecorded alcohol consumption.<sup>16</sup>

Crime data reveal patterns similar to those of alcohol, with juvenile arrests for alcohol consumption and public intoxication, for example, increasing during the early 1990s and the percentage of juvenile arrestees who were under the influence of alcohol at the time of the crime rising from around 17% in 1991 to about 27% in 1994.<sup>17,18</sup> Furthermore, crime data reveal that of the 24 350 persons arrested for homicide in Russia in 1995, nearly 75% were under the influence of alcohol.<sup>19</sup> The convergence of estimates from several scholars using different methods provides increased confidence that there were indeed major changes in the levels of alcohol consumption during this period and that there is considerable variation throughout the vast nation in aggregate levels of alcohol intake.

Leon and Shkolnikov<sup>4</sup> argued that alcohol played a major role in the Russian mortality crisis during the 1990s. The general category “external causes of death” was a leading contributor to excess mortality during this period. These external causes comprised mostly

alcohol-related incidents, accidental injuries, and violence-related injuries.<sup>20</sup> Those age groups (i.e., working-age males) and causes of death (i.e., alcohol and external causes) that showed the most appreciable benefits during the anti-alcohol campaign are the same groups and causes that were hardest hit during the political-economic transition of the early 1990s.<sup>4</sup> The mortality decline from 1995 to 1998 was also due largely to a reduction in these same types of death.<sup>13</sup> Furthermore, injuries and violence were the largest contributors to the decrease in male life expectancy during the transition period.<sup>20</sup> Overall, about 12% of the decline in life expectancy from 1990 to 1994 was due directly to alcohol-related mortality (e.g., poisonings, cirrhosis), and nearly one third of the drop was due to external causes, including homicide and suicide.<sup>21</sup>

Many regard individual and social stress resulting from the large-scale political, economic, and social changes, as well from the widespread social problems accompanying them, as the primary causes of increased alcohol consumption during the transition period.<sup>4</sup> The formerly far-reaching Soviet social welfare system collapsed, pensions and savings lost nearly all of their value, unemployment rose, and poverty increased substantially. These problems occurred together with shifting cultural values—from a focus on state goals and interests to a focus on more individualistic needs, wishes, and responsibilities—creating anomic conditions.<sup>22</sup> There was also a bleak outlook on the future, as well as the general stress of severe disappointment: the transition, after all, was supposed to make life better. Durkheim<sup>22</sup> argued that under such conditions, people, especially men, tend toward self-destruction.

Seeman and Anderson<sup>23</sup> have shown that a high level of powerlessness in individuals is significantly related to heavier drinking and to drinking problems. Given this social disruption, the bleak outlook, and the powerlessness of individuals to influence the structural characteristics creating such conditions, the rapid increase in alcohol consumption and lethal violence (including suicide) may reflect the rise in stress experienced by Russians during the transition.<sup>2,24</sup> This is especially true for specific groups within society, and one can see

this in data that indicate that the increase in mortality from alcohol-related causes was greatest among men in their 40s and 50s, a pattern that coincides with mortality peaks for homicide.<sup>1</sup> Finally, Gavrilova et al.<sup>25</sup> pointed out that this pattern of increase from 1991 to 1994 and then decrease from 1995 to 1998 fits the typical 2-stage stress-related pattern of acute stress and then relative recovery suggested in Braunstein and Toister.<sup>26</sup>

A constellation of supply-side factors likely enabled the rise in alcohol consumption. The state monopoly over alcohol was repealed in 1992, and this led to an increase in supply as local entrepreneurs rushed to make a profit in this lucrative business and international companies sought to open up new markets.<sup>2,27</sup> Supply had also increased because of the availability of large amounts of illegally produced alcohol, the scale of which is often blamed on the semiprohibition of the earlier anti-alcohol campaign.<sup>4</sup> These factors, together with inefficient tax collection on the part of the Russian government, helped to keep the price of alcohol much lower than that of other goods, and between 1989 and 1994 the price of alcohol rose at only one fifth the rate of food prices.<sup>2</sup>

The patterns of alcohol consumption and violence in Russia might also be linked in other ways. For example, in their study of 1 Russian city (Taganrog), Carlson and Vägerö<sup>28</sup> found that regardless of household income, heavy drinking was significantly higher among those men most likely to have suffered economic and status loss during the transition (e.g., those with a lower education and/or those with a manual occupation). These authors also found that the heavy drinkers in their study had a frequency of family conflicts and quarrels 6 times higher than that of the non-heavy drinkers. This is important, because Chenet et al.<sup>29</sup> showed that marriage among Russians is a protective factor against alcohol-related death and because Stack and Bankowski<sup>30</sup> found that single and divorced men have a higher relative risk of drinking compared with married men. In other words, married men who are heavy drinkers are likely to find themselves in situations that lead to divorce, and being single or divorced raises the risk of even heavier drinking.

