Chapter 9
Reconstructing Series of Deaths by Cause with Constant Definitions

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In all countries, the study of long-term cause-specific mortality trends is hampered by discontinuities that distort statistical series as a result of periodic revisions to the classification of causes of death. In very rare cases, when an office responsible for cause-of-death statistics has produced classifications for one or two transition years under two different revisions (as in England and Wales when the Eighth Revision of the International Classification of Diseases (ICD-8) was replaced by the Ninth Revision (ICD-9); see Meslé and Vallin 1993), observed transition coefficients can be used to reassign deaths classified under the old revision to the various items of the new revision. Unfortunately, in most cases, no such double classification is available, and a way has to be found to estimate the transition coefficients *ex post*.

This study took a method that we had developed for France in order to reconstruct continuous cause-specific time series of deaths, classified according to the Detailed List of ICD-9 since 1925 (Meslé and Vallin 1996; Vallin and Meslé 1988, 1998), and applied it to the Soviet Union as a whole and then to its 15 constituent republics. The first step in this method was to reconstruct time series for the Soviet Union for 1970–1987 (Meslé et al. 1992), using data compiled under the 1970 and 1981 Soviet Classifications, and then to process the data for each republic. The study next reconstructed continuous series for Russia, starting in 1965 (Shkolnikov et al. 1995a; Meslé et al. 1996) and working with data recorded under three consecutive revisions of the Soviet classification. This exercise showed that the results obtained for the Soviet Union as a whole could not be transposed directly to Russia: they made a useful starting-point, but were inadequate in a number of ways. Although the instructions for data collection and coding were the same everywhere, not only did their application vary in practice according to local interpretations, but patterns

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of disease also differed sharply from one republic to another, and this had differing impacts on particular changes to the detailed list and on data collection methods.

Differences between Russia and Ukraine might be expected to be fairly minor. In fact, there are considerable differences between the two republics. Once again, although the results obtained for Russia were a valuable starting-point, they had to be systematically verified and adjusted in many ways for Ukraine.

After a brief description of the method used to reclassify causes of death, we shall highlight the main points where the Russian exercise had to be adjusted for the specific Ukrainian context. This fundamental stage, which reduced the statistical discontinuities caused by changes to the detailed list, was still not enough to produce series with perfectly constant definitions, because, in addition to revisions to the classification, there are explicit or implicit changes to data collection and coding practices that also create statistical distortions. These distortions must be reduced before cause-specific mortality trends can be analysed, and such amendments are usually particular to each republic.

9.1 The Reclassification Method as Applied to Russia

Our reclassification method for each transition from one Classification to the next has three main stages: constructing bridge tables, defining fundamental associations of items with constant contents, and calculating transition coefficients.

9.1.1 Bridge Tables

The first stage consists of creating two symmetrical tables that show correspondences between the two classifications. The first table lists, for each item in the old classification, all the items in the new classification that have one or more diseases in common with it. Symmetrically, the second table lists, for each item in the new classification, all the items in the old classification that correspond partly or fully to it. We had only the title of each item on the Soviet list to indicate its medical contents, since there are no more details about the precise medical conditions included in each item.[1] However, the two tables already established for the Soviet Union and

[1] In contrast, in ICD-9, for example, the content of the 5,600 items is described in detail in the analytical list. Further, an alphabetical index containing more than 60,000 terms and expressions makes it possible to assign every medical condition precisely to a single item (WHO 1977, 1978). However, Galina Gurova, statistician in charge of cause-of-death classifications at Goskomstat, provided us with two tables that summarize the 1965 items partly or fully included in each 1970 item, as well as the corresponding list of three-digit codes from ICD-8. For the transition from the 1970 Classification to the 1981 Classification, a similar – though less complete – document was published by Goskomstat (1981). These gave us our second table and provided us with the information necessary to create our first table.

Russia can be applied to Ukraine. At this stage, only the medical content of the cause-of-death items as indicated is considered, and the two initial tables rely entirely on the Soviet classifications and not on their possible applications in the different republics.

9.1.2 Fundamental Associations of Items

These two bridge tables are next used to define *fundamental associations of items*, which contain all the old and new items that are strictly necessary for the medical conditions within a given association to be exactly the same in both the old and the new classifications (that is, no elements are missing). A fundamental association is first established on the basis of the theoretical definitions of items, then its statistical consistency is checked by analysing the annual numbers of deaths corresponding to each association (before and after revision). At the first stage of the project, annual numbers of deaths for each association were examined for the Soviet Union from 1970 to 1987 in order to detect any abnormal discontinuity in the series during the transition from 1980 to 1981, the year the new classification was introduced (Meslé et al. 1992). Next, Russia was treated separately for a longer period, and the series of deaths from 1965 to 1980 were checked, using Russian data, in order to detect any discontinuity during the transition from 1969 to 1970 (Meslé et al. 1996). Both for the 1981 revision in the Soviet Union and the 1970 revision in Russia, changes in the detailed lists caused far more statistical disruption than might be suggested by a simple comparison of the names of the items in the two consecutive Classifications. Each new revision was accompanied by changes in coding practices, independent of the theoretical definitions of the items. This meant that we had to find the actual definitions used and correct the associations accordingly, while ensuring statistical consistency. With respect to the revision for the Soviet Union from the 1970 to the 1981 Classification, 137 fundamental associations of items were established, matching 137 groups of the 185 items from the first Classification one-to-one with 137 groups of the 185 items from the second Classification. Similarly, 132 fundamental associations of items were established for Russia for the transition between the 1965 and the 1970 Classifications.

Of course, not all these associations are of the same kind. Some – fortunately, most – are extremely simple, matching a single item from the new revision with a single item from the old one. That was the case for 91 of the 132 fundamental associations established for Russia between the 1965 and 1970 revisions. Other associations are also very simple, either straightforward amalgamations (where several items from the first classification merge into a single item in the second classification) or straightforward subdivisions (where one item from the first classification is simply subdivided into several new items in the second). In Russia, these two categories contained 10 and 6 associations respectively. In fact, in the case of Russia, only 25 fundamental associations were genuinely complex, reflecting inter-item exchanges between several items in each of the 1965 and 1970 revisions (Meslé et al. 1996, Annex IV).

