EXCESS MORTALITY IN RUSSIA ON HOLIDAYS

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Formulation of the problem. It is known that holidays are accompanied by an increase in morbidity and mortality. The aim of this study was to summarize the experience of previous studies examining the relationship between national holidays and the time of death, as well as to analyze the Russian characteristics of mortality during holidays. The article poses the following questions: 1) Is the risk of dying on holidays increasing in Russia? 2) If so, on which ones? 3) Is this related to alcohol abuse? 4) To what extent are men and women involved? 5) What is the estimate of excess deaths on holidays?

Methods. The study used daily data on the number of deaths in Russia from all causes and from alcohol poisoning, disaggregated by sex for 2000-2017. In total, 35.4 million people died during the period under review. We studied 9 public holidays in Russia. The LOWESS moving average, calculated for non-holidays and extrapolated to holidays, was taken as zero. We took into account holidays that exceeded the LOWESS confidence interval. To estimate losses on a birthday, linear regression and its confidence interval were taken as zero. We used data from Rosstat and Google Trends to indirectly estimate legal and illegal alcohol consumption as well.

Results. Five out of nine public holidays in Russia are accompanied by an increase in the number of deaths. The greatest increase is observed in connection with the New Year on January 1-15. At this time, the number of excess deaths amounted to 113.6 thousand people over 18 years, or 6.3 thousand people per year, with a maximum on January 1 (2.0 thousand per day). This is 14.0% more deaths than on weekdays. The number of excess deaths on holidays on February 23, March 8 and May 9 amounted to 1.7 thousand per year. 80.9% of excess deaths in January are of men. The all-cause mortality and mortality from alcohol poisoning coincide with the maximum on January 1. After 2005, when the duration of the New Year holidays increased, the maximum on January 1 and the subsequent dynamics of mortality did not change. The annual maximum sales of alcoholic beverages are in December. Birthdays are also accompanied by an increase in total mortality by 9.1 thousand per year, and this is also associated with alcoholism.

Conclusion. In Russia, on holidays, mainly on New Year's and birthdays, there is a significant increase in mortality, which is mainly due to alcohol abuse and does not depend on the duration of the holidays in January. This damage can be reduced by a decrease in the availability of strong alcohol, the maximum sales of which occur in December.

Key words: *holidays, birthday, mortality, excessive mortality, alcohol poisoning, Russia, men, women.*

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IN THE PAPER WE USED THE RESULTS OBTAINED UNDER THE PROGRAM OF BASIC RESEARCH OF THE HIGHER SCHOOL OF ECONOMICS

In memory of Anatoly Vishnevsky

INTRODUCTION

Holidays are an important time in people's lives, a way to escape from everyday life, to change its usual rhythm. In many cultures, holidays are often associated with excessive consumption of alcohol, which is believed to help people relax and have fun. Indeed, such consumption does add to the fun, but sometimes the level and pattern of consumption become not only unhealthy, but even fatal. This phenomenon has been studied more than once.

Initial studies were based on monthly indicators, which revealed a maximum increase in mortality in December and January (Kloner, Poole, Perritt 1999: 1630). However, later more detailed data became available, which drew the attention of researchers to the New Year and Christmas holidays. It was shown that during and in connection with these holidays there is an increase in deaths from external causes, such as self-harm (non-fatal deliberate self-harm) (Bergen, Hawton 2007: 855), suicide and murder (Ajdacic-Gross et al 2012: 603). Non-violent causes of death have also been studied, such as cardiovascular disease (Kloner, Poole, Perritt 1999: 1630; Phillips et al. 2004: 3781) and respiratory diseases (Milne 2005: 849). In all these cases, there was an increase in mortality on holidays. In the US, deaths due to heart disease peaked around Christmas and New Year's Day, with declines in between (Phillips et al. 2004: 3781). In contrast to the US, in the UK deaths peaked on New Year's Day, but not Christmas or Easter (Milne 2005: 849). A more detailed study in the US confirmed that the largest peak in the number of deaths per year is around Christmas. This peak is followed, at some distance, by the New Year, and then, in decreasing order, Thanksgiving Day, Independence Day, Labor Day and Memorial Day. No increase in deaths was found on Presidents' Day (Phillips, Barker, Brewer 2010: 1463).

Overeating and alcoholism, a decrease in the quality of medical care, a decrease in the sense of danger in case of illness during this period (hence a delay in the seeking of medical help), as well as morbidity due to low temperature were all named as factors for increasing mortality during the New Year and Christmas holidays. The latter should be considered a coincidence of Christmas coming in the winter season, as in New Zealand, where these holidays occur during the summer (Southern Hemisphere), there is also an increase in the number of deaths on Christmas and New Year (Knight et al. 2016: e005098). It should be noted that in the materials of Western countries, the alcohol factor appears not as the main one, but as an equal among others.

Interestingly, in Kuwait (a Muslim country), the admission of patients to a large hospital increased by 1.5 times on the second day of Uraza Bayram, one of the two main Muslim holidays in the middle of summer (Zubaid, Thalib, Suresh 2006: 191).

Mortality in connection with another common celebration (a birthday) in Russia has been discussed only in the media, more often in the form of retellings of Western sources. The first studies of this problem abroad date back to the 1970s, when the so-called "birthday effect" was noted - the statistical phenomenon of the coinciding of an increase in mortality with the birth month in England and Wales (Anderson 1975: 151). This was later confirmed by daily data from Switzerland (Bovet, Spagnoli, Sudan 1997: 151), post-Soviet Ukraine (Vaiserman et al. 2003: 221) and the USA (Ajdacic-Gross et al. 2012: 603). The birthday effect sometimes appeared only in

men (Phillips, Van Voorhees, Todd 1992: 532), but more often without gender differences (Doblhammer 1999: 1; Medenwald and Kuss 2014: e004423). In the USA, it was also shown that the birthday effect is most often observed at the age of 20-39 years (51.0%), before this age - in 31.3% of cases, and after 39 years it sharply decreases (age 90+ - 4.3 %). At the same time, the coinciding of a birthday and a day off dramatically increases the risk of dying. In total, in the United States for 13 years (1998-2011) excess deaths per birthday amounted to 4,590 cases (Peña 2015: 59) or 353 per year. It has also been pointed out that this effect may be a statistical artifact due to accounting errors (Abel, Kruger 2009: 175; Phillips, Van Voorhees, Todd 1992: 532). Alcohol abuse, birthday stress, and suicide were commonly cited as factors in increasing birthday mortality.

It is important to note that birthday suicides are of particular interest in the foreign literature. For example, for Japan, a 1.5-fold increase in the number of suicides per birthday has been shown (Motohashi 2012: 1282). In Japan, it has also been shown that among men an increase in suicides occurs 5 days before and a week after the birthday, with a maximum on the day of birth, while for women this interval was wider. At the same time, the period of increased suicide risk depended on the age and social status of the deceased (Stickley et al. 2016: 259). In Germany (Bavaria), an increase in birthday suicides has not been found (Reulbach et al. 2007: 554), in contrast to the UK (Williams et al. 2011: 13). In the latter case, it was noted that the risk of suicide is higher in people who have recently sought psychiatric help.

As can be seen, in foreign publications the problem of the increase in mortality during the holidays has been studied quite actively. In Russia, despite the high level of alcohol consumption and its severe consequences, only once has there been registered an increase in holiday-related cardiovascular and general mortality, on January 2-5 in a limited geographical area (Kemerovo) (Barabash, Altarev, Fomina 2010: 35), or an increase in murders on New Year's Eve (Zhaksymbaev 2012).

PURPOSE OF THE STUDY

The purpose of this study was to generalize the experience of previous studies examining the link between national holidays and time of death, as well as to analyze the Russian characteristics of mortality on holidays. We posed the following questions: 1) In Russia, does the risk of dying increase on holidays?; 2) If yes, on which ones?; 3) Is this related to alcohol abuse?; 4) To what extent are men and women involved in this?; and 5) What is the estimate of the excess number of deaths on holidays?

MATERIALS AND METHODS

An epidemiological retrospective non-selective study was carried out. The work was carried out in several stages, depending on the nature of the holidays and the structure of the materials. At the first stage of the study, mortality on public holidays in Russia was analyzed based on the time series of daily mortality statistics for the period 2000-2017. Data on the daily number of deaths has been available since 2000 and was obtained using a special processing of anonymous

microdata collected by Rosstat from the complete registration of deaths. For the analysis, we used time series of daily numbers of deaths from all causes of death separately for men and women (a total of 18.5 and 16.9 million deaths over the period, respectively) and from accidental alcohol poisoning, which we defined as the sum of codes X45 (accidental alcohol poisoning) and Y15 (alcohol poisoning with uncertain intentions) of the ICD-10. In Russia in recent years there has been a sharp increase in deaths from Y15. This is probably due to the erroneous coding of some of the X45 deaths as Y15 deaths. In total, 501.5 thousand deaths from Y15 were detected during the analyzed period. Deaths without dates were excluded from the study (0.041%), as were those occurring on February 29 (5 days in 2000-2017).

In this part of the work, to estimate the excess number of deaths, the annual segments of the series of daily deaths in 2000-2017 were summarized. The series (n=365) included 7 major holidays in Russia: New Year (January 1), Orthodox Christmas (January 7), Old New Year (January 14), Defender of the Fatherland Day (February 23), International Women's Day (March 8), Spring and Labor Day (May 1), Victory Day (May 9), Russia Day (June 12) and National Unity Day (December 12).