Another potential outcome among married men who drink heavily, however, is domestic violence. Thus far in Russia, there is little work on relationship violence, but preliminary research suggests that rates are more than twice as high in Russia as in the United States, which itself has a much higher rate than most other Western nations.<sup>31,32</sup> There is also discussion of this relationship in the broader literature.<sup>33</sup> Overall, both divorce and drinking are likely to reduce social capital (i.e., norms and social networks that encourage cooperation) among individuals and social cohesion among groups, and Kennedy and Kawachi<sup>34</sup> have found social capital to be negatively related to mortality in Russia. Finally, social cohesion and collective efficacy (i.e., the willingness of neighbors to intervene for the common good) are also both implicated in rates of crime and lethal violence in the criminological literature.<sup>35,36(p918)</sup>

### Alcohol Consumption and Lethal Violence

Previous research has suggested that alcohol consumption is related to violence, because of both individual-level physiological<sup>37</sup> and group-level social and economic factors.<sup>38,39</sup> Studies of both victims of violence<sup>40–43</sup> and offenders<sup>44–46</sup> revealed that a high percentage of both groups are under the influence of alcohol at the time of the violent event. At the aggregate level, both longitudinal<sup>47–49</sup> and cross-sectional research<sup>50</sup> presented evidence of a correlation between alcohol and homicide. Parnanen,<sup>51–53</sup> Parker,<sup>50,54</sup> and Parker and Rebhun<sup>49</sup> detailed potential conceptual frameworks and theoretical pathways of the relationship between alcohol and violence.

In Russia there is strong evidence for a positive relationship between alcohol consumption and mortality, especially from external causes,<sup>55</sup> including homicide.<sup>56</sup> Yet although the Russian public health and mortality crisis have received considerable scholarly attention,<sup>57–62</sup> very little empirical work has been undertaken on homicide, despite the alarming increase in and high rate of lethal violence. This is largely because of the former Soviet government's secrecy in regard to (and even falsification of) data on alcohol,<sup>15,63</sup> crime,<sup>64</sup> mortality,<sup>20,65</sup> and socioeco-

nomics, making methodologically rigorous research on violence in the country virtually impossible until very recently.

As a result of newly available data, a few studies of homicide in Russia have begun to appear. For example, Chenet et al.<sup>29</sup> studied the socioeconomic determinants of violent death in Moscow; Nemtsov<sup>66</sup> examined the impact of the anti-alcohol campaign on violent mortality; Shkolnikov et al.<sup>62,67</sup> completed extensive analyses of homicide in Udmurtia; Shapiro<sup>60</sup> and Cornia and Panicia<sup>59</sup> studied the demographic impact of the political-economic transition, including the rising mortality from lethal violence; and Pridemore<sup>56</sup> examined the impact of social structure on the spatial distribution of homicide rates in the country. The similarity in patterns of alcohol consumption and deaths from external causes, including violence, are thus focusing attention on the role of alcohol.

## DATA AND METHODOLOGY

### Data

Table 1 lists the measures for each of the dependent and independent variables used in this analysis, together with the mean and standard deviation for each.

*Homicide.* Mortality data usually provide a more accurate estimate of the total number of homicides than crime data,<sup>68,69</sup> and this is true in Russia (unpublished data available from the author).<sup>56</sup> Raw data on crime were unavailable during the Soviet era, and the information released by authorities was vague and unreliable. The Ministry of the Interior (MVD) was responsible for these data, and the agency had a history of corruption and was known to be a tool of the Communist party, which had an ideological stake in what was reported.<sup>70</sup>

This situation began to change in the 1980s, and MVD transparency increased during the 1990s, but official crime data still leave much to be desired. For example, even though crime data on homicides include attempted homicides, they annually show a significantly lower number of homicides in Russia than mortality data. In 1999, for instance, the MVD reported 31 140 homicides,<sup>71</sup> whereas the Ministry of Health reported 38 225.<sup>72</sup> Figure 2 shows that throughout