Once the statistical continuity of each fundamental association is ensured, at least in terms of the total number of deaths, the next stage involves calculating the transition coefficients that make it possible to move from the items on the old detailed list to those on the new one.

9.1.3 Transition Coefficients

At this third stage, unless something has been wrongly assessed at the previous stages, any statistical discontinuity in a series of deaths attributed to one item must be resolved within the fundamental association to which that item belongs. The associations thus provide a framework within which *transition coefficients* can be calculated for each item. These coefficients are then used to redistribute the deaths classified under the old revision among the items in the new revision.

Determining the coefficients involves two steps. An initial set of coefficients is estimated by logical deduction, analysing the content of the associations. The result is then throughly checked statistically and the necessary corrections made in order to reach the final set of transition coefficients. This exercise was performed first for the Soviet Union for the period 1970–1987 (Meslé et al. 1992), then for Russia for the period 1965–1980 (Meslé et al. 1996).

9.1.3.1 Initial Estimate of Coefficients

In the case of simple associations, the coefficient is automatically 100%, i.e. all the deaths recorded under the old item are transferred to the new item. The same process applies to amalgamations of items, since the total number of deaths from each of the old items concerned is assigned to the single new item. In the case of a subdivision, the process is not much more complex, since the deaths recorded under a single item in the old classification are divided among the relevant items in the second classification, according to the number of deaths observed for each of the new items in the year when it was introduced. For example, in the case of Russia, within Association 90 (Meslé et al. 1996, Annex IV), 36.3% of the deaths recorded under the old Item 143 – *cholecystitis and cholangitis* – were assigned to the new Item 126 – *calculus of gallbladder* – and 63.7% were assigned to the new Item 127 – *cholecystitis and cholangitis, without mention of calculus*.

The exercise becomes trickier when complex associations are tackled. In many cases, the coefficients can be calculated almost automatically, assuming a proportional distribution of deaths. An example of this during the transition from the 1965 revision to the 1970 revision in Russia was Association 83, which groups items relating to digestive ulcers (Table 9.1).

We had 1970 deaths distributed across the 1970 items and 1969 deaths distributed across the 1965 items. This enabled us to estimate the number of deaths for 1970 that would have been attributed to each of the 1965 items, assuming that the

Table 9.1 *Ex post* reconstruction for Russia of the classification of deaths under Association 83 in both the 1965 and the 1970 classifications

	1965 Items		Total deaths
1970 Items	133	134	in 1970
115	3,026		3,026
116		1,083	1,083
117	84	15	99
Estimated deaths in 1970	3,110	1,098	4,208
Observed deaths in 1969	2,718	960	3,678

respective proportions of these items within the associations did not change between 1969 and 1970. The total deaths recorded in 1970 were simply reassigned according to the proportions observed in 1969. In our example, this method was used to attribute 3,110 of the 4,208 deaths in Association 83 to Item 133 – *gastric ulcer* – and 1,098 of them to Item 134 – *duodenal ulcer*. The other cells in the table could then be filled in. Cells for which there were no links between items, according to the description of the association, could be eliminated immediately. These cells are the shaded ones in Table 9.1. In this fairly simple case, the deaths in the other cells could be re-distributed automatically. The 3,026 deaths classified under Item 115 in 1970 could only be recorded in the cell where that item intersects with Item 133. Similarly, the 1,083 deaths under Item 116 were transferred to the corresponding cell for Item 134. Two subtractions were all that was then needed to fill the two other empty cells.

The transition coefficients could then be deduced directly from Table 9.1: 3,026/3,110, i.e. 97.3% of deaths under old Item 133 are to be assigned to new Item 115 – *gastric ulcer* – and 84/3,110, i.e. 2.7%, to new Item 117 – *peptic ulcer, site unspecified*. Similarly, 98.6% and 1.4% of the deaths recorded under old Item 134 will be transferred to new Items 116 – *duodenal ulcer* – and 117 respectively.

However, this operation is not automatic for all associations, where some additional assumptions must be made. An example of this, during the transition between the 1965 and 1970 revisions in Russia, is Association 109, which groups some causes of infant mortality (Table 9.2).

Using the method described in the paragraph above, we were able to fill in the cell that matches old Item 175 with new Item 153. But for the four other cells, there was no obvious reassignment. The 3,640 deaths estimated for Item 173 in 1970 were redistributed among Items 150 and 151 according to the proportions of those deaths recorded in 1970. We were then able to use Table 9.2a to obtain the transition coefficients in Table 9.2b.

By applying these transition coefficients to the deaths classified under the first classification, we can reclassify them under the second one; and by linking these data to the data from the following period, we obtain a series of causes of death with constant definitions for the whole period covered by the two consecutive classifications.

Table 9.2 *Ex post* reconstruction for Russia of the classification of deaths under Association 109 in both the 1965 and the 1970 classifications, followed by transition coefficients

	1965 Items		
1970 Items	173	175	Total deaths in 1970
(a) Deaths			
150	3,018	433	3,451
151	622	89	711
153		4,118	4,118
Estimated deaths in 1970	3,640	4,640	8,280
Observed deaths in 1969	3,539	4,512	8,051
(b) Transition coefficients			
150	82.9	9.3	
151	17.1	1.9	
153		88.8	
Total	100.0	100.0	

Experience shows, however, that not all the statistical distortions have been resolved at this stage, because this initial estimate of transition coefficients, based on an analysis of the internal consistency of each association, is not always satisfactory. The series of deaths corresponding to certain items are still subject to distortion at the point of revision, so some changes to the initial coefficients are required, in some cases to include age-specific adjustments.

9.1.3.2 Checking Time Series and Determining Final Coefficients

For each item, the statistical continuity of the series must be checked by age group after the transition coefficients have been applied. In most cases, the result is satisfactory and does not show any suspicious discontinuity at the point when the revised detailed list came into force. In some cases, however, discontinuities that cannot be explained solely by the change in classification persist, and some transition coefficients must be revised. In many cases, this can be done without regard to age; however, for items comprising diseases whose proportions vary strongly with age, coefficients sometimes need to be age-adjusted. In addition, some differentiation by age may turn out be necessary in certain cases where the problem had already apparently been resolved in terms of numbers of deaths at all ages. Russia, which reports high numbers of annual deaths, lent itself particularly well to age-specific refinements, some examples of which have already been published (Meslé et al. 1996). In the end, for Russia, 17 of the 210 items in the 1965 Classification were distributed differently by age between the items of the 1970 Classification (Meslé et al. 1996, Annex V-1). At the next transition, from the 1970 to the 1981 Classification, 24 of the 185 items were distributed differently by age between the 1981 items (Meslé et al. 1996, Annex V-2).