Since the increase in the number of deaths on holidays lasted 2 or more days, the total number of days of increased mortality was 22 days. For two official holidays (Russia Day and National Unity Day), no increase in the number of deaths was found, hence for the study they were considered as weekdays.

At the first stage, from the daily indicators of total mortality and alcohol poisoning in 2000-2017, after summation (n=365), 2 rows were distinguished: deaths on holidays and deaths on weekdays, with the exception of holidays and artifacts of “the first and last of the month”. For mortality on weekdays, a trend was built, which was then extrapolated to holidays.

The weekday trend was described using the LOWESS method (LOcally WEighted Scatter-plot Smoother) or locally weighted polynomial regression (Cleveland, Devlin 1988: 596). The accuracy of fitting the trend line to the observed data (fitting) was controlled using the smoothing parameter (bandwidth). A 95% confidence interval was constructed for the LOWESS trend. Additional mortality on holidays was defined as the difference between actually observed daily mortality and everyday mortality extrapolated to holidays on these days. Only those holidays that exceeded the confidence interval were taken into account.

Since the weekday trend line had gaps on the holidays of the month, these gaps had to be filled in. To fill in the missing points of the trend line and calculations, linear interpolation was used, connecting by a straight line the extreme points of the missing series.

The total mortality series had 11 primary recording defects from February to December (see discussion of results): a peak on the first day of the month and a minimum the day before. Sometimes these peaks extended to two days - a total of 35 days that were excluded from the number of weekdays (9.2% of deaths of the total), including the May 1 holiday. The gaps were filled in the same way as the holiday gaps. The minimum total mortality on December 31 did not fall outside the 95% confidence interval, and the series of deaths from accidental alcohol poisoning did not have such defects.

The second stage is the study of mortality in connection with a birthday. Those who died on January 1 were tentatively excluded, since the day of death of some of them was erroneously registered on that day. The following algorithm was used to analyze birthday mortality. The days of death and birth of each deceased were numbered according to the numbers of the days in the year (from 1 to 365/366). Next, the number of the day of death was subtracted from the number of the birthday. If the numbers of the day of birth (DR) and death (DS) coincided, the difference was equal to zero. If the difference between the number of the DR and DS fell within the interval of ±182, the differences retained the corresponding values with a + or - sign. If the difference went beyond ±182 days, then an additional calculation was performed using the formula 365(366) - DS+DR. As a result, the distribution of DS of all the deceased relative to their DR was obtained on a scale of ±182 days.

The third stage is the study of alcohol consumption, both legal and illegal, using official Rosstat statistics on alcohol sales[1]. An indirect indicator of illegal alcohol consumption was Internet searches for moonshine and vodka, obtained using the public tool Google Trends[2]. This algorithm allows you to select a country, region, and arbitrary period of time since 2004 (days, months, years) and set a search query in the form of a word or a combination of words. In response, Google Trends returns results as a number series. The Google Trends algorithm automatically calculates the proportion of search queries from all queries on the Internet and thus normalizes queries over time and makes them independent of changes in the number of connections in a given period. Next, Google Trends determines the maximum number of search queries in the selected period and takes it for 100%; the remaining points of this period are automatically recalculated as a percentage of the maximum.

The following words and phrases were used as search queries: “moonshine” and “vodka” + “buy vodka”. The answer to the word "moonshine" includes all phrases with this word (for example, "moonshine still" and "moonshine recipe"). For this study, data were reported monthly or daily from January 2004 to February 2020.

RESULTS

A. Total mortality

Daily summaries of all deaths in 2000-2017 are shown in Figure 1.

The main trend in mortality is a progradient decrease in deaths by September and a return growth by December. This trend is complemented by irregular monthly fluctuations with maximum values in summer. Figure 1 also shows a number of regular peaks that occur on the first day of each month from February to December. Each such maximum is preceded by a minimum on the last day of the month. This is probably an artifact due to the arbitrary registration of some deaths occurring on the last day of the month as having occurred on the first day of the next month. It cannot be ruled out that the change in accounting occurs not in 2, but in 3 or 4 days. An equally

[1] URL: https://www.fedstat.ru/indicator/57614
[2] URL: https://trends.google.com

significant decrease in deaths was not observed on December 31 (Figure 1). It should be noted that the peaks in the first days of the months in the last 3 years are less pronounced (2015-2017). A similar phenomenon, but on a weekly basis, was observed in the USA and noted in a 1999 paper (Phillips, Christenfeld, Ryan 1999: 93). In the publications of D. Phillips and co-authors in 2004 and 2010, who worked on similar topics and with similar tasks, this was not noted (Phillips, Barker, Brewer 2010: 1463; Phillips et al. 2004: 3781). In addition to the peaks of such a technical property, Figure 1 shows peaks corresponding to January 1, February 23, March 8 and May 9. One can see additional peaks on January 7, 14 and 20, which are superimposed on the "tail" of the January 1 peak, as well as that the peak on May 1 differs in duration from other maxima in the first days of the month.

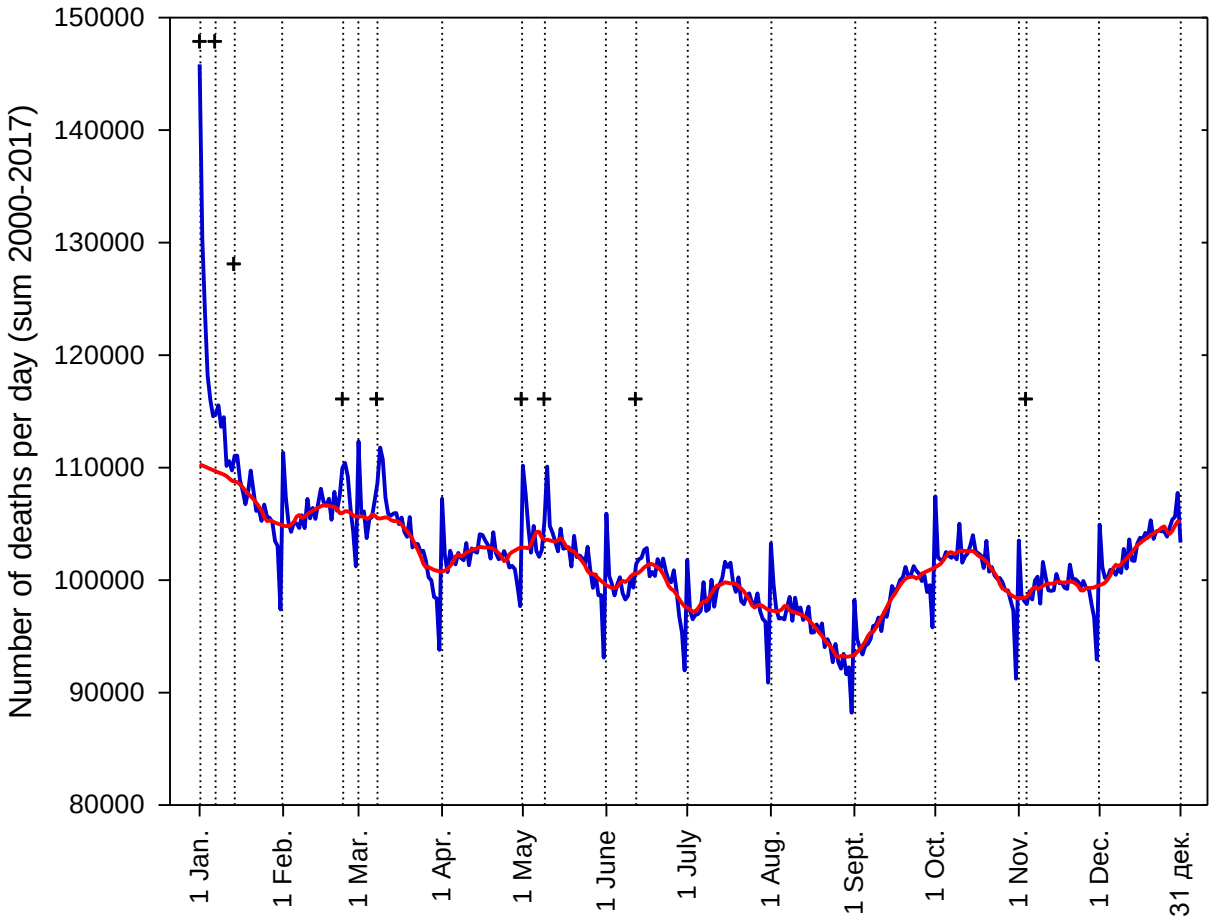

Figure 1. Distribution of the total number of deaths during the year for the period 2000-2017 in Russia

The red line is the LOWESS floating average for non-holidays, extrapolated to public holidays. The vertical dotted line is the first days of months and days of holidays; the crosses indicate, in order: January 1, 7 and 14, February 23, March 8, May 1 and 9, June 12 and November 4.

Source: Authors' calculations.

