RUSSIAN SHORT-TERM MORTALITY FLUCTUATIONS DATABASE: AN INSTRUMENT to EXAMINE the IMPACT of EXTERNAL SHOCKS and PANDEMICS at SUBNATIONAL LEVEL

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Introduction

The COVID-19 pandemic exposed significant gaps in the availability and reliability of mortality data, particularly at the regional and short-term levels. This led to a surge in interest in developing databases that capture fluctuations in mortality within short time frames, such as weekly or monthly intervals. The Russian Short-Term Mortality Fluctuations Data Series (RuSTMF) was created in response to this challenge. It offers comprehensive data on weekly crude and age-standardized death rates for Russia and its regions from 2000 to 2021. The dataset serves as a tool for analyzing the impacts of short-term risk factors, including heatwaves, seasonal influenza, the COVID-19 pandemic, and other socio-economic or environmental crises, on mortality rates.

The Russian Short-Term Mortality Fluctuations Data Series (RuSTMF) provides a detailed examination of short-term mortality trends not only at the national but also at the regional level across Russia. This research can be of great interest and serve as a valuable stimulus for other countries to develop similar datasets at the subnational level. The unique regional focus of RuSTMF allows for a more nuanced understanding of mortality dynamics, highlighting the significant regional variations within the country. By addressing both national and regional mortality fluctuations, RuSTMF enables policymakers and researchers worldwide to adopt and expand these practices in their respective countries, fostering the development of more comprehensive mortality monitoring systems at the subnational level.

Theoretical Focus

The RuSTMF data series responds to the increasing relevance of intra-annual mortality fluctuations, driven by factors such as population aging, climate change, and the ongoing shifts in public health risk dynamics. While international mortality data has been available on a country level, regional mortality patterns in large nations like Russia have received less attention. The RuSTMF fills this gap by offering both crude and standardized death rates on a weekly basis for different regions, allowing researchers to analyze both long-term and short-term mortality trends at the regional level.

The project builds upon earlier theoretical work that emphasized the importance of tracking short-term mortality, especially during high-impact events like pandemics and climate anomalies (Ballester et al., 2011, 2019; Islam et al., 2021; Modig et al., 2021).

Data and Research Methodology

The RuSTMF is grounded in depersonalized individual-level mortality data provided by Rosstat (Russian Federal State Statistics Service). The dataset is freely available in .csv format and can be accessed online. It contains detailed mortality information broken down by region, sex, and age. The data are suitable for statistical analysis using standard software, making them accessible to researchers and public health officials alike. The variables used in the RuSTMF dataset include:

- **PopCode**: Territory code
- **Year:** Calendar year
- **Week:** Week of the year
- **Sex:** Gender (Male, Female, Both)
- **CDR:** Crude death rate
- **SDR:** Standardized death rate

As an illustration of the data structure and methodology, **Figure 1** presents a visual representation of the short-term mortality fluctuations captured by RuSTMF, demonstrating both the impact of the COVID-19 pandemic and regional variability in mortality dynamics. The figure is derived from the RuSTMF visualization toolkit available at https://mlinz.shinyapps.io/RosBKS/.