9.1.4 Reconstructing Time Series over Periods That Encompass Several Revisions

To process the periods governed by more than two consecutive revisions, the method described above must firstly be applied to the first pair of classifications in order to reassign the recorded deaths to the items of the second and obtain continuous time series for the whole period covered by those two classifications. The same method can then be applied to the second and third classifications, in order to reassign all the deaths already processed under the third, and so on, until all the deaths from the period under review have been reclassified according to the most recent revision. This exercise was performed in order to reconstruct cause-of-death series in France for the entire period 1925–1996, governed by seven successive revisions of the ICD, to bring them into line with the 5,600 items of ICD-9 (Vallin and Meslé 1988, 1998). In the case of the countries of the former USSR, the exercise concerns a smaller number of revisions[2] and less detailed lists of items, but the principle is the same.

9.2 Adjusting the Russian Transition Coefficients to Ukraine

Although we found that the coefficients estimated for the Soviet Union for the transition from the 1970 Classification to the 1981 Classification were not directly applicable to Russia (Meslé et al. 1996), we hoped that the Russian coefficients would be applicable to Ukraine, given the close cultural proximity between those two republics. Therefore, initially we applied the Russian coefficients directly to the Ukrainian data. In most cases, the results were perfectly acceptable. However, for some time series, fairly significant discontinuities appeared during one or other of the transitions, so these had to be processed specifically for Ukraine. In a decentralized cause-of-death coding system, cultural proximity proved insufficient to guarantee uniform interpretation of the changes.

9.2.1 Smooth Transposition

For the transition from the 1965 Classification to the 1970 Classification, we were able to reassign 183 of the 210 items in the first to the 1970 items without difficulty, by applying the Russian transition coefficients directly to Ukraine (Table 9.3, 2nd column). The same proved to true for 166 of the 185 items in the 1970 Classification during the transition to the 1981 Classification (Table 9.3, 3rd column).

[2] The first study, of the Soviet Union as a whole, (Meslé et al. 1992) covered only two revisions. The publication on Russia (Meslé et al. 1996) covered three, as does this study on Ukraine. Work in progress on the Baltic States covers four Soviet revisions plus ICD-9 and ICD-10 (recently adopted in those countries).

Table 9.3 Number of items in the initial classification for which the Russian transition coefficients had to be adjusted for Ukraine

	Initial classification	
Changes adopted	1965	1970
No change	183	166
Change not affecting the content of the fundamental association concerned	15	17
Change affecting the content of the fundamental association concerned	12	2
Total	210	185

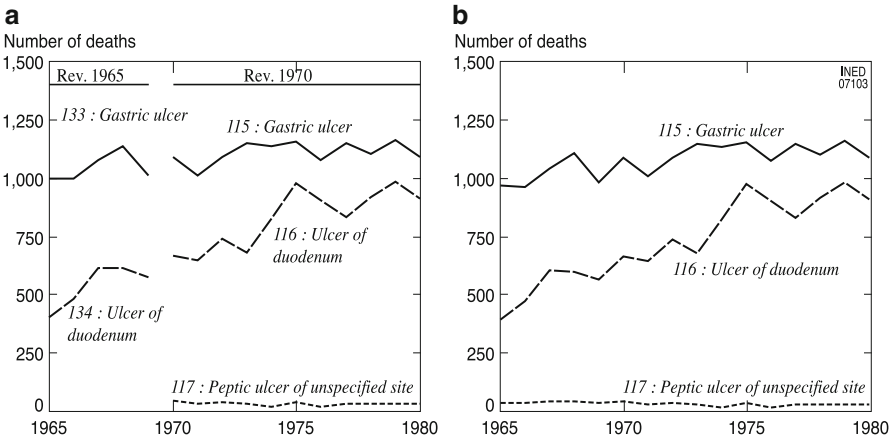

Fig. 9.1 Reconstructing Ukrainian time series using Russian coefficients. Digestive ulcers, 1965 and 1970 classifications. (**a**) before reconstruction; (**b**) after reconstruction

For example, Fig. 9.1 illustrates the transition from the 1965 Classification to the 1970 Classification for the items in Association 78 (Annex IV-1 on the Website (http://www.demogr.mpg.de/books/drm/009 or http://extras.springer.com/)). That association shows that Item 117 – *peptic ulcer, site unspecified* – in the 1970 Classification contained some of the deaths previously classified under Item 133 – *gastric ulcer* – and Item 134 – *duodenal ulcer* – in the 1965 Classification. Graph a in Fig. 9.1 shows the trend for the 1965 items before 1970 and for the 1970 items after 1970. Graph b shows that direct application of the Russian coefficients is sufficient to reconstruct the time series for Ukraine without any major discontinuity during the transition.

Figure 9.2 shows that the transition from the 1965 to the 1970 Classification for the items in Association 103, relating to congenital anomalies (Annex IV-1 on the Website), was similarly smooth. Item 151 – *other congenital anomalies of circulatory system* – in the 1970 Classification picked up some deaths previously classified under Item 173 – *congenital anomalies of heart* – and under Item 175 – *birth trauma* – in the 1965 Classification. Once again, direct application of the Russian coefficients is sufficient to reconstruct the time series for Ukraine without major discontinuities at the point of revision.