**TABLE 1—Measures Used for Independent and Dependent Variables: Russia, 1995.**

Variable	Measure	Mean	Standard Deviation
Homicide rate	Homicides per 100 000 persons	31.8	19.0
Alcohol consumption	Deaths per 100 000 persons due to “alcohol poisoning”	31.7	19.2
Poverty	Proportion of population living below poverty line	30.9	11.5
Relative deprivation	Gini coefficient of income inequality	0.31	0.03
Unemployment	Percentage of active labor force unemployed	10.2	3.8
Mobility	Number per 1000 persons who moved into and within each region	29.9	11.2
Family disruption	Percentage of households with only 1 adult and at least 1 child younger than 18 years	15.7	2.1
Ethnic heterogeneity	Lieberson’s measure of population diversity	0.3	0.2
Population density	Percentage of regional population living in cities with population > 100 000	38.3	17.3
Males 25–54	Proportion of population that is male and aged 25–54 years	31.7	19.2

most of the 1990s, this discrepancy was even greater, with annual crime data often reporting less than 75% of the number of homicides recorded by vital statistics data.

Our study used regional estimates of homicide mortality from vital statistics data as the dependent variable. The vital statistics registration system in Russia is called *Zapis Aktov Grazhdanskogo Sostoyaniya* (Registry of Acts of Civil Status) and is referred to as ZAGS. Until 1999, Russia used the Soviet coding scheme to classify the cause of death on death certificates. Item 174 in this classification had the same case definition as International Classification of Diseases (ICD) codes E960 to E978 of the World Health Organiza-

tion (WHO)<sup>65,73</sup>: “death resulting from injury purposely inflicted by another person, including legal interventions and executions.” In 1993 Russia initiated a transition to the use of the WHO classifications, and in 1999 it began reporting deaths with the ICD codes, 10th Revision.

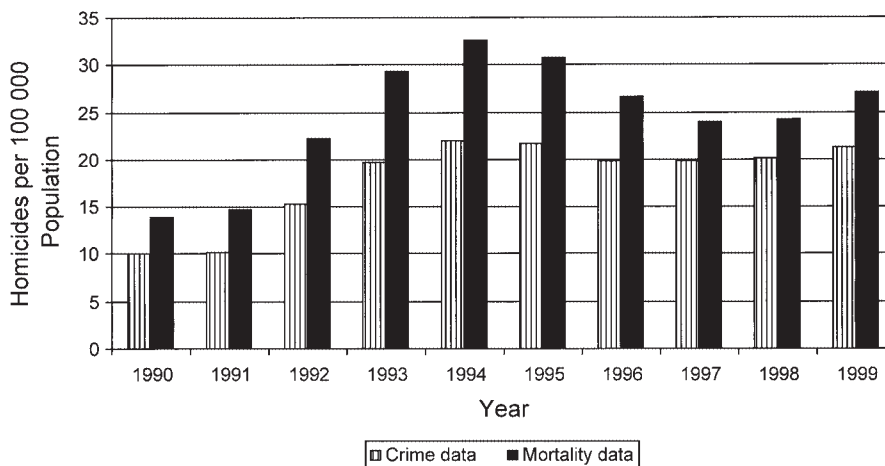
These vital statistics data on homicide were unavailable until late in the Soviet era. Today, however, aggregate homicide data are released annually in various publications from the State Committee on Statistics (Goskomstat) and in the Ministry of Health’s annual *Smertnost’ naseleniya Rossiiskoi Federatsii*. Soviet and Russian data on mortality in general,<sup>74</sup> and on violent death specifically,<sup>75</sup>

have been subjected to various validation procedures, with positive results.<sup>3</sup>

*Alcohol consumption.* Data on alcohol production and consumption in Russia went unpublished between 1961 and 1988.<sup>15</sup> In general, alcohol-related data did begin to appear publicly under Gorbachev,<sup>76</sup> but the details of measurement and collection were usually not made clear enough during this time to undertake rigorous scientific research.<sup>63</sup> The State Statistical Committee of the Union of Soviet Socialist Republics began to estimate illegal production of alcohol in 1980, but again these data were not reported publicly until 1988. Then, because of the difficulties with estimating the large amount of illicit production (and thus consumption) in the country, these estimates were halted in 1990.