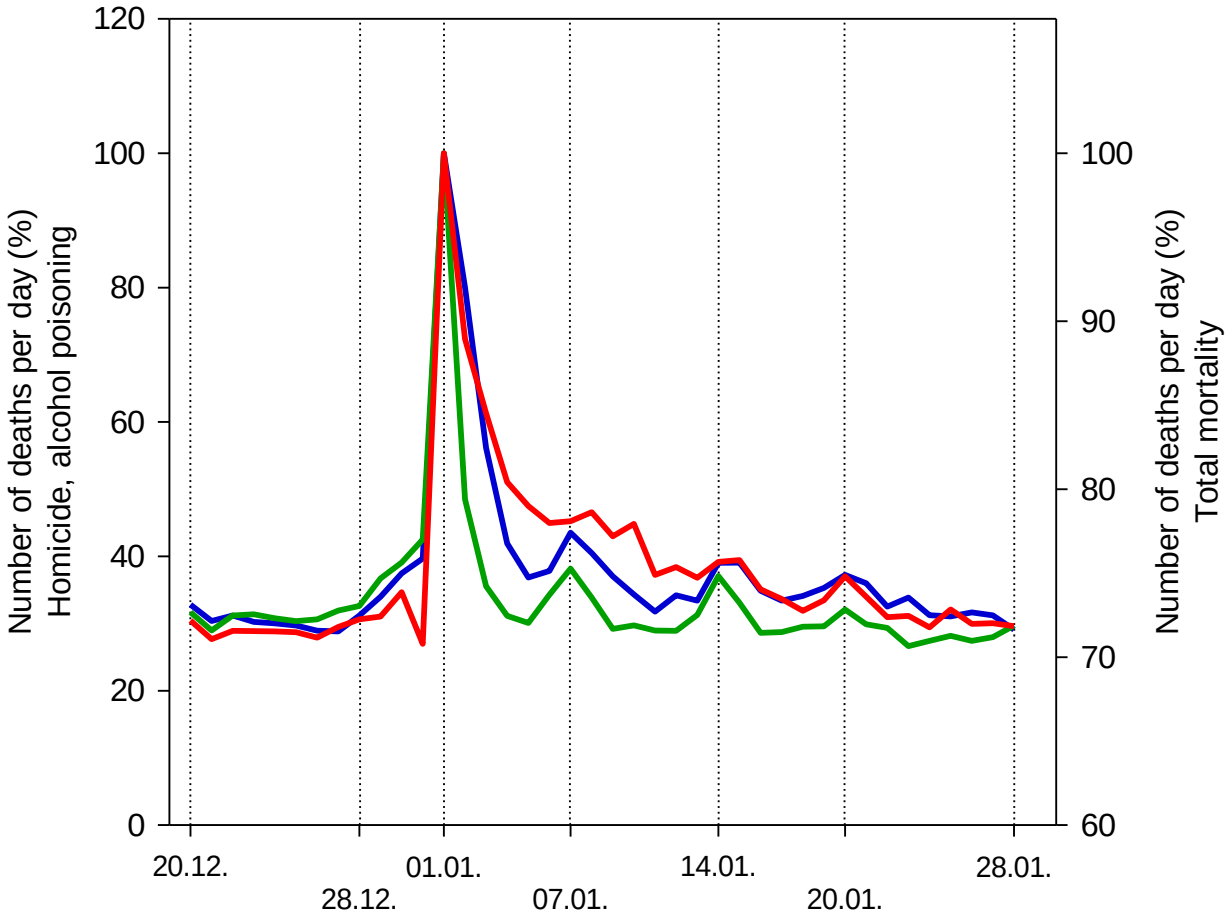

Figure 2. The ratio of the daily number of deaths from December 20 to January 28 to the maximum level recorded on January 1 (January 1 = 100%; indicators are averaged; 2000-2017).

The red line is the ratio of the daily total number of deaths to the maximum level recorded on January 1 (right axis), the blue line is deaths due to alcohol poisoning, the green line is homicides (left axis).

Source: Authors' calculations; murders - (Nemtsov 2019: 31).

The peak on January 1 is the largest among all peaks during the holidays (Figure 1). To calculate the additional number of deaths due to the New Year and other January holidays, days were selected that exceeded the confidence intervals of the floating average LOWESS for non-holiday days (gray line in Figure 1). To estimate the period of additional mortality on holidays, 2 options could be chosen: to consider as the end of the holiday increase in deaths the day when the mortality curve crosses either the 0.95 confidence interval or the LOWESS line. The first, more stringent method was chosen, in accordance with which losses from 1 to 14 were taken into account with the exception of January 10-13. In the second case, excess losses would have to be calculated until January 17, without exceptions on January 10-13. The dynamics of the number of deaths in January is shown in Figure 2; an estimate of additional excess deaths is in Table 1.

In November-December, the number of deaths generally increases, with some slowdown after December 20 (Figures 1, 2) and an increase after December 28. The decrease of 106 deaths on December 31 is within the LOWESS confidence interval. A significant increase in the number

of deaths was observed from 1 to 10 and 14-15 January and corresponds to the holidays of the New Year, Christmas and the Old New Year. The additional peak on January 20 following the feast of the Epiphany/Blessing of the Water on January 19 was insignificant.

Table 1. Estimated excess deaths due to holidays in January, 2000-2017 (missing January 11-13 - insignificant increase)

	Number of deaths on the holidays											
Date	1	2	3	4	5	6	7	8	9	10	14	15
Sum of losses on individual days (persons)	35558	20153	13833	8208	6172	4789	5068	5957	4155	5102	2285	2360
Total						113 640						
Sum of losses on individual days (%)	31.3	17.7	12.2	7.2	5.4	4.2	4.5	5.2	3.7	4.5	2.0	2.1

In 2000-2017 the number of excess deaths during the January holidays came to 113.6 thousand people (Table 1), or 6.3 thousand on average for the January holidays, with a maximum of 2 thousand people on January 1. This result should be considered more accurate than what was obtained previously based on monthly indicators (Nemtsov 2017b). The number of deaths on holidays is on average 14.0% more than on weekdays (mortality on weekdays was calculated on the basis of the floating average).

Excess losses in January varied from year to year and generally decreased as alcohol consumption decreased. Thus, in 2003, at the height of the last peak of mortality and consumption, an additional 17,827 deaths occurred, and in 2005, against the background of a decrease in these indicators – 8,513. However, the peak on January 1 remains unchanged throughout the study (Figure 3), amounting to 120- 130% of the December average. After 2012-2013 the decrease in mortality after the peak on January 1 became more gradual, reaching the December level only at the end of January. In some years this phenomenon was expressed especially sharply (Figure 3), but this did not affect the overall assessment of losses - this new phenomenon up to 2017 inclusive was reflected in the average values. Along the way, it is worth paying attention to how the peak of February 1 has grown in recent years.

The remaining 6 holidays, marked with crosses in Figure 1, were analyzed in the same way as in the case of the January holidays. However, the May 1 holiday fell out of the total mortality calculations due to accounting errors in the first days of the month. On the holidays of June 4 and November 12, no increase in mortality was found (Figure 1). Significant results are presented in Table 2.

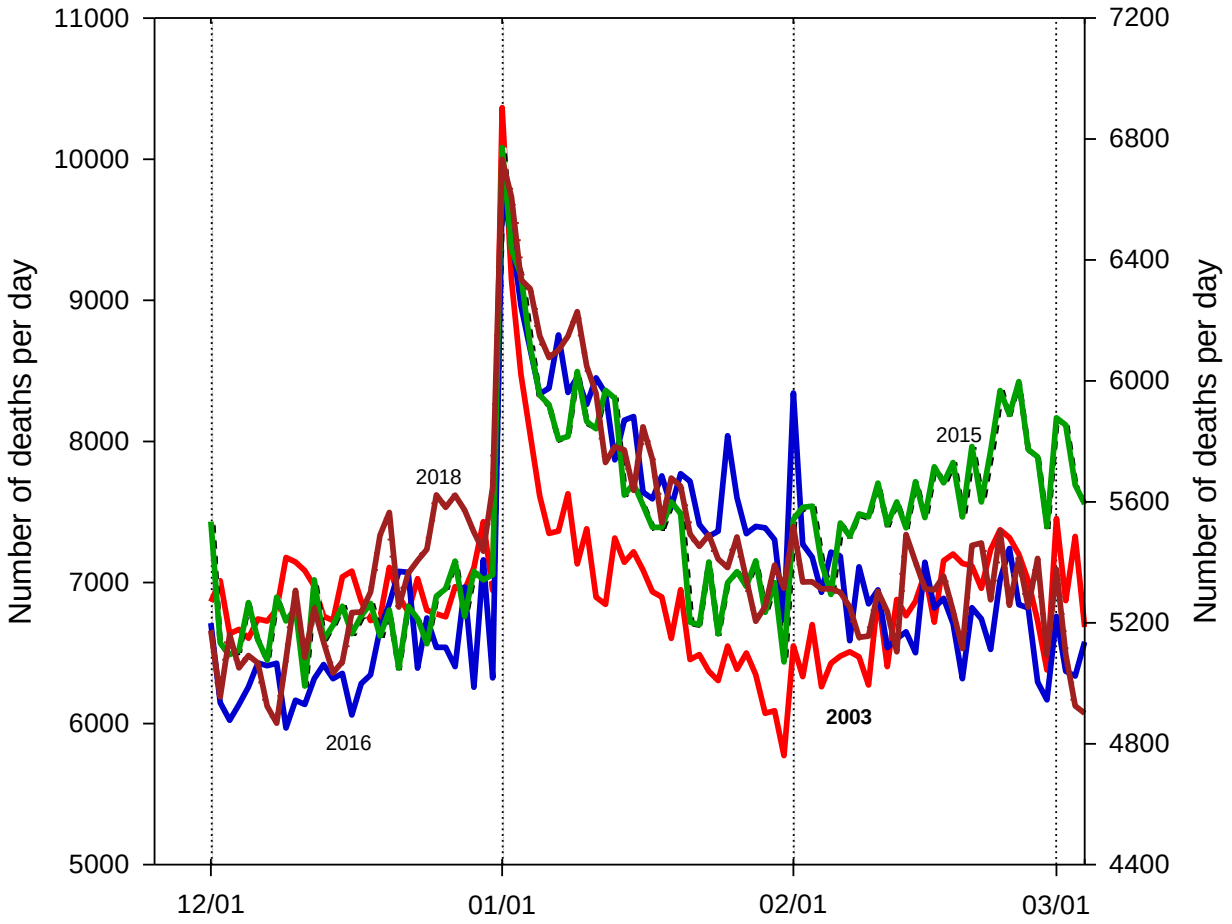

Figure 3. Dynamics of the number of deaths in Russia in different years from December 1 to March 1

Highs January 1, 2015, 2016, 2018 (green, blue and brown lines - axis on the right) are adjusted to the 2003 maximum (red line - axis on the left).