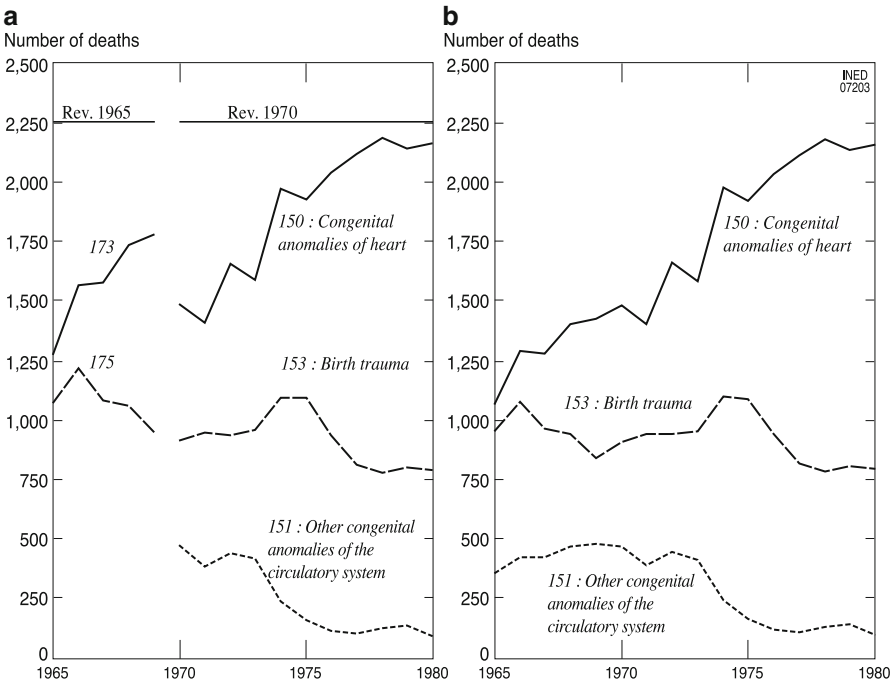

Fig. 9.2 Reconstructing Ukrainian time series using Russian coefficients. Congenital anomalies, 1965 and 1970 classifications. (**a**) before reconstruction; (**b**) after reconstruction

Figure 9.3 shows an example of the successful direct application of Russian coefficients to Ukrainian data for the transition from the 1970 Classification to the 1981 Classification. This is Association 80, relating to acute pneumonia (Annex IV-2 on the Website). Item 105 – *viral pneumonia* – and Item 107 – *other acute pneumonia* – in the 1970 Classification transfer mostly to the items with the same numbers and titles in the 1981 Classification, but also to the newly-created Item 153 – *congenital pneumonia and aspiration pneumonia*. In this case, the Russian coefficients fit Ukraine perfectly. Moreover, this operation leads to the disappearance, as if by magic, of the curious fluctuation in *viral pneumonia* in the 1970s. This is because the transition coefficients used here vary with age, separating out children under 1 year of age, who are treated differently in the two consecutive revisions. Consequently, the striking fluctuation in Item 105 is offset by the variation in Item 107, which was less dramatic but involved higher numbers. It is worth noting, however, that even after the time series have been reconstructed, a strong fluctuation in *other acute pneumonia* persists between 1985 and 1993. This can be attributed to a very real trend in alcoholism, related to the recent history of the former Soviet republics, which will be discussed below.

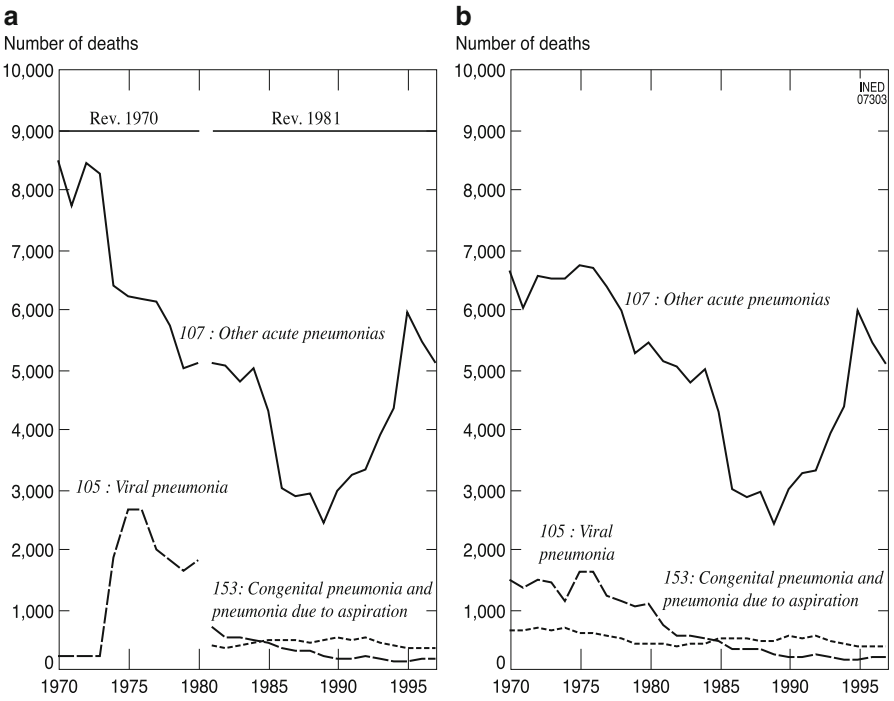

Fig. 9.3 Reconstructing Ukrainian time series using Russian coefficients. Acute pneumonia, 1970 and 1981 classifications. (**a)** before reconstruction; (**b)** after reconstruction

9.2.2 Determining Coefficients Specific to Ukraine

In contrast, the Russian coefficients had to be modified in 27 cases out of 210 for the transition from the 1965 Classification to the 1970 Classification and in 19 cases out of 185 for the transition from 1970 to 1981 (Table 9.3). These modifications were of different kinds. Table 9.3 distinguishes between modifications that do not alter the overall content of the fundamental association of items concerned and those that redefined the fundamental association.

9.2.2.1 Modifications That Do Not Alter Fundamental Associations of Items

Most modifications related only to the value of the coefficients and did not alter the target items. This was the case for 15 items in the 1965 revision and 17 items in the 1970 revision. Most of these modifications concerned coefficients that varied with age, sometimes redefining the age groups used. But in all these cases, the transition coefficients were only adjusted within the fundamental association of items used to calculate the Russian coefficients.