Other common measures of alcohol consumption include retail sales of and household expenditures on alcohol. Such data are available for Russian regions but again cannot be considered reliable measures of true alcohol consumption for several reasons.<sup>14</sup> First, it is commonly accepted that individuals underreport consumption levels and the amount of money spent on alcohol. Second, although retail sales are normally considered a more reliable figure, several Russia-specific conditions again create a problem. Most notably, the quantity of homemade *samogon* produced, sold, and consumed has reached considerable levels and varies from region to region.

One can also rely on vital statistics data, such as the rate of deaths due to cirrhosis of the liver, as a proxy for aggregate alcohol consumption.<sup>16,66,77,78</sup> There are problems with this measure in Russia, however, because (1) it is common for many cases of alcoholic liver cirrhosis to be recorded in the “other cirrhosis of the liver” category, thereby underestimating alcohol consumption, and (2) Russian registration habits make it common to classify deaths caused by the long-term effects of drinking in a more proximate alcohol-related category without reference to the underlying alcoholism.<sup>20</sup> As a result, most deaths due to alcoholism are recorded as “alcohol poisonings.”<sup>14,79,80</sup> This category is normally reserved for true accidents (e.g., accidental ingestion of industrial alcohol or rare cases of acute poisoning resulting from lethal doses) in Western nations but contains over

**FIGURE 2—Russian homicides per 100 000 population according to crime and mortality data, 1990–1999.**



80% of all alcohol-related deaths recorded annually in Russia. Shkolnikov et al.<sup>13(p917)</sup> state that “changes in acute alcohol poisoning can be regarded as a good estimation of changes in the frequency of excessive drinking” in Russia.<sup>81</sup>

For these reasons, we used the rate of deaths due to alcohol poisoning as a proxy for the regional aggregate level of alcohol consumption. This cause of death is coded as 163 in the Ministry of Public Health’s death classification system (and as 860 in the International Classification of Diseases codes, 9th Revision); these data are available from the Ministry publication *Smertnost’ naseleniya Rossiiskoi Federatsii*.

**Demographic and socioeconomic data.** We included several socioeconomic and demographic variables in the models to control for the effects of these social factors on homicide rates. These control variables were drawn from the theoretical and empirical literature on social structure and homicide.<sup>82–84</sup>

Poverty was measured as the percentage of the population living below the poverty line and was defined as the proportion of the regional population that reports an income lower than that necessary to purchase the basic requirements (i.e., food, goods, and services) for survival.<sup>85</sup> The poverty line varies by region, depending on local prices. These data are available in Goskomstat’s *Rossiiskoi statisticheskii ezhegodnik*.<sup>85</sup>

Relative deprivation refers to the inequitable distribution of wage income among the working population; the Gini coefficient is used to measure this construct. Data on the distribution of income (by deciles) in each region were obtained from Goskomstat.

Employment was nearly universal during the Soviet era, and guaranteed pensions and housing subsidies went along with it. Not only has unemployment increased substantially after the dissolution of the Soviet Union, but the level of unemployment varies widely throughout the nation, depending largely on the type of dominant economic sector in the region and on patterns of internal migration. We measured unemployment as the percentage of the economically active population that was unemployed. The approach used to calculate this measure is equivalent to the International Labour Market’s method of calculat-

ing unemployment rates; unemployment data are available from Goskomstat’s annual *Rossiiskii statisticheskii ezhegodnik*.<sup>85</sup>

We defined mobility as the number of people per 1000 population moving into and within each region. Data on migration in Russia were based on registration records maintained by the Ministry of the Interior<sup>65</sup> and are available from Goskomstat’s *Demograficheskii ezhegodnik Rossii*<sup>86</sup> and *Regiony Rossii*.<sup>87</sup>

As a measure of family disruption, we used the proportion of the regional population living in households with a single adult and at least 1 child younger than 18 years, which is a measure commonly used in structural-level analyses of social disorganization and violence in the United States.

We defined heterogeneity in terms of ethnicity. Although more than 80% of the citizens of Russia are ethnic Russians, the country is home to dozens of different ethnic groups. This means that (1) ethnic Russians are not always the clear majority in some regions and (2) there may be several ethnic groups in a region, and therefore one may wish to include more than simple majority/minority in a measure of ethnic heterogeneity.

