Reconstruction of coherent cause-specific mortality time series for Russia and its regions[*]

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Introduction

The analysis of long-term trends in cause-specific mortality is complicated due to changes in international classifications of diseases. Such changes often produce discontinuities in trends in mortality rates by cause of death (Vallin and Meslé, 1988; Janssen and Kunst 2004). The most proper and comprehensive approach for overcoming the problem is reclassification (reconstruction) of all death in time series according to one and the same classification system (ICD). A *reconstruction method* based on a painstaking comparison of the contents of the classifications successively in use and on the building of statistically balanced associations of items with the same medical contents results in the computation of transition coefficients calculated for each change of classification for each cause of death. (Vallin and Meslé, 1988; Meslé and Vallin 1996). This method was used for recalculating Russian series of mortality by cause of death for the years 1956-1987 (Meslé et al. 1996; Meslé et al. 2003) in accordance with Soviet Classification based on ICD-9 so that plausible series between 1956 and 1998 were produced.

The year 1999 marked a new methodological challenge because of the introduction of the ICD-10 in Russia. Therefore, in this paper the algorithm for transition from ICD-9 to ICD-10 for Russia is presented and discussed. In order to solve this methodological task, we analyze specific features of this transition with a particular focus on different experiences of regions in implementing the new classification. Indeed, if ICD-10 was implemented effectively in 1999 in most regions, in some regions its actual implementation seems to have been postponed for 1-3 years. As a result, Russian mortality statistics by causes of death show some inconsistences for the period 1999-2002. In order to account for such methodological challenges we had to add several

complimentary steps to the original reconstruction method which allowed to produce continuous series of causes of death for the whole Russia and some of its regions.

Data

Deaths counts by cause of death are available for Russia since 1956. But for reconstructing cause of death series based on ICD-10 we could not rely solely on the country's counts and had to use regional data as well. Regional mortality data by causes of death is available in Russia since 1989. However 1992 is the first year for which regional death counts are available in accordance with the current administrative-territorial division.

Deaths counts by cause of death (both regional and for the whole Russia) were taken from Federal State Statistics Service. Population estimates stem from the Human Mortality Database (HMD, 2013) and Russian Fertility and Mortality Database (RFMD, 2013).

Method

In order to take into account the delay in implementation of new coding system in regions the reconstruction (for description of original method, see: Vallin and Meslé, 1988; Meslé et al., 1992; Meslé and Vallin, 1996) was not performed for Russia as a whole but was first produced for the combined group of regions that had implemented ICD-10 in 1999, and then separately for regions that had postponed the transition. All results then were totalized to obtain coherent series of death at the national level for the years 1992-2012. Finally, an additional adjustment was performed to insure the continuity with the years 1956-1991, for which regional data were not available.

Main findings

The transition to ICD-10 in Russia took place during a period of high fluctuations in mortality. More precisely, the transition coincided with the economic crisis of 1998 that reversed the positive trend of mortality decline brutally. As a consequence, it was necessary to take in account this sharp change in the reconstruction of many causes of death (Figure 1).
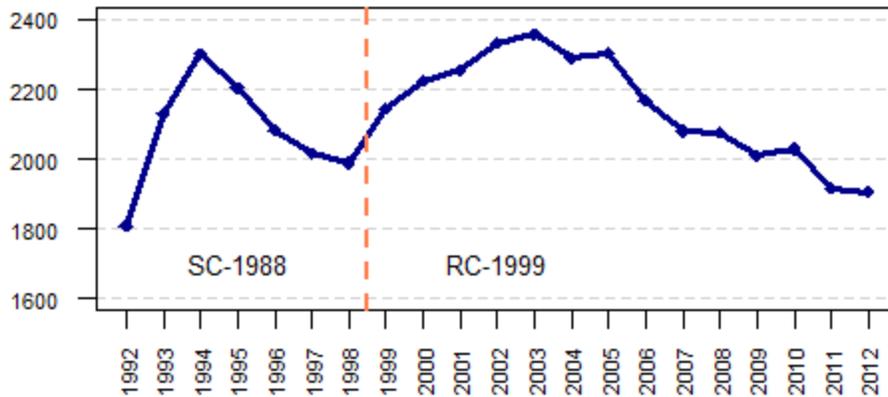
Figure 1. Death counts (thousands), Russia, both sexes

The non-simultaneity of the transition to ICD-10 in all Russian regions represented a very important methodological issue. The Russian Abridged Classification of 1999 (RC-1999) comprises 229 items, in comparison with the 175 items of the Soviet Classification of 1981 modified in 1988 (SC-1988) was increasing the number of items in the list of causes of death.