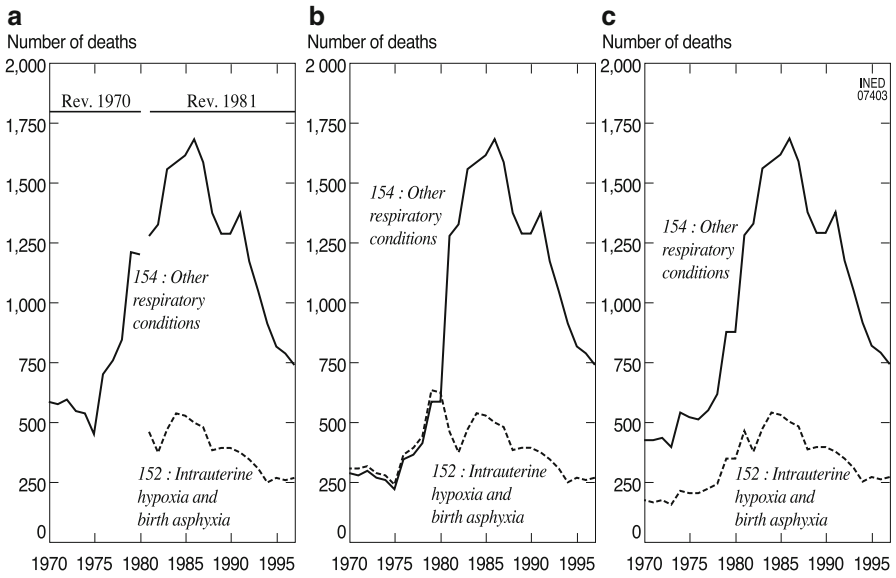

Fig. 9.4 Reconstructing Ukrainian time series using Russian coefficients (**b**) and coefficients adjusted for Ukraine (**c**). Respiratory conditions of newborn, 1970 and 1981 Classifications. Graph **a** gives trends before reconstruction

A simple example is illustrated (Fig. 9.4) by Association 112, comprising several respiratory conditions of newborn infants (Annex IV-2 on the Website), in the transition from the 1970 to the 1981 Classification. This very simple association reflects the subdivision of Item 154 – *postnatal asphyxia and atelectasis* – from 1970 into two items in the 1981 Classification: Item 152 – *intrauterine hypoxia and birth asphyxia* – and Item 154 – *other respiratory conditions* (Graph a in Fig. 9.4). In this case, direct application of the Russian coefficients gave an unsatisfactory result (Graph b in Fig. 9.4). In order to refine the final result, the transition coefficients were modified slightly (Graph c in Fig. 9.4). The increase in respiratory conditions of newborn infants can be attributed to the considerable improvement in diagnosis of neonatal conditions in the 1970s and 1980s. However, this change in diagnostic and reporting practices is likely to have varied significantly between Soviet republics, even between two as similar as Ukraine and Russia. The coefficients for these items were therefore modified for the transition from the 1970 Classification to the 1981 Classification.

9.2.2.2 Modifications That Alter Fundamental Associations of Items

In a few cases, adjusting the Russian coefficients to Ukraine required more changes, in that we had to modify the list of target items to which the contents of the source

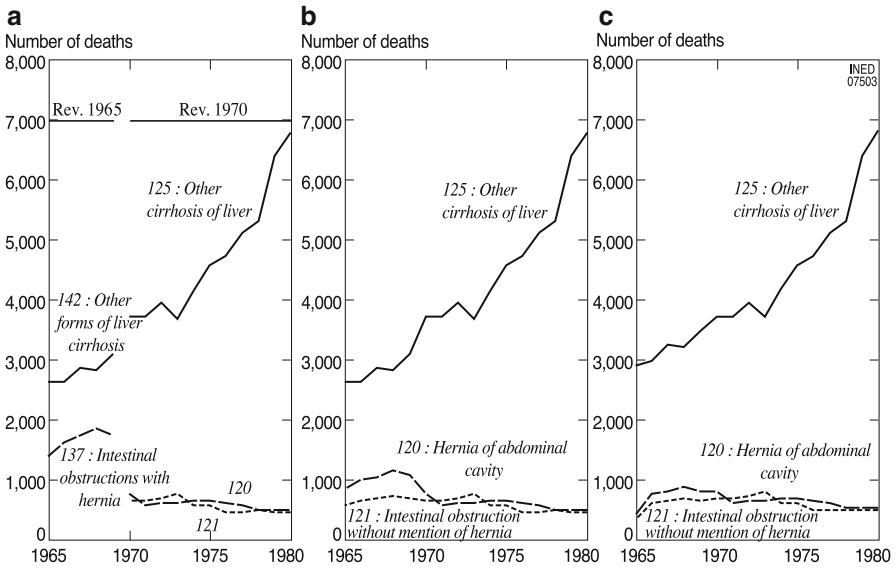

Fig. 9.5 Reconstructing Ukrainian time series using Russian coefficients (**b**) and coefficients adjusted for Ukraine (**c**). Intestinal obstruction and cirrhosis of liver, 1965 and 1970 Classifications. Graph **a** gives trends before reconstruction

item were to be reassigned. This applied to 12 source items in the 1965 Classification and two in the 1970 Classification. Theoretically, this type of change could have occurred even within a single association. In fact, in all cases, it had to be done hand in hand with modifying the association defined for Russia. In some cases, the change was a simplification: where certain target items had been removed, we had to split a Russian association into two simpler Ukrainian associations. In other cases, the opposite modification applied: when new target items had been identified, two Russian associations had to be merged into a single, more complex Ukrainian association.

Figure 9.5 illustrates this type of modification with a simple case, where two Russian associations (one of which was very straightforward) were merged, in order to better reflect the situation in Ukraine. This produced Ukrainian Association 81 for the transition from the 1965 Classification to the 1970 Classification. For Russia, Item 125 in the 1965 Classification – *other cirrhosis of liver* – was clearly an exact match for Item 142 of the same name in the 1970 Classification. The two items therefore formed a simple association. In the case of Ukraine, this association was severely unbalanced; so we thought it would be helpful to merge it with another association, reversely unbalanced, matching Item 137 in the 1965 Classification – *intestinal obstruction with hernia* – with Items 120 – *inguinal hernia and other hernia of abdominal cavity with obstruction* – and 121 – *intestinal obstruction without mention of hernia* – in the 1970 Classification. The result obtained by applying the

Russian transition coefficients directly was unsatisfactory (Graph b in Fig. 9.5), whereas the adjustment made specifically for Ukraine achieved better continuity in the series at the time of the change to the detailed list.