Thus, we used Lieberman’s<sup>88,89</sup> measure of “population diversity” to gauge ethnic heterogeneity. This measures the likelihood that any 2 randomly paired persons within a region are of different ethnic backgrounds. The measure ranges from 0, which indicates that every person has the same ethnicity, to 1, which indicates that each person has a different ethnicity. The population diversity measure is calculated as follows:

$$(1) \quad A_w = 1 - \sum_{i=1}^N p_i^2,$$

where  $A_w$  is the within-group population diversity (i.e., the probability that any 2 randomly paired persons have a different ethnic status) and  $p$  is the proportion of the population that is in each ethnic group  $i$ . Thus, the higher the score on  $A_w$ , the higher the level of ethnic heterogeneity. Our study data on the ethnic composition of the regions came from the 1989 Russian census.

Population density was defined as the percentage of the region’s population that was

living in cities with a population of at least 100 000 people.

The final control variable was the proportion of the population that was male and aged 25 to 54 years. As a result of research on violence in the United States, it is commonly accepted that young males constitute a large percentage of both victims and perpetrators of violent crimes. Research in Russia, however, has shown that the age distribution of homicide offenders and victims is substantially different from that in the United States. Homicide victimization rates in Russia are highest among men aged 25 to 54 years.<sup>1</sup> Crime data revealed that the median age of those arrested for homicide in Russia in 1997 was more than 10 years greater than in the United States, 34 and 23 years old, respectively,<sup>67,90</sup> and that in Russia only 27% (as opposed to 55% in the United States) of homicide arrestees were younger than 25 years. To control for regional variation in the relative size of this high-risk group, the model included a measure of the regional proportion of the population that was male and aged 25 to 54 years. These data were obtained from the annual Goskomstat publication *Chislennost’ naseleniia Rossiiskoi Federatsii po polu i vozrasty na 1 yanvarya goda. Statisticheskii byulleten*.<sup>91</sup>

## Methodology

**Unit of analysis.** Our study was a cross-sectional study of the 89 Russian regions, using 1995 data unless otherwise noted. Nine of these regions, each recognized as an “autonomous district,” are sparsely populated and located entirely within a larger region; thus, data for these areas are reported as part of the respective larger region. Furthermore, because of warfare, social unrest, and poor record keeping, reliable data were unavailable for the Ingush and Chechen Republics. This left a total of 78 regions for analysis.

Although a lower level of aggregation might be more meaningful, the data collection and reporting process in Russia made disaggregation a difficult task. Various local offices and officials gathered all the data used here then sent it to the regional Goskomstat offices or the regional offices of the various ministries. This information was then aggregated to the regional level, and these aggregated

data were forwarded to the respective offices in Moscow. As a result, data aggregated to levels lower than the region were rarely readily available without contact with individual regional offices.

*Missing values.* Data were missing for 3 of these regions: Dagestan (poverty and inequality data), the Jewish Autonomous Oblast (poverty, inequality, and mobility data), and the Chukot Autonomous Okrug (poverty, inequality, and unemployment data). In the case of poverty in Dagestan, the 1994 value was substituted, but similar information was unavailable for the other missing data.

To retain these cases for analysis, we replaced the remaining missing observations by using the other independent variables in the model as instruments to estimate the missing scores.<sup>92</sup> This produced a fitted value that was used in place of the missing observation.

*Measurement error.* Measurement error in an independent variable violates the assumption that the regressors are independent of the error term, thereby creating biased and inconsistent estimates. Measurement error in the poverty variable presented a special concern, because the percentage of the population living below the subsistence minimum is based on monetary income, which creates 2 main sources of error. The first source is the inherent difficulty in measuring income: in Russia, the traditional underreporting of income is exacerbated by de facto state borrowing from its citizens via wage arrears, and by unreported income of citizens earning a living at undeclared second and third jobs. Second, the income-based measure does not include nonincome forms of support, such as subsidized housing and medical care or other forms of public assistance.<sup>93,94</sup> This creates a problem in Russia, a formerly socialist nation where price controls and state subsidies remain common in some sectors and where a thriving barter economy still exists in many areas.

We used an instrumental variable, infant mortality, to purge the poverty variable of any relationship with the error term. This measure was chosen because (1) the literature provides consistent support, in general and in Russia,<sup>95–97</sup> for a relationship between infant mortality and poverty, and (2) it is unlikely that rates of infant mortality and of homicide

are causally related, because in 1995 only 126 homicide victims were infants younger than 1 year (these cases show up both in the infant mortality rate and in the homicide rate) and because the type of medical services corresponding to each of these medical situations is very different. Thus, we used the regional infant mortality rate as an instrumental variable for poverty and used a 2-stage least squares procedure to estimate the model.<sup>92</sup> The instrumental variable was first used to estimate the level of poverty in each region, thereby making the correlation between poverty and the error term 0. The second stage was simply a reestimation of the original model using these fitted values.