Source: Authors' calculations.

Table 2. Estimated excess deaths due to holidays in February, March and May (total for 2000-2017)

Indicator	Days and months of holidays						
	February		March			May	
	23	24	8	9	10	9	10
Number of excess deaths on holidays	4004	4275	3168	6306	5211	1691	6502
Monthly sum	8279			14685		8193	
Total				31157			

As can be seen, the largest number of losses is associated with the March 8 holiday, and the total losses of the three holidays are 3.5 times less than in January. Thus, the total number of excess deaths due to holidays in 2000-2017 came to 144,797 or 8,044 per year (table 1 and 2).

B. Deaths due to alcohol poisoning

In 2000-2017 deaths from alcohol poisoning accounted for 1.42% of the total number of deaths. Both overall mortality and deaths due to alcohol poisoning are characterized by a decrease in the summer months with a minimum in early August (Figure 4). After that, return growth begins by

December. In addition, the figure reveals monthly fluctuations with a maximum in the middle of the month, which are more distinct compared to total mortality (Figures 4 and 1). It is noteworthy that the peaks of the end and beginning of the month are absent.

Figure 4 shows peaks on holidays: January 1, 7 and 14, February 28, March 8, May 1 and 9 turned out to be significant. Holiday peaks are more pronounced compared to total mortality (Figure 1); they correspond exactly to the peaks of total mortality but are shorter than the latter (Figure 2). The number of fatal poisonings on holidays is 41.5% more than on weekdays.

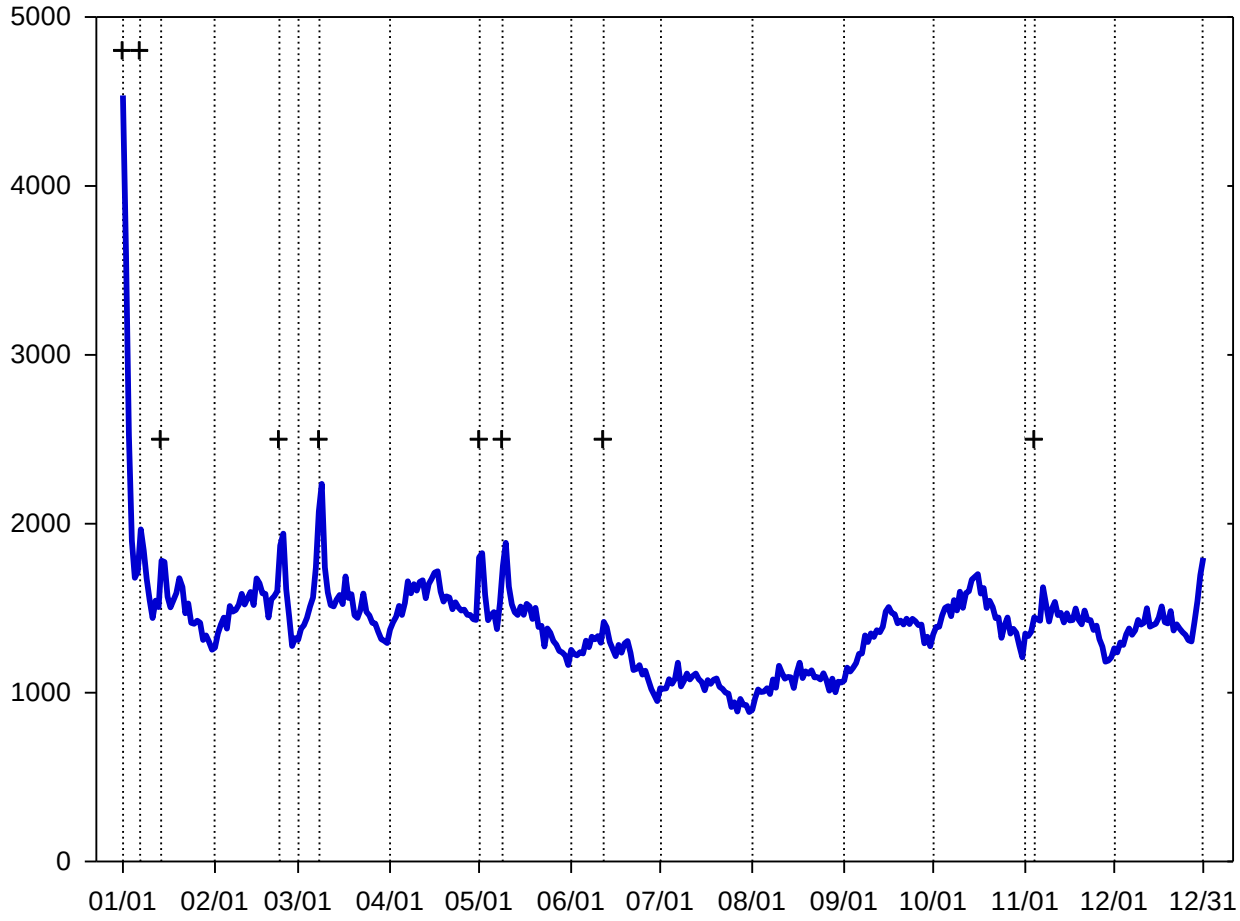

Figure 4. Distribution of the daily number of deaths during the year due to alcohol poisoning for the period 2000-2017 in Russia

The crosses indicate, in order: January 1, 7 and14, February 23, March 8, May 1 and 9, June 12 and November 4.

Source: Authors' calculations.

The growth of poisonings begins on December 28, as does that of murders. Probably, the increase in overall mortality, distorted by the December 31 artifact, begins in the same way (Figure 2). During the January holidays, the proportion of deaths due to alcohol poisoning in the total mortality more than doubles (from 1.42 to 3.53%). The additional number of deaths due to alcohol poisoning in total in 2000-2017 is presented in Table 3 and comes to 14,682.

Table 3 Estimated excess deaths due to alcohol poisoning on holidays, 2000-2017; skipping January 10-13 – a slight increase

Month	January										
Dates	1	2	3	4	5	6	7	8	9	14	15
Number of excess deaths	3236	2290	1207	577	349	379	622	490	315	393	380
Total						10 238					
%	31.6	22.4	11.8	5.6	3.4	3.7	6.1	4.7	3.1	3.8	3.7
Month	February		March		May						
Dates	23	24	8	9	1	2	9	10	11		
Number of excess deaths	381	452	590	755	457	485	434	573	317		
Total	833		1345				2 266				
Amount			4 444								
%	45.7	54.3	35.9	64.1	20.2	21.4	19.2	25.3	14.0		

Of interest is the ratio of total excess deaths to those from alcohol poisonings (Table 4). This ratio makes it possible to roughly estimate the excess total mortality on May 1, which could not be determined directly due to an accounting defect. Excess total mortality is on average 9.6 times greater than poisonings. It can be assumed that the losses on May 1 came to 942 x 9.6 = 9,043. This value, together with the total excess deaths on other holidays, will be 5.9%, which is close to the share of poisonings in their total amount (6.4%). From this we can make the assumption that total mortality for the May 1 holidays in 2000-2017 came to about 9 thousand deaths.

Table 4. The ratio of excess total mortality and alcohol poisonings on holidays

Holidays	Excess deaths		% of alcohol poisonings to their total	Ratio of total to alcohol poisonings
	From alcohol poisoning	Total		
1 January	10238	113640	69.7	11.1
23 February	830	8279	5.7	10.0
8 March	1345	14685	9.2	10.9
1 May	942	-	6.4	-
9 May	1324	8193	9.0	6.2
Average				9.6

C. DEATHS OF MEN AND WOMEN

Averaged data on the deaths of men and women separately in 2000-2017 are shown in Figure 5.

The main feature of the trend in women's deaths is a decrease by the middle of the year with a minimum in August-September, while for men this feature is less pronounced - they die more evenly throughout the year. From February to July, the average number of deaths for men fell by 3.2% and for women by 12.2%. Accordingly, in July the proportion of male deaths increased from 50.8% to 53.2%.