These adjustments of Russian associations for Ukraine, the results of which are shown in Annex IV (on the Website),[3] were performed after – not before – the Russian coefficients were modified; therefore we are providing that document only for general interest. Since our aim was to achieve a satisfactory result quickly and easily by capitalizing on the Russian exercise and the cultural proximity of the two republics, after some thought, we decided to dispense with the long, complex approach that had allowed us to establish transition coefficients for Russia based on fundamental associations. It should be borne in mind that the Russian coefficients for the transition from the 1970 Classification to the 1981 Classification themselves merely represented an adjustment of the USSR coefficients to Russia.

9.3 Beyond Revision: Other Changes in Coding Practices

In all countries, in addition to periodic revisions of the official classification, new instructions issued to certifying doctors or coders may destroy the continuity of the statistical series for some items. For instance, since ICD-9 was adopted in France in 1979, the country has seen a large number of abnormal fluctuations in cause-of-death series for various years (Meslé and Vallin 1996; Vallin and Meslé 1998). One of the most common examples is *disseminated malignant neoplasm*, where the number of deaths shot up from 3 in 1981 to more than 3,000 in 1982. Similarly, in England and Wales, the 1984 decision to adhere more strictly to WHO rules on underlying cause led to an instant reduction in the number of deaths classified under items such as *pulmonary embolism and heart failure*, which had previously both been wrongly viewed as underlying causes (OPCS 1985; Meslé 1995).

This type of problem also affects data from the Soviet republics, specifically Ukraine. We had already noted that, even after we resolved discontinuities arising from changes in the classification, a number of dramatic variations persisted in the reconstructed series for the Soviet Union as a whole – and this was even more true for Russia, where we had looked at data over a longer period. We had attempted to reduce these variations (Meslé et al. 1996), and would obviously also have to do so for Ukraine, which, as might be expected, differed significantly from Russia. This exercise is outlined in Sect. 9.3.1 below. The subsequent sections discuss the measures taken for Ukraine and for Russia in order to deal with the removal of occupational accident items from the Soviet classification in 1988 (Sect. 9.3.2) and trends in deaths from senility and ill-defined causes (Sect. 9.3.3).

[3] Owing to changes during the process of establishing transition coefficients, when Russian fundamental associations were merged or subdivided, we arrived at a slightly different number of associations for Ukraine. For the transition from the 1965 to the 1970 Classification, there are 124 Ukrainian associations as against 132 for Russia. For the 1970/1981 transition, there are 138 associations for Ukraine, to Russia's 137.

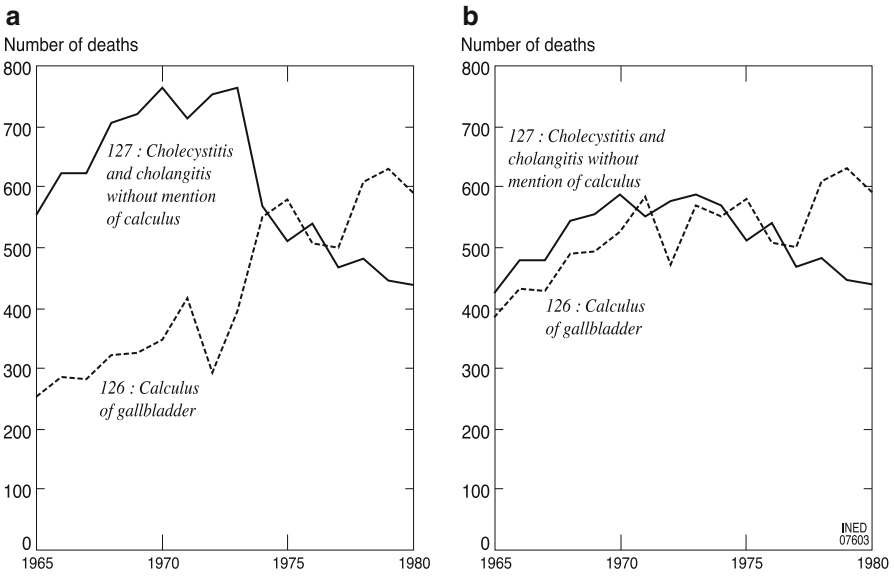

Fig. 9.6 Number of deaths classified under items 126 and 127 in 1970 Classification, before (**a**) and after (**b**) correction

9.3.1 Ex Post Corrections of Some Time Series

These corrections were performed at two levels. Firstly, alignment of the 1965–1969 data with the 1970–1980 data, achieved by reclassifying the 1965–1969 data set according to the 1970 Classification, had revealed anomalies for years other than the transition year, before and, especially, after the revision. Secondly, alignment of these combined data with the 1981–1997 data, achieved by reclassifying the 1965–1980 data set under the 1981 Classification, had revealed other anomalies in the period 1981–1997.

9.3.1.1 After Reclassification According to the 1970 Classification

After the reconstruction of 1965–1980 series according to the 1970 Classification, a first round of corrections was made. Table 9.4 provides an overview of these changes.

For example, the number of deaths attributed to Item 127 – *cholecystitis and cholangitis, without mention of calculus* – fell dramatically in 1974, while there was a symmetrical increase for Item 126 – *calculus of gallbladder* (Fig. 9.6a). In order to remove this dual anomaly, which probably arose from a change in the coding instructions for certain diseases of the biliary tract, for the years 1965–1973 we assigned between 12% and 25% (depending on age) of deaths classified under Item 127 to Item 126 (Fig. 9.6b). This type of new instruction on how to interpret the detailed list appears to be highly dependent on the local context. Item 127 also

Table 9.4 Percentage of deaths transferred ex post from one item in the 1970 Classification to one or two other items

			Proportions (%)										
Old item	New item	Age	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
41	45	All ages					40						
65	64	Age 0–9						10					
		Age 35–59	35										
67	48	Age 60–74	45										
		Age 75+	40										
		Age 75–79					15						
75	74	Age 80–84					25						
		Age 85+					70						
		Age 0–74						55					
88	98	Age 75–79						84					
		Age 80+						89					
89	98	Age 0–69						20					
		Age 70+						40					
94	95	Age 50–54						45					
96	93	All ages	20										
97	93	All ages	55										
		Age 0–54	15										
		Age 55–59	10										
		Age 60–64	6										
100	86	Age 65–74	4										
		Age 75–79	2.5										
		Age 80–84	2										
		Age 85+	1.5										
		Age 60–64	5	5	5								
		Age 65–69	15	5	5								