*Regional differences.* The Northern Caucasus and Central Chernozem economic regions both have substantially lower homicide rates than the rest of the nation, whereas the economic regions east of the Urals have much higher rates than the rest of the country. We used 3 dummy variables to see whether these differences remained after control for level of alcohol consumption and the structural factors.

*Model estimation.* We used ordinary least squares regression to estimate the cross-sectional effects of aggregate alcohol consumption on regional homicide rates, controlling for the structural factors outlined in Data and Methodology (Data: Demographic and Socioeconomic data). Because of the structure of these data, a log-log model was estimated. The distributions of several of the variables were positively skewed, and taking the natural logarithm of the original values resulted in a more normalized distribution and also pulled the few extreme values closer to the rest of the distribution. This model also allowed an intuitive interpretation of the coefficients, with the slope representing an elasticity, or the percentage change in the dependent variable associated with a 1% change in the independent variable. The equation to be estimated is as follows (units are given in Table 1):

$$(2) \text{ Ln Homicide rate} = \alpha + \beta_1 (\text{Ln Alcohol mortality rate}) + \beta_2 (\text{Ln Poverty}) + \beta_3 (\text{Ln Gini coefficient}) + \beta_4 (\text{Ln Unemployment}) + \beta_5 (\text{Ln Mobility}) + \beta_6 (\text{Ln Single-parent households}) + \beta_7 (\text{Ln Population diversity}) +$$

$$\beta_8 (\text{Ln Percentage urban}) + \beta_9 (\text{Ln Percentage male aged 25 to 54 years}) + \beta_{10} (\text{Regional dummy variable}) + \epsilon$$

## RESULTS

The correlation matrix is available from the author. With 1 minor exception, unemployment, the bivariate correlations are in the expected direction for all of the control variables. Figure 3 shows the log of the homicide mortality rates plotted against the log of the alcohol proxy. The Pearson correlation coefficient between the two is .53.

Table 2 presents the results of model estimation, with each model employing the fitted values for poverty. The coefficients were interpreted in terms of percentage changes, because this is a log-log model. Model 1 does not include any of the dummy variables, whereas models 2, 3, and 4 show the results of model estimation with the inclusion of dummy variables for the economic regions of Caucasus, Chernozem, and east of the Urals, respectively. With a *P* level set at .05, the inferences remain the same across all models, with 1 minor exception in the heterogeneity control variable.

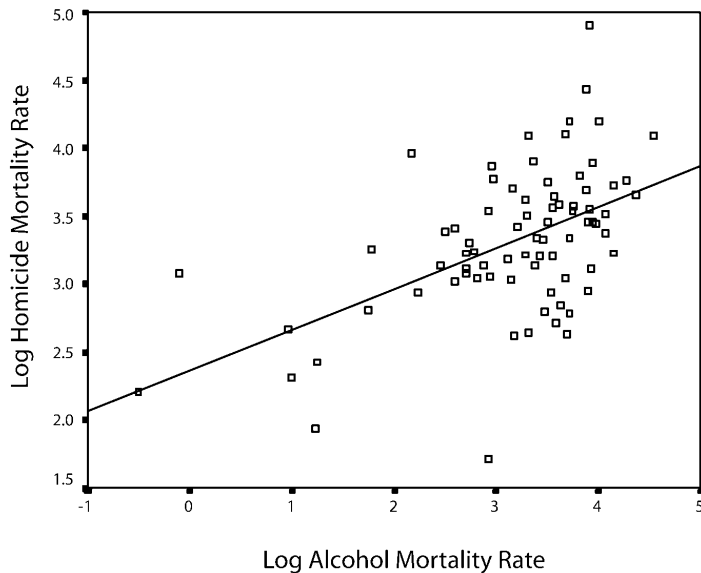
### Alcohol

It is clear from the model estimation that the proxy for alcohol consumption was positively and significantly related to the variation in the regional level of homicide mortality. The coefficient varied from .21 to .27 across the 4 models, *P* values less than .001 in each of the models. In other words, when the structural-level factors expected to influence regional homicide rates were controlled, an increase of 1% in the alcohol consumption proxy was associated with about a 0.25% increase in the regional rate of homicide.