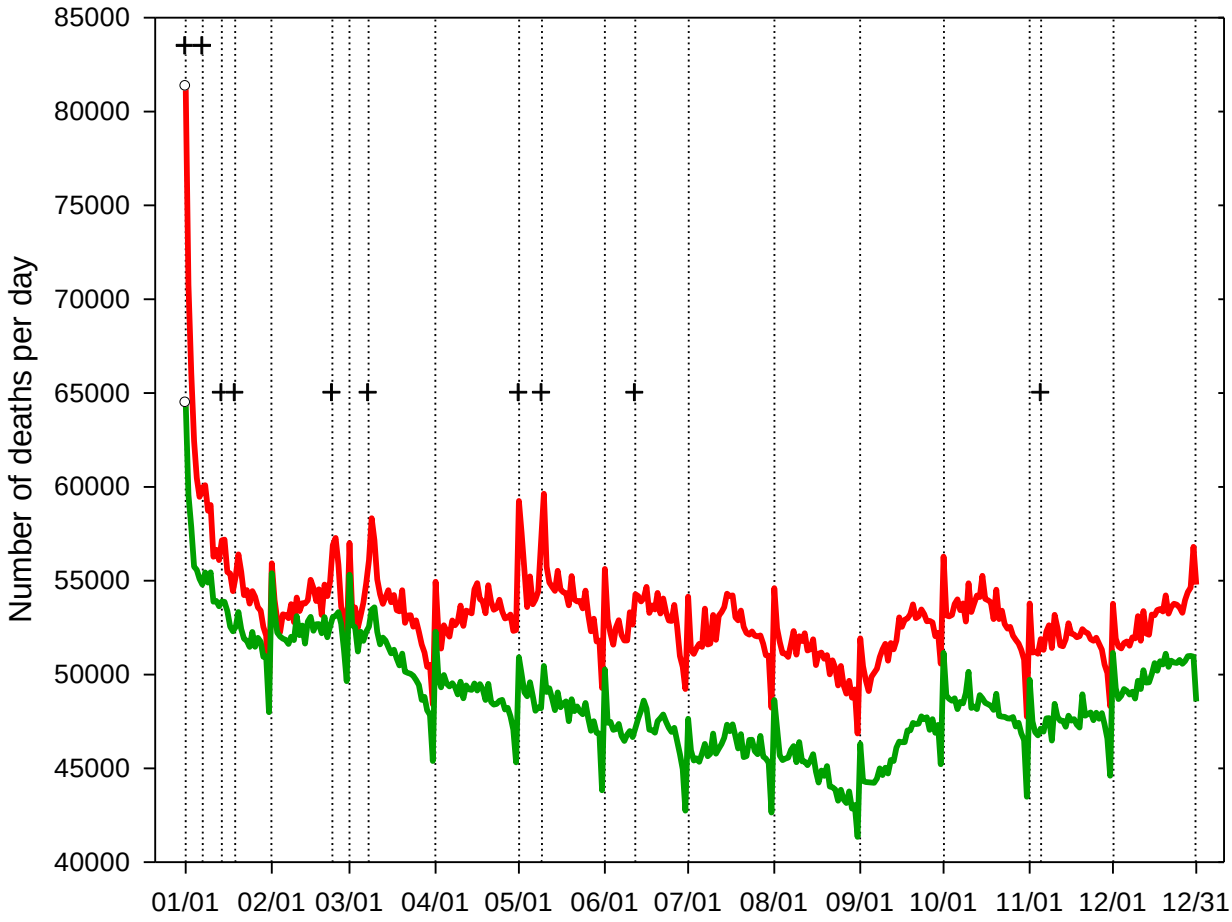

Figure 5. Distribution of the daily number of deaths of men (red line) and women (green line) during the year for the period 2000-2017 in Russia

Men are the red line, women the blue line. The circles indicate the maximums on January 1, the crosses indicate state and national holidays.

Source: Authors' calculations.

The artifacts of the last and first days of the month are expressed in the same way, with the exception of April 30 and December 31: there was no decrease in men.

The maximum number of deaths on January 1, among both men and women, is fairly high, but on this day, in absolute terms, 26.2% more men died than women (assuming that the total number of women in Russia in 2000-2016 was 10% more, the relative indicator differs even more); peaks on other holidays for women are either much smaller or non-existent. A detailed analysis of mortality in January showed that the New Year's increase in male deaths stretches until January 24 and comes to 6,554 deaths. For women, the increase in deaths ends on January 11 at 1,550 deaths. Excess losses of men in January came to 80.9% of the total. The combined excess deaths of men and women (8.1 thousand) is greater than overall excess mortality (8.0 thousand), which is most likely due to a more detailed determination of the duration of the loss period when assessing gender differences.

D. DURATION OF HOLIDAYS AS A FACTOR IN THE INCREASE IN MORTALITY IN JANUARY

One often cited behavioral factor for the increase in mortality in January is the long duration, up to 11 days, of the New Year and Christmas holidays, which combine New Year, Christmas and Old New Year. The increase in the duration of the January holidays began on January 1, 2005 (FZ-201 2004). Before this time, the New Year and Christmas holidays were separated by two or three working days and in total amounted to 4-5 days. It is possible to determine the effect of the duration of the holidays by comparing 2 five-year periods, before and after the approval of the Law (FZ-201 2004) (Figure 6).

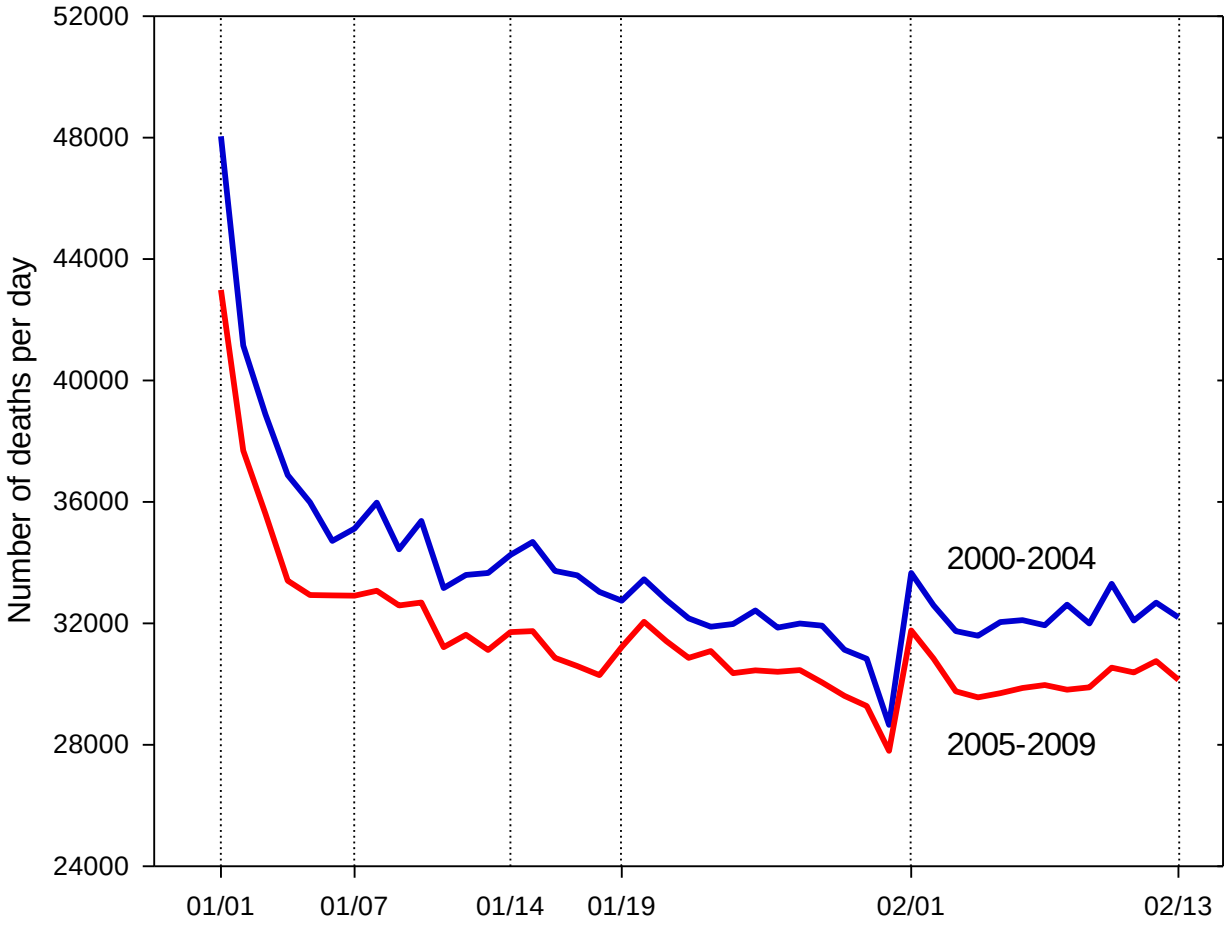

Figure 6. Distribution of deaths between January 1 and February 13 in 2000-2004 and 2005-2009

Blue line - 2000-2004, red line - 2005-2009. Vertical dotted line - state and national holidays, as well as February 1 and 13.

Source: Authors' calculations.

As can be seen in Figure 6, the distribution of deaths by years varies quantitatively: in 2000-2004 there were more deaths. This is due to the fact that during this period there was an increase in mortality, and in 2005-2009, a decrease. However, the form of distribution in 2005-2009 practically duplicates the distribution of 2000-2004. It should be noted that in 2004-2009 not

only the distribution of holidays is duplicated, but also the artifact of the beginning and end of the month (January 31-February 1).

E. ALCOHOL CONSUMPTION

In order to estimate excess deaths during the January holidays, it is important to investigate the nature of alcohol consumption in connection with the holiday. However, only legal sales, which make up the majority of consumption (about 70%)[3] , are available for analysis. The distribution of monthly sales of the main alcohol drinks (vodka and wine products) since January 2017 is shown in Figure 7.