(continued)

Table 9.4 (continued)

			Proportions (%)										
Old item	New item	Age	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
100	93	Age 70–74	15	5	10								
		Age 75–79	25	10	10								
		Age 80+	30	15	10								
		Age 0–54	35										
		Age 55–59	35	15									
		Age 60–64	35	15									
100	98	Age 65–69	30	15									
		Age 70–74	30	15	5								
		Age 75–79	27.5	15	5								
		Age 80–84	20	15	5								
		Age 85+	20	20	5								
		Age 55–59	5	5	5								
		Age 60–64	10	10	10								
100	99	Age 65–79	15	15	10								
		Age 80–84	18	15	10								
		Age 85+	20.5	15	10								
		Age 55–64						60					
		Age 65–69						25					
102	99	Age 70–74						35					
		Age 75–84						40					
		Age 85+						45					
107	105	Age 0–59					28						
		Age 60+					15						

110	113	All ages		68			
114	113	All ages		68			
120	121	All ages			10	17	
		Age 0–79	25				
127	126	Age 80–84	15				
		Age 85+	12				
151	149	All ages	65				55
157	154	All ages					45

needed to be corrected for the same years for Russia, but in the opposite direction, since the number of deaths classified under that item suddenly increased in 1974. The counterbalance we had found for Russia was Item 128 – *other diseases of liver and biliary tract* – which, for Ukraine, was not in the least anomalous.

In some cases, the anomaly relates to the revision year itself. In 1970, when a new classification was adopted, an initial interpretation of the new rules prompted transfers of deaths, which were called into question in subsequent years. According to the above method, the years 1965–1969 should have been aligned with the 1970 Classification at the previous stage, and the years 1965–1970 corrected *ex post*. But in these few cases, it seemed preferable first to align the period 1965–1969 with the trend observed after 1971, then to reduce the peak or trough observed in 1970. Figure 9.7 gives the example of Item 110 – *peritonsillar abscess* – and Item 114 – *other diseases of respiratory system* – for which, after reconstructing the time series, we observed a peak in 1970. To bring down this peak, clearly caused by conflicting instructions from 1 year to the next, these two items were linked to Item 113 – *chronic forms of pneumonia and bronchiectasis* – which at first sight had not required any particular correction, but in fact showed a slight deficit in 1970 and in any case included many more deaths than the other two items. In Fig. 9.7b, the first two series are corrected while the 1970 deficit in the third series is slightly reduced.

This example shows how the interpretation of the classification can vary from one republic to another. In the case of Russia, the three items above did not require any ex post correction, whereas Items 133 – *infections of kidney* – and 134 – *calculus of urinary tract* – which we have used in the past to illustrate the case (Meslé et al. 1996), did not show any anomaly in Ukraine.

A total of 33 items were corrected *ex post* in this way. For 25 of them, the correction involved age adjustment (Table 9.4). For Russia, only 22 items had had to be corrected *ex post*, of which just 6 involved age adjustment.

9.3.1.2 After Reclassification According to the 1981 Classification

After the deaths recorded for 1965–1980 had been reclassified under the 1981 Classification, the next stage was to make another set of corrections; this involved only three items for Ukraine (Table 9.5), although it had involved 11 for Russia.

9.3.2 Discontinuation of Occupational Accident Items in 1988

Although it was not fully revised, the 1981 Classification was amended in 1988 with respect to accidental causes of death. Until that date, every accidental cause of death, with one or two exceptions, was divided into two items, in order to distinguish occupational accidents from non-occupational accidents.[4]

[4] The ten items for occupational accidents were ‘hidden causes’ (see Chap. 8). In order to produce statistics on these items to use here, we had to retrieve tables that had been kept secret for many years, separately from the basic tables.

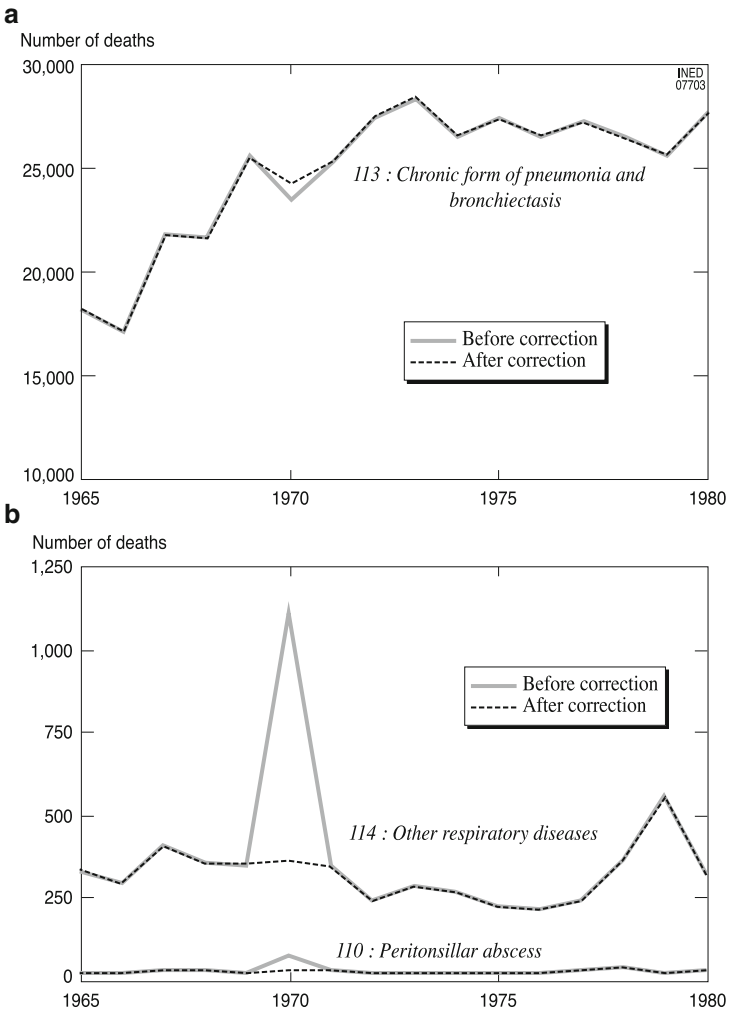

Fig. 9.7 Number of deaths classified under items 133 and 134 in 1970 Classification, before (**a**) and after correction (**b**)

This distinction was abandoned in 1988, and all accidental deaths with a specific cause were classified under a single item. Consequently, Items 160–185, previously concerned with deaths from injury and poisoning, were renumbered sequentially from 160 to 175. The list of these new items is contained in Annex III-3b (on the Website).