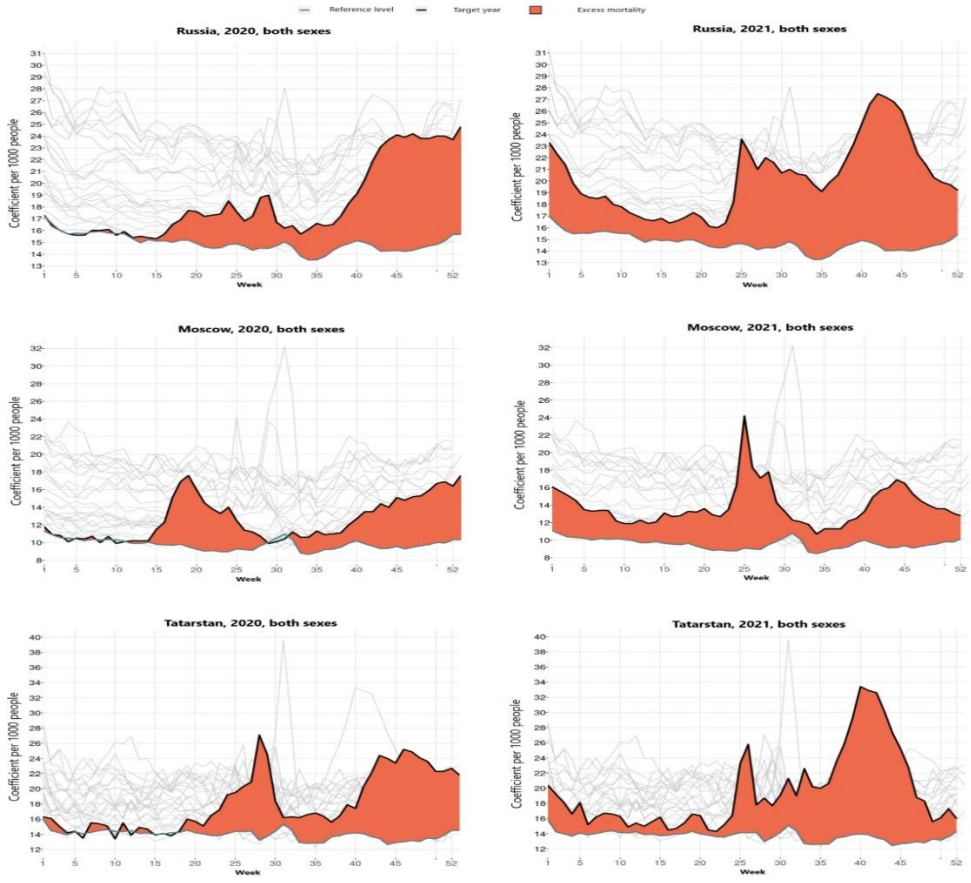

Figure 1. Week-specific age-standardized death rates and excess death rates (orange areas on the graph) for Russia as a whole, Moscow and the Republic of Tatarstan in 2020 (left panel) and 2021 (right panel).

The database covers over two decades of mortality data (03.01.2000 - 31.12.2021- **Figure 2**) and is accessible via text files (.csv format), allowing integration with statistical analysis software. The age-standardized death rates follow the methodology used by the Human Mortality Database (Jdanov et al., 2021), where the European Standard Population (Eurostat, 2013) serves as the baseline for standardization. This approach minimizes biases introduced by demographic differences across regions.

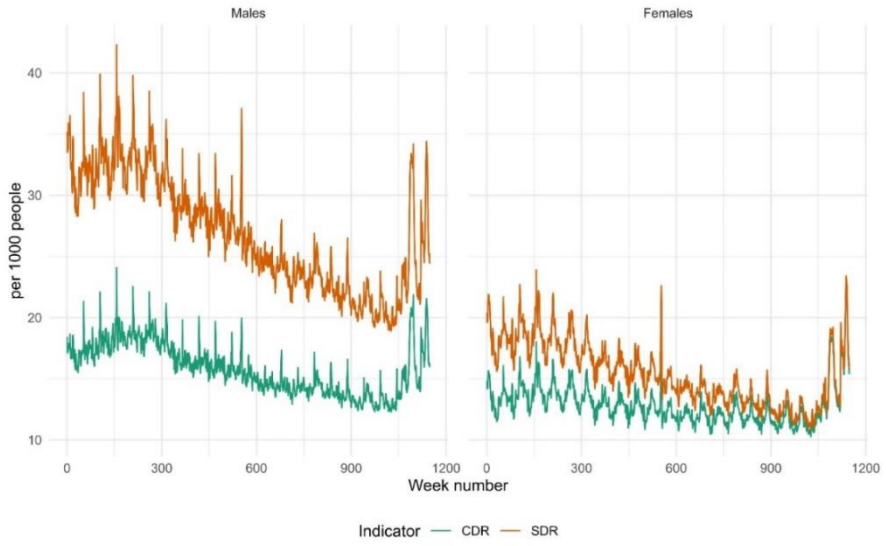

Figure 2. Weekly crude (CRD) and standardized (SDR) death rates in Russia, per 1000 population, men and women, 1 week 2000 – 52 week 2021

The methodology for RuSTMF is adapted from the STMF framework, with adjustments to fit the regional context of Russia. Weekly death rates are calculated based on mid-year population estimates and weekly death counts. Crude death rates are computed by dividing the number of deaths in a given week by the population for that week, standardized using the direct standardization method to account for age distribution. For each age group, the ratio of deaths in a given week to the population is used to calculate age-specific death rates, which are then standardized across regions using Eurostat's 2013 European Standard Population (Ahmad et al., 2001).

Expected Findings

The RuSTMF data series is expected to provide critical insights into the spatial and temporal patterns of mortality fluctuations in Russia. By tracking weekly mortality data, researchers can discern the immediate impacts of short-term risk factors, such as climate-related events, epidemics, and socio-economic crises. For instance, excess mortality during the COVID-19 pandemic, heatwaves, and influenza outbreaks can be closely monitored at both national and regional levels. The data may reveal significant regional disparities in mortality rates, driven by differences in healthcare quality, socio-economic conditions, and regional demographic structures.

Conclusion

The RuSTMF is a valuable tool for studying mortality fluctuations in Russia, providing unprecedented detail on weekly mortality trends across the country. The dataset is particularly useful for analyzing the effects of short-term risk factors, such as infectious disease outbreaks and extreme weather events, on mortality. Its applications extend to a wide range of fields, including demography, epidemiology, and public health.

The practical applications of this data series are vast. It could be used to:

- Develop early warning systems for public health emergencies;
- Inform regional and national health policy decisions;
- Improve the accuracy of mortality forecasting models;
- Analyze the impact of climate change on human health.

Overall, the RuSTMF represents a significant advancement in the field of demographic research and public health planning in Russia.

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