The most conservative estimate for the effects of alcohol on homicide mortality is probably that in model 2, because it employs a regional control for the Northern Caucasus, where homicide rates are low; in addition, because of the higher proportion of Muslims in this region, rates of alcohol consumption are lower here than in much of the nation.

### Structural Control Variables

This analysis revealed that structural factors commonly found to covary with homi-



**FIGURE 3—Scatterplot of the log of the regional homicide rates and the log of the regional alcohol poisoning mortality rates.**

**TABLE 2—Results of Model Estimation for Regional Homicide Mortality Rates Regressed on Alcohol Consumption and Structural Control Variables: Russia, 1995.**

Variable	Model 1	Model 2	Model 3	Model 4
Constant	-6.905 (.013)	-7.460 (.008)	-5.734 (.035)	-5.669 (.022)
Alcohol	0.266 (<.001)	0.211 (<.001)	0.257 (<.001)	0.263 (<.001)
Poverty	1.682 (.003)	1.638 (.003)	1.557 (.005)	1.212 (.016)
Inequality	0.622 (.127)	0.740 (.086)	0.684 (.104)	-0.051 (.923)
Unemployment	-0.177 (.123)	-0.088 (.288)	-0.220 (.079)	-0.135 (.462)
Mobility	0.069 (.351)	0.127 (.241)	0.071 (.346)	-0.005 (.488)
Family disruption	1.597 (<.001)	1.558 (<.001)	1.421 (<.001)	1.259 (<.001)
Heterogeneity	0.119 (.043)	0.128 (.031)	0.082 (.134)	0.112 (.038)
Percentage urban	0.005 (.461)	0.029 (.289)	-0.009 (.432)	4.9 × 10 <sup>4</sup> (.496)
Males 25-54 years	-0.208 (.367)	-0.652 (.160)	-0.169 (.390)	-0.554 (.163)
Caucasus	...	-0.355 (.043)	...	...
Chernozem	...	...	-0.275 (.089)	...
East	...	...	...	0.430 (<.001)
Adjusted R <sup>2</sup>	0.56	0.57	0.57	0.64

Note. Numbers in parentheses are P values (1-tailed test). Caucasus, Chernozem, and East are dummy variables, coded 1 for administrative regions located in each of the economic regions, respectively, and 0 otherwise. The East dummy variable represents the Western Siberia, Eastern Siberia, and Far East economic regions.

cide rates in the United States also appear to have an impact on homicide rates in Russia.<sup>83,84</sup> For example, the relationship between area measures of poverty and homicide rates

is the most consistent finding in the literature,<sup>98</sup> and this analysis showed a positive and significant relationship between poverty and homicide rates across all 4 models.

When the most conservative estimate from model 4 was used, a 1% increase in the regional poverty rate was expected to lead to an approximately 1.25% increase in the regional homicide mortality rate ( $P=.016$ ).

The results were similar for family disruption and ethnic heterogeneity. Again, when the results from model 4 were used, an increase of 1% in the level of single-parent households within a region was associated with a 1.25% increase in homicide rates ( $P<.001$ ). Furthermore, regional ethnic heterogeneity was also found to be positively and significantly related to rates of homicide ( $b=.112$ ,  $P=.038$ ). Again, when the literature on social structure and homicide in the United States was used as a guideline, we found nothing unexpected with these control variables. That is, factors for which findings are usually insignificant or equivocal in the United States—such as inequality and unemployment—showed similar results in Russia.

Finally, when we controlled for both alcohol consumption and the structural factors, homicide rates in the Northern Caucasus and east of the Ural mountains remained significantly lower and higher, respectively, than those in the rest of the nation. This pattern of homicide coincided with that of suicide<sup>99</sup> and overall mortality.<sup>100</sup> Shkolnikov<sup>100</sup> called this pattern the “west to east gradient” and attributed it to the variation in the level of development across the nation.

## DISCUSSION

Previous research has shown that external causes of death, including homicide, were disproportionately implicated in excess mortality in Russia during the 1990s, especially among males.<sup>20</sup> Furthermore, Deev et al.<sup>55</sup> concluded from their work that there is a relationship between alcohol consumption and mortality, especially for external causes of death, and Pridemore<sup>1</sup> showed that the group with the highest rate of homicides (i.e., men aged 25 to 54 years) also exhibited the highest level of alcohol consumption. Moreover, official crime data have suggested that about three quarters of all those arrested for homicide in Russia are under the influence of alcohol at the time of the crime.<sup>19</sup> Taken together, this and other evidence led Leon and Shkol-

nikov<sup>4(p790)</sup> to claim that “alcohol is a proximal risk factor and plays a central role in the recent [mortality] crisis.”