This amendment compelled us to perform one final reclassification operation. In most cases, the new item created in 1988 was a simple merger of the two items from the 1981 classification. In one case, however, an item had to be subdivided: deaths

Table 9.5 Percentage of deaths exchanged *ex post* between an item in the 1981 revision and another item

			Proportions (%)			
Old item	New item	Age	1965–1986	1987	1988	1989
98	100	Age 55+	10	5		
		Age 0–64				15
		Age 65–69				20
98	99	Age 70–74				30
		Age 75–79				40
		Age 80–84				60
		Age 85+				
		Age 60–64	3			
		Age 65–69	8	3		
99	100	Age 70–74	10	5		
		Age 75–84	20	10		
		Age 85+	25	15		

classified under Item 162 – *motor vehicle traffic accident*, occupational – were redistributed among the new Items 160 – *motor vehicle traffic accident* – and 161 – *motor vehicle traffic accident involving collision with pedestrian*.

A supplementary list of fundamental associations of items is provided in Annex IV-3 (on the Website) for this mini-revision of 1988. It is the same as the list already provided for Russia (Meslé et al. 1996).

The analyses in subsequent chapters and the basic results detailed in Annexes VI–VIII (deaths) and X–XII (rates), given on the Website, are based on the current version of the Classification, which does not distinguish occupational accidents. However, we thought the reader might find it helpful to have information on the distribution of deaths from injury and poisoning in the initial version of the 1981 Classification (which distinguishes occupational accidents) for the period 1965–1987 (Annex IX on the Website).

9.3.3 Senility and Ill-Defined Causes of Death

In the late 1980s, there was a specific change in the coding instructions relating to deaths reported as due to senility or to an ill-defined cause, which previously had been very rare.

In Spring 1989, the Soviet Health Minister, Evgeni Chazov, who at the same time was also head of a cardiology unit, issued a new directive that radically altered diagnosis of deaths of people aged over 80 from cardiovascular diseases and diagnosis of sudden cardiac death at younger ages.

The new instructions recommended that any death occurring after age 80 be registered as due to senility, unless the person's medical history or an autopsy report

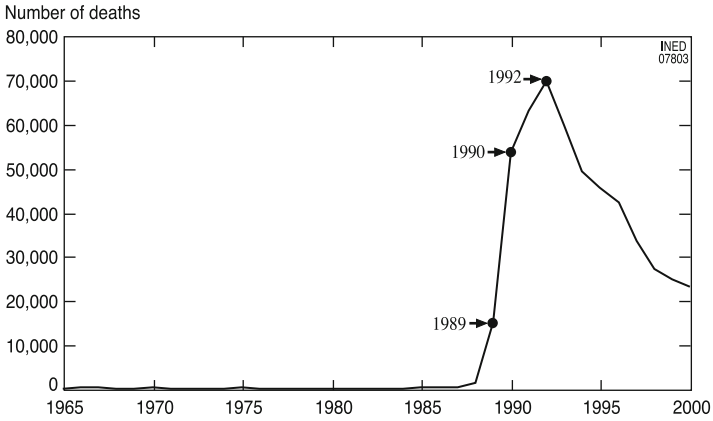

Fig. 9.8 Ukraine: annual trends in number of deaths classified as senility

made it possible to diagnose a precise cause of death or mentioned death from injury, poisoning or another external cause. As soon as the directive was issued, the number of deaths classified under *senility* rose dramatically. In Russia, the number of such deaths, which had never exceeded 300 before 1989, suddenly leapt to over 20,000 in 1990 and almost 45,000 in 1992 (representing 2.5% of all deaths). At the same time, the number of deaths of people aged over 80 classified as due to certain diseases (particularly *atherosclerotic cardiosclerosis*) fell.

The change had still greater impact in Ukraine (Fig. 9.8), where the reform was adopted even before it was officially launched throughout the Soviet Union. The number of deaths classified under *senility*, which had never exceeded 400 before 1988, rose to 1,300 in that year, before shooting up to 15,000 in 1989, 53,000 in 1991 and 70,000 in 1992 – even though total deaths in Ukraine (697,000 in 1992) are far lower than in Russia. This means that in 1992, the proportion of deaths classified under *senility* reached 10%! After 1992, as in Russia, the general rush to classify deaths as due to senility fell off, and the number of deaths classified under that item decreased. In Ukraine, they fell to 33,000 by 1997 and 23,000 in 2000. Nevertheless, the importance that the item acquired in the 1990s completely altered the trend in ill-defined causes of death.

Moreover, with respect to deaths before the age of 80, the directive prohibited registration of acute cardiovascular disease unless the diagnosis was confirmed by an autopsy report. This probably accounts for much of the rise in deaths from ill-defined causes (apart from senility) during the 1990s. In particular, many deaths previously coded as *sudden cardiac death* began to be registered as due to an ill-defined cause.

In the case of Russia, our hypothesis was that, despite all this, these practices should not excessively distort analysis of the structure or trends of cause-specific mortality, as long as deaths classified under ill-defined causes (including senility) were redistributed among the other items. Simple proportional redistribution seemed sufficient to achieve this. Before 1989, numbers of deaths from ill-defined causes

were so low that this rough redistribution method was more than adequate; and for the period after 1989, in light of all we have just said, the same method – which tends to favour the major causes of death, particularly diseases of the circulatory system – was good enough. However, in the next chapter we shall show that, because of the scale of this phenomenon in Ukraine, we had to re-think our strategy there.

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