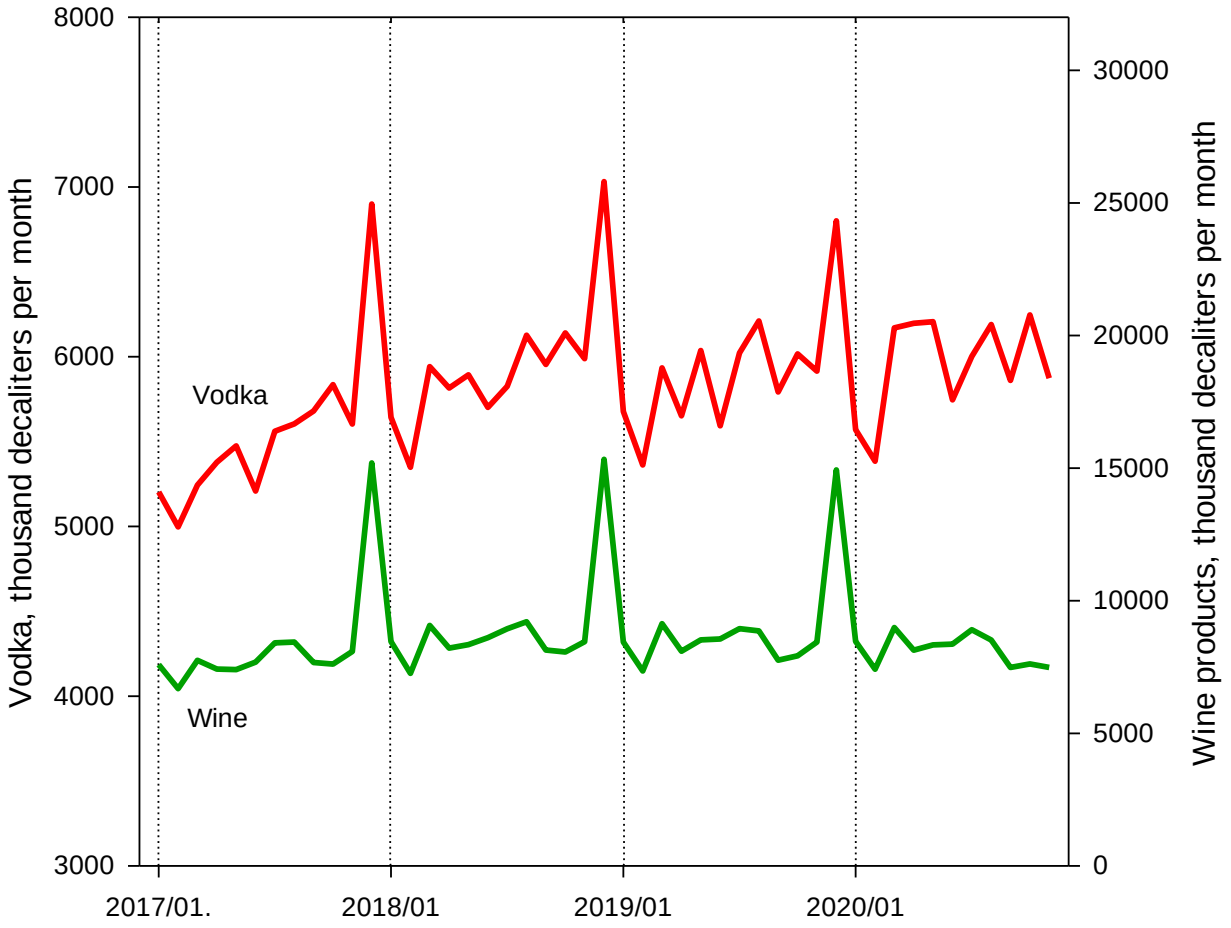

Figure 7. Distribution of sales of vodka and wine products (wine) by months from January 2017 to November 2020, thousand decaliters per month

Source: Rosstat RF data, authors' calculations.

Earlier data are not quite suitable for analysis, due to a change in the classification of wine products and the introduction of the EGAIS (Unified State Automated Information System), covering an increasing number of territories and thereby increasing the accuracy of sales

[3] Ministry of Health of the Russian Federation. Order No. 575 dated July 30, 2019 "On approval of the methodology for assessing the average per capita alcohol consumption in the Russian Federation". Appendix to the order.

accounting. However, Figure 7 shows that both before 2017 and after, the annual sales peak occurs in December of each year.

An idea of the sales of illegal alcoholic beverages can be obtained indirectly based on the popularity of Internet requests for the delivery of alcoholic beverages (Figure 8).

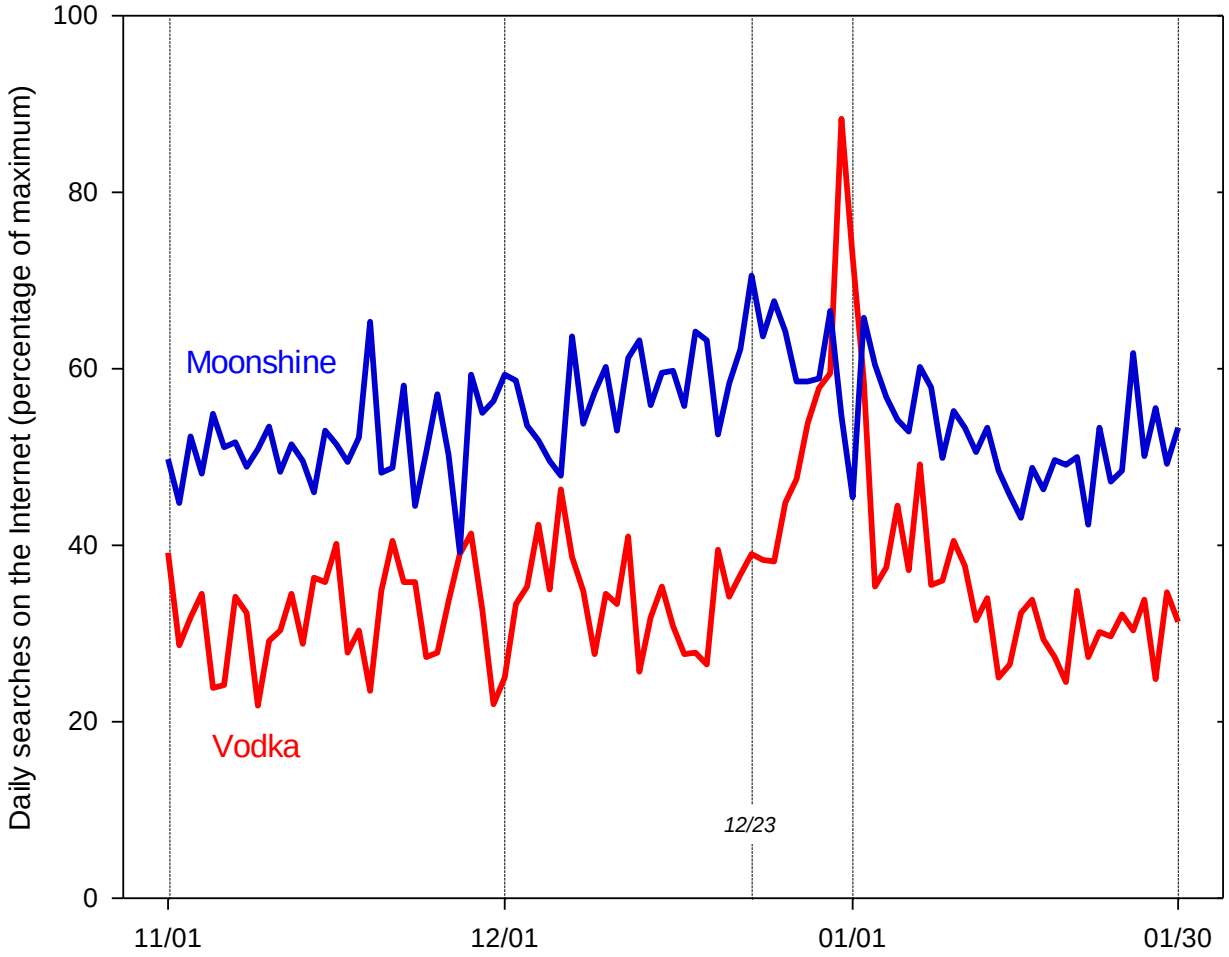

Figure 8. The ratio of the number of daily searches on the Internet for the phrase "vodka" + "buy vodka" (vodka) and "moonshine" from November 1 to January 30 (average value for 2007-2020), to the maximum

Source: Google Trends data of the Federal State Statistics Service of the Russian Federation, authors' calculations.

Searches for moonshine increase from May to December with a maximum on December 23, after which a decrease in the number of searches begins, especially sharp on January 1. Searches for vodka remains fairly even, with slight fluctuations from February to December 23, after which they begin to rise sharply, with a maximum on December 31 and then an even sharper decline on January 1-2.

F. BIRTHDAY DEATHS

The popularity of birthday celebrations is comparable to that of New Year's. However, unlike the New Year and other holidays, birthdays are dispersed throughout the year, which required a different method for identifying mortality associated with it: combining birthdays with 182 days before and after it (Figure 9).