Our hypothesis was that alcohol also plays a role in the high rates of violence in the country and in the variation of homicide rates from region to region. Although levels of homicide and of alcohol consumption increased in Russia after the dissolution of the Soviet Union, vital statistics data have revealed that rates of both vary significantly from region to region, and the results presented here provide evidence for their covariation. That is, when structural factors believed to influence homicide rates were held constant, the proxy for alcohol consumption was consistently positively and significantly related to regional variation in homicide rates. Analysis of these aggregate data did not allow strong conclusions about the causal pathways through which alcohol consumption may influence rates of lethal violence in Russia. The finding, however, is in line with the more general literature relating alcohol and socioeconomic factors to violence in the country.<sup>29,66</sup>

However, although alcohol seems to be an important factor in homicide rates, many people drink, often and to excess, without violent consequences. This suggests that the role of alcohol may vary according to the cultural context and social situations involved.<sup>101</sup> Parker and Rebhun<sup>49</sup> called this *selective disinhibition* and argued that the relationship between alcohol consumption and violence is mediated by situational characteristics. For example, Parker found evidence for an alcohol–violence relationship in the United States and argued that alcohol consumption is a situational factor that may serve to turn a run-of-the-mill confrontation into a homicide event.<sup>50</sup> Similarly, the experimental research of Taylor<sup>102</sup> suggested that alcohol consumption leads to aggression when some form of competition is involved in the interpersonal interaction, and Fagan’s<sup>103</sup> review of the literature led him to conclude that alcohol will more likely lead to violent behavior in situations containing contentious or combative elements.

One of the main assertions here relates to these cultural and situational contexts. First, rates of alcohol consumption in Russia are among the highest in the world, and Russian

culture is more tolerant of those who drink to excess and more accustomed to the personal and social ills that follow.<sup>8</sup> More specifically, what, how, and where Russians drink may result in situations that are more likely to lead to violence. Distilled spirits, in the form of vodka, are the preferred form of alcohol, resulting in quicker intoxication. Furthermore, research has shown that binge drinking is common among Russians,<sup>7</sup> resulting in heavier intoxication. Finally, cultural traditions and current economic constraints leave Russians drinking more frequently in unregulated private or semiprivate settings. Thus, faster and stronger intoxication, together with the lack of external controls or mediators, may increase the proportion of situations in which alcohol consumption leads to a violent outcome in the country.

## CONCLUSIONS

Russian citizens were thrust into a unique political and economic transition in the 1990s. These changes not only created new challenges but also resulted in situations that exacerbated historically persistent social problems in the country. Despite the generally high levels of alcohol consumption and homicide in Russia, the levels of both vary widely throughout the nation. The research reported here suggests a close relationship between the two, with higher regional rates of alcohol consumption associated with higher rates of homicide.

The level of aggregation in our study data does not permit strong statements about the causal pathways through which alcohol operates to increase rates of lethal violence in the Russian regions. The results, however, are consistent with a growing literature that implicates the tradition of heavy drinking in Russia in a host of health and social problems, including homicide. Although such an association might be expected, it was not until very recently that scientists were given access to reliable data that allowed them to study these issues. Furthermore, although the models presented here do not allow one to test such hypotheses, certain cultural traditions and common social situations in Russia—such as a preference for distilled spirits, a tendency toward binge drinking, and the practice of

drinking most often in (semi)private settings—may create contextual circumstances that increase the risk of a lethally violent outcome.

Given these cultural components, together with the disappearance of the powerful authoritarian regime, a public policy response will likely be unpopular and difficult to implement. The role of alcohol in a wide variety of social and health problems in the country is becoming apparent, however, and concerted steps must be taken to remedy these problems. Further and more detailed research can inform policy and the implementation of public health campaigns. This research agenda might be generally patterned on research undertaken in other nations, especially those in which rates of alcohol consumption are high. However, it is also important to be aware of the role played by Russian history and culture, as well as the unique social, political, and economic circumstances currently facing the nation. Russia offers a laboratory in which one can examine the role of widespread social change; the creation and expansion of markets; public policy; and severe economic depression on the patterns and levels of alcohol consumption, and in turn the impact of increased alcohol consumption on violence and health. Such research not only increases our local knowledge of Russia but is more generally applicable as well. ■

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No protocol approval was needed for this study.

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