Consistency of cause-specific mortality data at subnational level in Russia, France, Germany, and the U.S.

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Background

Cause-of-death (CoD) mortality analysis is (mostly) the analysis of the underlying cause data.

Selection of the underlying cause depends on:
- Quality of diagnostics (pre- and postmortem)
- Certification process
- Interpretation of the ICD-rules by the coder

Approaches of certifying and selecting some specific causes as underlying differ across and within countries.

Potential inconsistencies in CoD data should be revealed before performing the analysis.
Motivation for the study

An idea to perform cause-specific mortality analysis across Russian regions (as part of a PhD Thesis and other projects)

The question arose: which causes can be analyzed at regional level?

Search for an answer resulted in a paper published in 2016. The paper presented the method of indirect assessment of the consistency of causes of death at subnational level. The method was illustrated by applying it to the Russian data

What about other countries?
How to identify potential inconsistencies in the cause-specific mortality data when only the data itself are available?
Variability measures

CoefVar = 30%
Max/Min = 10

CoefVar = 57%
Max/Min = 10

CoefVar = 30%
Max/Min = 2.5

Drawbacks:

Can return the same values for very different distributions

Information behind the values is hidden
**Visual inspection**

- CoefVar = 30%
  - Max/Min = 10

- CoefVar = 57%
  - Max/Min = 10

- CoefVar = 30%
  - Max/Min = 2.5

**Drawbacks:**
- Time consuming
- Not systematized
Heatmaps

subnational entities

causes of death
Application to the real data

4 highly populated countries with different systems of producing information on causes of death

<table>
<thead>
<tr>
<th>Countries</th>
<th>Period</th>
<th>Subnational areas:</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>2005-2009</td>
<td>20 metropolitan regions</td>
</tr>
<tr>
<td>Germany</td>
<td>2005-2009</td>
<td>15 federal states</td>
</tr>
<tr>
<td>The USA</td>
<td>2008-2012</td>
<td>43 states</td>
</tr>
<tr>
<td>Russia</td>
<td>2005-2009</td>
<td>52 regions</td>
</tr>
</tbody>
</table>

67 groups of CoD (the same for the four countries)

Indicators:

\[ S_{r,c} = \frac{SDR_{r,c}}{SDR_r} \cdot 100\% \quad \Rightarrow \quad V_{r,c} = \frac{|S_{r,c} - S_{*,r,c}|}{S_{*,r,c}} \cdot 100\% \]
Producing information on causes of death

**FRANCE**

Centralized coding. Death certificates are coded by the French Epidemiological Center for the Medical Causes of Death (CépiDc).

The automated coding system was implemented in 2000.

**GERMANY**

Coding is centralized at the level of Federal States (Länder).

In 2007 the implementation of the automated coding system was initiated (automated coding was used very rarely before 2012). Federal States are free to decide if and in which cases the coding software should be applied.
Producing information on causes of death

**THE U.S.**

Death certificates are coded by the National Center for Health Statistics (before 2011 some states processed death certificates on their own).

**The automated coding** system is used since 1968 and had been developed further since then several times.

**RUSSIA**

Coding is **decentralized**. Medical practitioners who certify the death are at the same time responsible for choosing the UCD and coding it in accordance with ICD rules.

**Automated coding systems are in use in some regions. The automatization** of the coding process **is not centralized** at the federal level.
Limitations

Indirect method. We reveal POTENTIAL inconsistencies

It is possible that some deviations (even the large ones) are true and caused by real differences in epidemiological patterns.

At the same time, smaller deviations (which are not marked as suspicious on the heatmaps) can also be caused, to some extent, by differences in certifying and coding practices.

On the heatmaps we do not distinguish between the “size” of the causes of death.

The analysis was performed at the top level of countries’ subdivision. Different approaches to certifying and coding may exist within regions (states, lands) as well.
Conclusion (1)

Heatmaps allow indirect assessment of the consistency of CoD statistics at subnational level presenting the broad picture at one glance.

Causes that are easy to be defined as underlying (neoplasms, perinatal causes, congenital malformations, a few other specific diseases) showed low variability in all countries.

“Garbage” and alcohol-related causes tend to have higher variability across subnational units in Germany, the U.S., and Russia indicating that medical professionals may have different views on whether these causes should be reported in the death certificate and/or chosen as underlying
Conclusion (2)

Among the four countries chosen for the analysis, France has the most consistent and comparable cause-of-death mortality data across its subnational entities.

Russia has the highest number of CoDs with suspiciously high variability indicating dissimilarity of certifying and coding practices at subnational level.

The vertical patterns on the Russian heatmap reveal a few regions which have the most peculiar CoD mortality structures. No vertical patterns are noticeable on the heatmaps for the other countries.
Thank you for your attention!