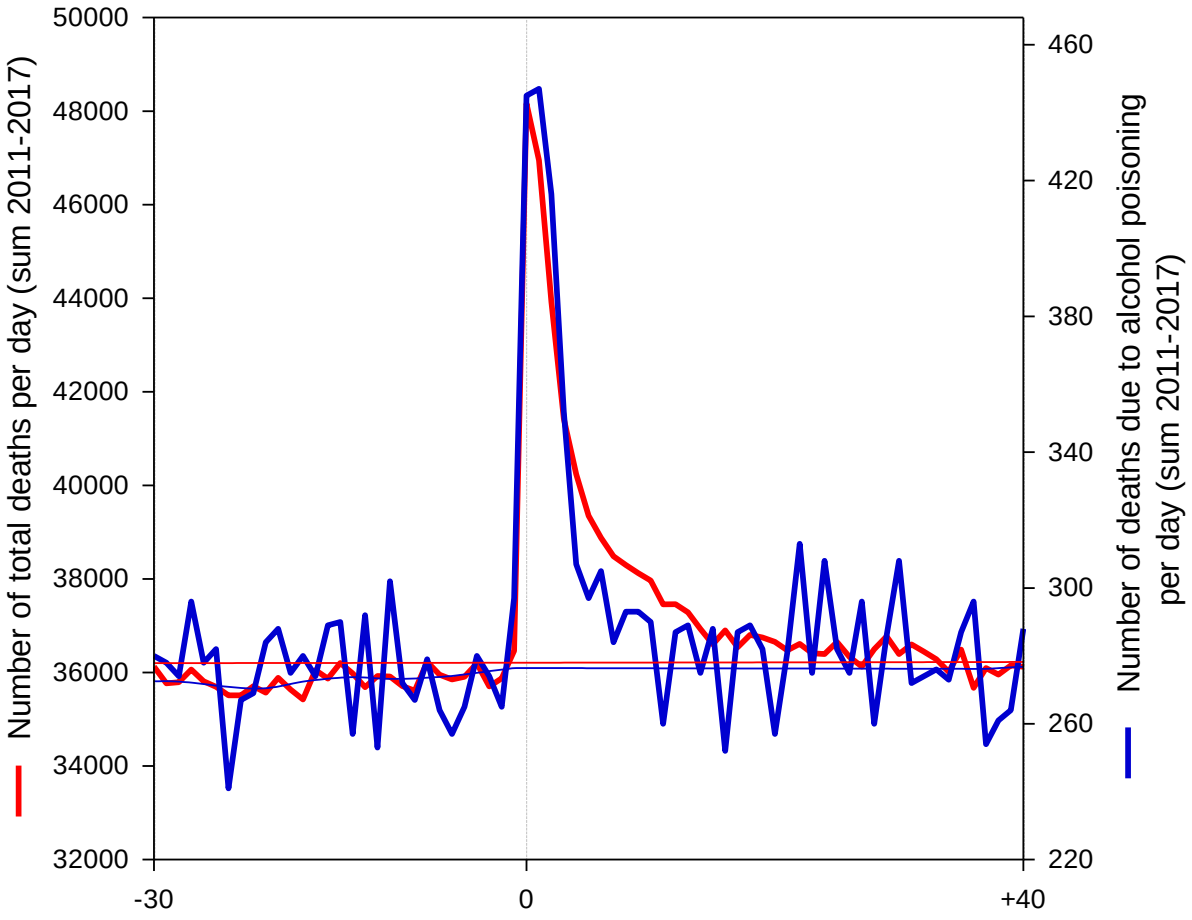

Figure 9. Distribution of the total number of deaths (red line - axis on the left) and alcohol poisoning (blue line - axis on the right) 30 days before and 40 days after a birthday

Horizontal lines are regressions of days outside a birthday: red line - total mortality, blue line - alcohol poisonings.

Source: Authors' calculations.

Figure 9 shows that in connection with a birthday there is a sharp increase in the number of deaths with a maximum on the birthday and a gradual decrease in mortality over 4 days for poisoning and 22 days for total mortality (the day of crossing the regression confidence interval for non-holiday days).

Table 5. Estimate of excess deaths linked to a birthday in 2011-2019

Mortality	Average number of days	Average value per year	Total over 7 years	Minimum	Maximum
Total	22	8.665.1	77.986	851	12.867
From alcohol poisoning	4	82.0	738	36	237

Over a period of 9 years (2011-2019), the excess number of deaths was 78.0 thousand, for alcohol poisoning - 0.7 thousand (Table 5; an average of 8.7 and 0.08 thousand per year, respectively). The ratio of total mortality losses and poisonings in the case of birthdays is described as 106:1, while this ratio for the January holidays is 11:1, with similar overall mortality for the two (8 and 9 thousand).

DISCUSSION OF RESULTS

An uneven distribution of deaths during the year, with a maximum in January, or more precisely, on the New Year and Christmas holidays, has been shown repeatedly. Judging by the number of deaths, it can be considered that in countries of Christian culture, Christmas and/or New Year are the main holidays of the year. To such countries now can be added Russia, where the maximum number of deaths during each year occurs on January 1 (Figure 1). An excess number of deaths due to the January holidays persists on average until January 15 (Table 1, Figure 2): for men until January 22 and for women until January 11. Over the 18 years from 2000 to 2017, an additional 113.6 thousand people died during this period of time (Table 1), or 6.3 thousand per year on average, of which 2 thousand deaths occurred on January 1. The maximum of excess deaths during the January holidays was observed in 2003 at the maximum of total mortality, when excess deaths in January amounted to 17.8 thousand people. In the following years, along with a decrease in overall mortality and alcohol consumption, there was a decrease in the January 1 peak; however, after 2012-2013 the decline in mortality has been flattening since January 2 (Figure 3), thus increasing the excess losses. This is likely due to the inclusion of new pathology categories and/or new age groups, which remains to be explored.

Adding January losses to losses on other holidays, we get total excess holiday losses in 2000-2017 of 144.8 thousand people, or 8.0 thousand deaths per year.

Is the death of 113.6 thousand people in 18 years a lot or a little? A comparison with the population of a large city, such as, for example, Obninsk (117.4 thousand, Kaluga region) or Kamyshin (109.9 thousand, Volgograd region), will help to answer the question. In other words, January losses alone over 18 years are comparable to the loss of the population of a large city over the same period. The quantification can be done differently by comparing with losses in other countries.

The most detailed quantitative study was carried out in the USA, where over 26 years (1979-2004) excess losses during the New Year and Christmas holidays came to 42,325 deaths, or 1.6 thousand per year on average (Phillips, Barker, Brewer 2010: 1463), versus 8.0 thousand per year in Russia – that is, Russia's excess losses were 5 times greater for a population half the size. One adjustment, however, is required for the calculations for the USA: estimates are made for

“natural” causes (mortality from natural causes spikes), which during this period accounted for 93% of all deaths, while external causes of death were not included in the calculations (Phillips, Barker, Brewer 2010: 1463).

With the exception of deaths due to alcohol poisoning, we did not study the diagnostic composition of deaths, but this composition has been studied in detail in foreign literature. It has been shown that there are 2 mortality maxima in the US, falling on December 25-26 (Christmas) and January 1. These peaks were determined by 93% "natural causes", such as diseases of the circulatory system, neoplasms, respiratory diseases, endocrine and metabolic diseases, and diseases of the digestive system. And this applied to all age groups except children (Phillips, Barker, Brewer 2010: 1463). Among the external causes of an increase in January mortality in the United States and Russia were homicides on New Year's Eve and/or Christmas (Bridges 2004: 723), suicides (Bergen and Hawton 2007: 855; Bridges 2004: 723), and alcohol or drug abuse (Phillips, Barker, Brewer 2010: 1463).

Significantly, in the western literature the alcohol factor in the growth of January mortality has been noted, but, as a rule, only in passing. It has been specifically studied only in one work known to us (Phillips, Barker, Brewer 2010: 1463), but even here its role is modest, no more important than a number of others. In our work, the study of alcohol poisoning is undertaken in order to understand the situation in Russia, which, during the study period, was one of the countries with the highest consumption of alcoholic beverages. Among all the pathogenic factors of New Year's losses in Russia, alcohol is probably one of the main ones. This is evidenced by the high peaks in New Year mortality and the similarity of the subsequent dynamics of the total number of deaths and deaths from alcohol poisoning (Figure 2), the maxima of which fall on January 1. The two types of mortality differ in the duration of their increase in January, and this, apparently, is due to the difference in thanatogenesis: shorter for alcohol poisoning and longer for general mortality, in which, as we saw in the USA, somatic pathology predominates (Phillips, Barker, Brewer 2010: 1463). It also predominated in Russia, in the city of Kemerovo (Barabash, Altarev, Fomina 2010: 35).

The period of excess mortality on holidays is shortest for murders (Nemtsov 2019: 317), longer for poisonings, and the longest for general mortality (Figure 2). In the same, but descending, order are these types of excess mortality during the New Year holidays compared to weekdays: during the holidays murders increase most of all (+206%, i.e. 3 times (Nemtsov 2019: 317)), poisonings less, and overall mortality (respectively + 41.5 and + 14.0%) even less. In the case of poisonings, such a gap between weekdays and holidays may be due to the fact that on New Year's Eve heavy drinking includes people with moderate addiction or with none at all, who are held back from abuse on weekdays by social restrictions. A connection between murders and alcohol consumption has been shown many times (for example, Ajdacic-Gross et al. 2012: 603; Phillips et al. 2004: 3781); this connection was also found on holidays (Phillips, Barker, Brewer 2010: 1463; Nemtsov 2019: 317) However, so far it has not been possible to find a convincing explanation for Russia's having such a large gap between weekday and holiday violence.

The significance of the alcohol factor for overall mortality in Russia is based on the similarity with alcohol poisoning in terms of their dynamics and the maximum on January 1. The significance of alcohol for overall mortality on New Year’s Eve is also underscored by the

incidence of alcoholic psychosis, which was studied in Moscow and in six other large Russian cities (Nemtsov 2017a: 76; Nemtsov, Izarovskii, Sakharov 2014: 25). The difference between alcoholic psychoses and alcoholic mortality is that the maximum of psychoses falls on January 7th. This can be explained by the fact that every alcoholic psychosis is preceded by a binge, the duration of which is on average (mode) 7 days (Nemtsov, Loshakov 1997: 52). From this it follows that in the case of psychosis, the "alcohol punch" also falls on January 1st.