The additional items were often resulting from the splitting of a group of causes into more precise conditions. For instance the SC-1988 item "Malignant neoplasms of urinary organs" was splitted into 3 RC-1999 items: "Malignant neoplasm of kidney", "Malignant neoplasm of bladder" and "Malignant neoplasm of other and unspecified urinary organs". In the first years following 1999, abrupt changes were frequently observed in death counts of these new items at the country level. As an example, in Figure 2, the number of deaths attributed to "Malignant neoplasm of other and unspecified organs steeply decreased between 1999 and 2002 while those attributed to malignant neoplasms of kidney and of bladder were increasing inversely.
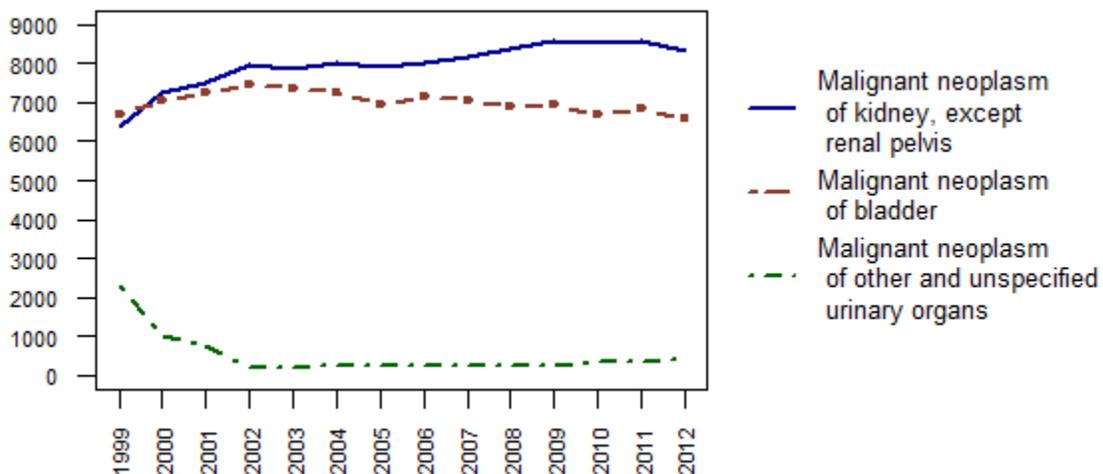

Figure 2. Death counts of neoplasms of urinary organs RC-1999 classifications, Russia, both sexes

Such change can be explained by the postponement of the fully implementation of ICD-10 in some regions. Looking more precisely to the data, we came to the hypothesis that although published for every region according to ICD-10, in at least four regions, deaths seem to have been coded into ICC-9 first and then roughly translated into ICD-10 to be transmitted at the national level and published. It seems that it was the case in 1999 for Stavropol kray and the Republic of Ingushetia, and even from 1999 to 2001 in Sverdlovsk oblast. In a somewhat different manner, in the City of Moscow, ICD-10 items seem to have been used to code a small part of deaths only while the rest were treated as in the three previous cases. Such hypotheses clearly arose when measuring observed mortality rates separately for two large groups of causes: those classified in ICD-10 items which have a title identical or rather similar to an ICD-9 item and those classified to ICD-10 item for which no similar item existed in ICD-9. For each region, Figure 3 compares mortality due to the first category of causes to that due to the second one, in 1999 (left part of the graph) and then in 2002 (right part of the graph). In 1999, four regions appear in a quite abnormal situation: in Sverdlovsk oblast, Stavropol Kray, and the Republic of Ingushetia, mortality by causes of the second category is zero simply, while this mortality is very low for the City of Moscow. By contrast, in 2002, plausible levels of mortality by that group of causes appear for all regions, even though it is rather low in the Republic of Ingushetia, a situation that could be explained by actual specificities. What is quite sure here is that, in these four regions, even if theoretically data were made available according to ICD-10 since 1999, for a couple of years coding more or less relied on ICD-9 items and that an unofficial conversion into ICD-10 items was made relying on similarities between item titles.
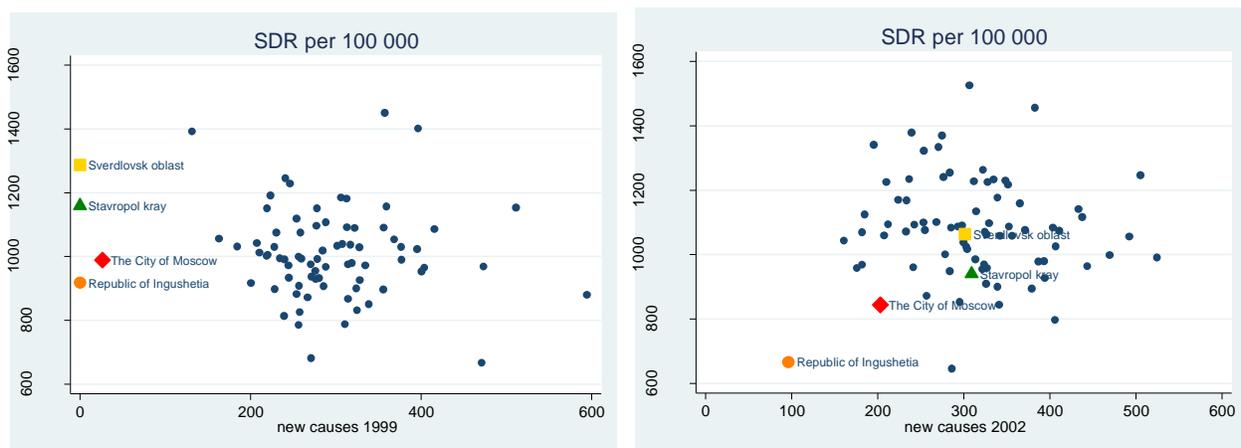