There is a persistent idea that the severity of the consequences of the New Year holidays is due to their duration. Hence the numerous proposals to shorten the duration of these holidays. But the reason is not in the duration: when comparing two periods (2000-2004 and 2005-2009) between which the duration of the holidays more than doubled, the period of excess mortality in the first and second periods was identical (Figure 6). Their difference is due to the fact that in Russia in 2004, i.e., in the second period, there began a decrease in alcohol consumption which continues to the present (World Health Organization 2018: 90). An important conclusion follows from this: the sale of strong drinks should be limited in December, when the annual maximum sales of both legal (Figure 7) and illegal alcohol (Figure 8) occur. The difficulty of solving this problem, even for the legal sector, is obvious: December is not only the peak of sales, but also the maximum of financial revenues to the budget from the alcohol market. However, the matter is complicated by the fact that since 2016 the formation of alcohol policy has been transferred to the Ministry of Finance of the Russian Federation. The main and, it seems, the only interest of this ministry is in collecting taxes on the alcohol market and combating the illegal production and sale of alcohol.

The excess deaths of women in connection with the New Year were 4 times less than those of men, and the increase ended earlier. Peaks were less pronounced on other holidays (Figure 5). This once again indicates that the male population bears the brunt of harm from alcohol. More interesting is this: the summer decrease in mortality occurs almost exclusively due to women (Figure 5). However, it was not possible to connect this phenomenon with the characteristics of male alcohol consumption: in the case of alcohol poisoning, seasonal fluctuations are expressed in the same way as evidence of a decrease in the consumption of hard alcohol in the summer. And the summer decrease in female mortality can be explained by the greater sensitivity of women to weather conditions in winter (Murphy, Luy, Torrisi 2019).

The multi-year trend of New Year's growth is generally in line with the downward trend in alcohol consumption that began in 2004 (World Health Organization 2018: 90). A deviation from this trend occurred in 2013-2014, after which the decline in mortality in January slowed down against the backdrop of a continuing decline in mortality in the remaining months of the year. This phenomenon can be explained by the fact that at that time the period of excess mortality expanded almost until the end of January (Figure 3). It can be assumed that this is due to the inclusion of new population groups in mortality (by age and/or by cause). Only a special study can solve this.

The results of the study of birthdays were unexpected: the losses associated with this turned out to be almost 2 times more than in January (8.0 thousand against 6.0 thousand per year), and the period of losses turned out to be longer (22 days against 15). At the same time, in January there are not 1, but 3 holidays. It is noteworthy that in the case of birthdays, the overall mortality was much higher than from alcohol poisoning (ratio 106:1) in comparison with what was in January

(11:1). Perhaps the peculiarity of this holiday is determined by the large participation of the elderly and / or the smaller participation of heavy drinkers, for whom “every day is a holiday”. It is possible that for this cohort of people the New Year holiday is more significant than a birthday: 20 days before the New Year, the incidence of alcoholic psychosis begins to decrease, with a minimum on January 1 (Nemtsov 2017b: 76), while there is no decrease in mortality from alcohol poisoning before a birthday (Figure 9).

One wonders why in Russia and other countries the New Year and Christmas holidays stand out for the severity of their consequences, sometimes even fatal. It might be put more broadly: they stand out for a special style of behavior (“On Christmas, everyone is a little magician.” I. Brodsky). No other holiday in Russia and in Western countries is preceded by such pre-holiday excitement and movement of people. It is difficult to observe this in the population before a birthday, due to the dispersal of these days in the year. However, in anticipation of January 1, even alcoholics reduce their alcohol consumption starting from mid-December, as a result of which the minimum incidence of alcoholic psychosis on holidays falls on January 1 (Nemtsov 2017b: 76).

Here it should be said that the structuring of time is a natural need, and this need is realized, in particular, by choosing a reference point. In “everyday time”, one of these points is a holiday (Volovikova, Tikhomirova, Borisova 2003). The rituals accompanying the holiday, in the broad sense of the word, reinforce the meaning of the holiday (Schneider 2019). Holidays and their rituals have other functions, but why among the holidays is such a special role played by the New Year, a birthday and / or Christmas?

It seems that this phenomenon is based on traditions formed by remnants of pagan psychology, which in the last 3-4 decades in Russia and the world have been expanding, even up to the emergence of neo-paganism as a religious practice (Krutous 2005: 90). In the everyday and broad manifestation of pagan psychology, there is little religiosity; it is more a matter of traditions. However, belief in signs and the evil eye is still common, as is belief in the pagan protection provided by amulets. But the pagan part of the psychology of modern man reveals itself especially brightly as Christmas or January 1st approaches. This is evidenced by the widespread New Year and Christmas "ritualism" in the form of oriental symbols and fetishization of the holiday. It turns out that in 2021 we entered the year of the metal bull, porcelain and other representations of which were quickly snatched up before the New Year in souvenir stalls. The pagan worldview is acutely manifested not only before January 1, but also on birthdays. This is most likely determined by the fact that these are milestone dates, the beginning of a new year or a new life cycle, and the cyclical nature of transformations is an important element of the pagan worldview. The second important feature of paganism is sacrifice for the sake of future well-being. In this context, the feast and alcohol take on another property - a ritual one: "As we party on New Year's Eve, so we will live the whole year".

It is important to note the stability of the increase in mortality due to milestone holidays both in the United States and in Russia. In the USA, this phenomenon was observed during the entire study, i.e., for 26 years (1979-2004) (Phillips et al. 2004: 3781), and in Russia, since at least 1956, when records of monthly mortality rates began to be kept. The difference between the two countries was determined not only quantitatively, but also by the fact that the United States

suffered its main holiday losses on Christmas, and Russia on January 1. In both cases, the peak of annual mortality falls on these days. For the United States, several reasons for the New Year and Christmas losses were named, including alcohol (Phillips et al. 2004: 3781). In contrast, in Russia, the alcohol factor seems to predominate among others that have yet to be explored.

The time has come to carefully and without pathos compare such phenomena as the joy brought by the New Year holiday with the human losses at this time, and on this basis to determine the acceptability of certain measures to reduce the damage. The main thing here is to inform the population about the possible consequences of life-threatening and health-threatening behavior during the holidays. It seems that the information policy should be supplemented by a decrease in the availability of strong alcohol for our citizens in connection with the New Year. This should be done in December, especially in its last week, when there are maximum annual sales of alcoholic beverages, especially strong ones. Such a barrier may be in the form of a price policy and/or rationing of sales and/or a time limit on the sale of liquor.

The increase in mortality on New Year's Eve is only the tip of the iceberg. There is a much wider incidence of morbidity, which has yet to be studied, and in this regard, it is also necessary to prepare the health services specifically for this date. During a conference call on November 19, 2020, the Minister of Health M.A. Murashko had already warned regional leaders about the traditional increase in workload during the New Year holidays[4].

Naturally, such efforts should not be made only once or limited to a short pre-New Year period. It is also necessary to persuade the Ministry of Finance to support restrictions on the sale of alcoholic products before the New Year.

RESEARCH LIMITATIONS

In contrast to the general idea of the article, the calculations in it should be treated with caution, as they depend on several attendant circumstances. The first one is the reliance on LOWESS calculations. This method has many advantages over the simple floating average and its other types, since it does not require a preliminary determination of the shape of the curve. But LOWESS is determined by the initial choice of estimation parameters. It is difficult to say whether this increases or underestimates the calculation results, but in both cases the error is small.

The second limitation, as noted above, concerns the interpretation of total excess mortality as alcohol-related, based on the similarity of the dynamics of total and alcohol mortality. It would be more correct to compare the number of deaths with alcohol in the blood before and after the holidays. However, these data are dispersed in local forensic medical examination bureaus, and even there they are presented in a summary, annual form, while our task requires their detailed distribution. However, in this case, only a selective study is possible: 35.4 million cases are still impossible to cover with such work.

The third limitation is associated with artifacts of registration of total mortality in the last and first days of the month, which were excluded from the calculations. This also forced us to

[4] URL: https://vrachirf.ru/company-announce-single/81862

exclude deaths in connection with the May 1 holiday, and this artificially reduced the real damage on holidays. The artifact, apparently, is associated with errors or falsification of the primary record of the date of death. This phenomenon is not reproduced in alcohol poisoning (Figure 4) and murders (Nemtsov 2019: 31). The last 2 types of mortality carry socially significant information and therefore are under special control that does not allow falsification of the date of death.

There is also a fourth limitation. The main holiday damage occurs in January, the coldest month of the year. One might think that this damage depends on weather conditions in the form of influenza, SARS and pneumonia. It is impossible to completely exclude this factor, but it is also impossible to imagine that colds naturally heal by January 1.

From practice we know that the celebration of a birthday, and therefore fatal consequences, can be postponed for several days, but, as a rule, no more than a week. If this phenomenon were frequent and distributed randomly, that is, according to a normal or other distribution, we would have an additional peak or "step" of mortality on the descending branch after the maximum. But this is not revealed in Figure 9, which means that this phenomenon is infrequent and the error that delayed celebrations introduce is small.

It can be said more definitely that the results of holiday losses in the present work are somewhat underestimated. This is due first of all to the exclusion of May 1 holidays from the calculations, which, according to indirect data, could come to about 9 thousand people over 18 years. The second thing that could underestimate the results is the determination of the end of the increment of deaths on holidays by the confidence interval, and not by LOWESS. From this it follows that the quantitative estimates of holiday losses obtained in the work should be interpreted as “not lower than”.

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