Figure 3. Ratio of "new" and "old" causes of death in Russian regions in 1999 and 2002 (SDR per 100 000)

In other words, while these regions were still using the Soviet classification based on ICD-9, cause-of-death statistics were published according to ICD-10 codes in a wrong way. At first it gave us the illusion of adequate and identical coding in all territories. In fact for the first years supposed to be covered by the new classification, deaths were classified into the previous Soviet classification and then reclassified into the ICD-10 abridged list, using only a selection of items, which were supposed to have the same contents as the old ones.

In 1999 together these four above-mentioned regions made up more than 12% of Russia's population. If we exclude these 4 regions of the death counts, trends in new items appear more consistent from 1999 (Figure 4, to be compared to Figure 2).
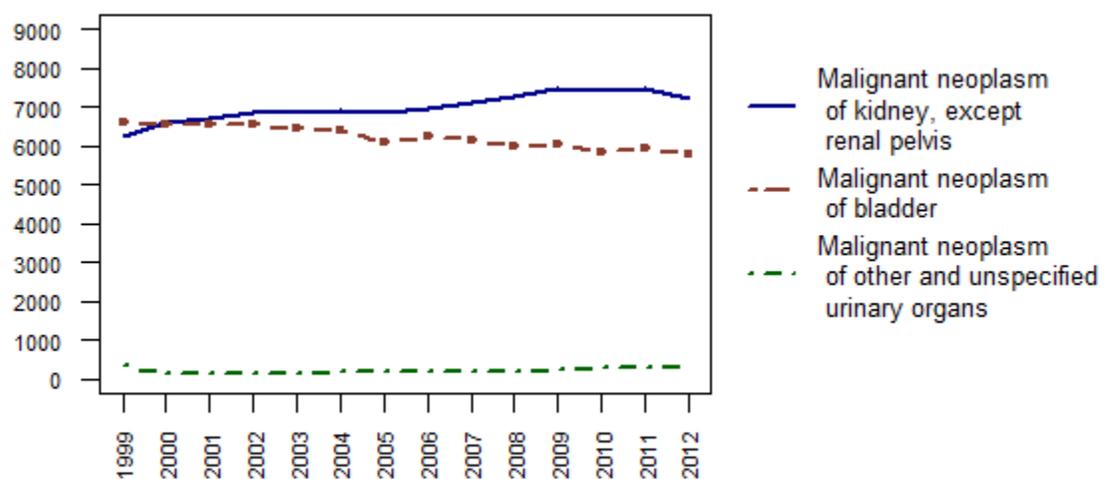

Figure 4. Death counts of neoplasms of urinary organs RC-1999 classifications, Russia (4 regions excluded), both sexes

The fact that between 1999 and 2002 cause-of-death certification and coding procedures in several highly-populated territories were assigned according to different classification system does not allow performing reconstruction on country-based counts. So we had to perform reconstruction for these territories separately.

Consequently, we performed 3 separate reconstructions. We first produced transition coefficients for all the regions which really used ICD-10 from 1999 and reclassified deaths of these regions from 1992 to 1998 into ICD-10, in order to get coherent time series for the full period from 1992 to now, under that classification.

Then we performed specific reconstructions for the City of Moscow and Sverdlovsk oblast. In both cases we preliminarily reclassified deaths that were inaccurately coded in ICD-10 back to Soviet classification, for years 1999 and 1999-2001 respectively and then did specific

reconstructions. Unfortunately, in the cases of Stavropol oblast and Ingushetia Republic population and consequently deaths counts was not large enough to perform specific reconstructions. After reclassification of deaths for the year 1999, we applied the transition coefficients obtained at the first stage (for all the regions which used ICD-10 from 1999).

Conclusion

The transition to ICD-10 in Russia is complicated by non-simultaneity of the ICD-10 implementation in Russian regions as well as by high mortality fluctuations at the time of the transition. Mentioned delay in introduction of ICD-10 in some regions produced inconsistencies in cause of death series for Russia for the period 1999-2002. To deal with this we had to make separate reconstructions for some specific regions requiring a few additional steps, before adding their results to get national time series. The executed procedure of reconstruction allowed to produce coherent series of causes of death covering the period from 1956 to 2012, by combining previous works and the current work solving the ICD-10 shift.

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