Does chaotic history make life expectancy trends chaotic in frontier countries like Baltic States?

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Provisional draft of a full paper

At the end of 17th century, the region today occupied by the three Baltic countries (Estonia, Latvia, Lithuania) was divided into two parts: the northern one (roughly today Estonia and Latvia) under the Swedish kingdom, and the southern one (roughly Lithuania) included in the Great Duchy of Lithuania that, in its Union with Poland, covered an immense territory from the Baltic Sea to the Black Sea. After the Great Northern War, in several steps ending in late 18th century, the Russian Empire annexed all these territories, including the today Baltic states that corresponded at the time to seven Russian "Gubernias" (Estlandia, Liflandia, Curlandia, Vitebsk, Kovno, Vilno and Suvalki) totally or partially. Then, during World War I, the Brest-Litovsk treaty gave birth to the three modern Baltic states (within territories more or less close to the current ones). Two decades later, during World War II, the three countries were enrolled in the Soviet system as three Republics of the USSR. Another five decades, and Baltic countries resumed independence, and they entered the European Union soon after.

Such strong historical changes caused major impacts (either positive or negative) on the implementation of the health transition in the region that would be quite interesting to document, but they also produced dramatic changes in the quality and the accuracy of information required to compute mortality indicators.

The aim of this paper is to briefly summarize existing indicators of mortality in the Baltic region for the 18th and 19th century, but to focus more precisely on mortality trends since WW-I and to try to measure what were the consequences of getting in and then getting out of the Soviet system in terms of health and survival. To do so, we will first establish Baltic trends in life expectancy as precisely as possible (by discussing and solving problems of death under-registration). Then we will compare these trends to those of France and Russia.

We will see how much Baltic countries suffered to have been incorporated into the USSR but also how they made very fast progress in the late 1950s and early 1960s. Then we will see how they fell into the deep health crisis that characterized the whole Soviet Union from the mid-1960s to its end, and how they succeeded to recover better and sooner than all other new states born from the split of the USSR.

I. A review of existing estimates before WW1

Mortality estimates for the 18th century or before are not totally missing thanks to historical demography works on parish registers, but very scarce and they concerns a few small localities only. It is totally impossible to make solid judgement on the health consequences of the annexion of the Baltic region by the Russian Empire. The only relevant fact that appears is that sources of data collection somehow deteriorated.

First more aggregated mortality indicators (at the level of Russian gubernias) are available for the second half of 19th century. Figure 1 provides a general comparison of crude death rates in the five gubernias with each other, and supports the comparison with other Russian regions (Moscow, St-Petersburg, Vitebsk) and with 50 Russian gubernias all together. Crude death rate were much lower in the five Baltic gubernias than in the remaining European Russia, especially, if compared to the Moscow gubernia. Also, Estliandia, Courliandia, and Lifliandia demonstrate lower mortality levels than in Kovno and Vilno gubernias, which were close to Vitebsk (and other Belarussian gubernias like Grodno and Minsk not shown on Figure 1). By the 1910s, the difference in mortality levels between the three Estonian/Latvian and the two Lithuanian gubernias notably diminished. This was partly due to faster improvements in Vilno and Kovno gubernias, especially during the end of the 19th and beginning of the 20th centuries. However, despite a long-term mortality stagnation between 1870 and 1905, the lowest mortality in the region remained in Courliandia.

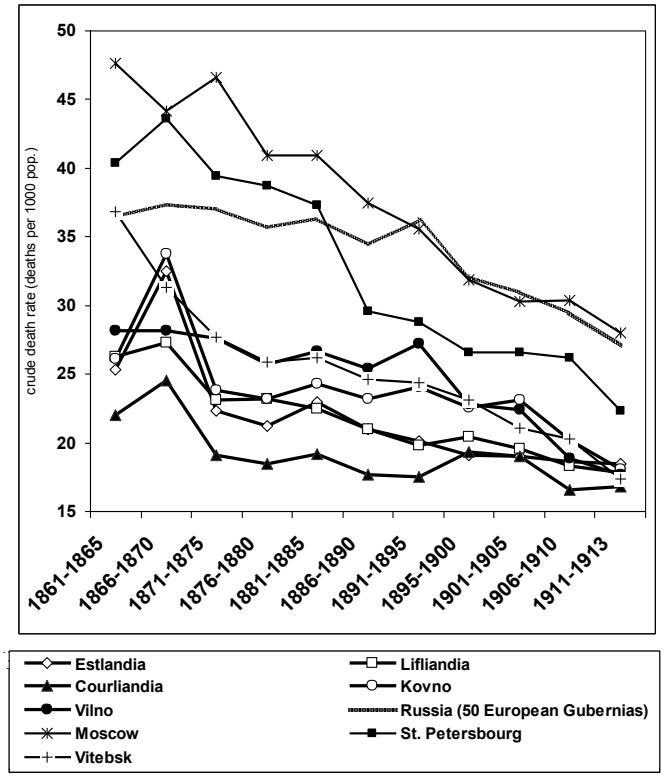

Figure 1. Trends in crude death rate in five Baltic gubernias, 1861-65 – 1911-13
Source: Rashin, 1956.

Mortality levels in Kovno and Vilno gubernias remained somewhat higher, until the end of the 19th century but their crude death rates decrease faster at the very beginning of the 20th century, and more or less caught up with Latvia and Estonia ones by the eve of WWI. The

specificity of Lithuania among the Baltic countries has been recorded and analysed in earlier research (Stankūnienė, 1989; Krumins et al., 1991; Krumins and Zvidrins, 1993).

However such estimated trends are not completely free from under-registration of deaths that was rather important at the time. In particular, infant and child mortality that strongly impact life expectancy at these level of mortality shows rates somewhat questionable. Indeed the assessment of infant and child mortality is impeded by underregistration of infant deaths and live births, especially in Kovno and Vilno gubernias where parish registration was not so developed as in the Lutheran Baltic region. Table 1 shows that there was a significant and consistent decrease in infant mortality in the Baltic gubernias (Estliandia, Lifliandia, Courliandia), whereas opposite trends were observed until 1886-97 in Kovno gubernia and even until 1908-10 in Vilno gubernia. Very likely, the latter trends largely reflect improvement in registration of vital events in these two gubernias. Very obviously, however, infant mortality levels in all these gubernias was substantially lower than in other Russian regions.

Table 1. Infant and child mortality in the Baltic region (Estliandia, Lifliandia, and Courliandia), Kovno, and Vilno gubernias, 1867-1910

	Infant mortality (ratio of infant deaths to number of live births)			Child mortality (ratio of child deaths (for ages 1-5) to number of live births)		
	1867-1881	1886-1897	1908-1910	1867-1881	1886-1897	1908-1910
Estliandia	181	156	138	110	140	128
Lifliandia	210	190	163	120	101	78
Courliandia	166	156	144	123	108	85
Kovno	155	173	164	152	138	135
Vilno	125	141	150	166	155	116
Vitebsk	163	187	185	148	139	120
Moscow	406	366	299	148	150	137
Russia (50 European gubernias)	271	274	253	152	158	136
Source: Rashin, 1956.						

A consistent decrease in child mortality (1-5 years) can be observed in Courliandia, Lifliandia, and Vilno gubernia. It is less pronounced in Estliandia where it occurred only between 1886-1897 and 1908-1910. The decrease in child mortality in Kovno gubernia was slower, especially at the end of the period. Throughout the whole period 1867-1910, however, child mortality estimates for Lifliandia and Courliandia were much lower than the average of European part of the Russian Empire (Rashin, 1956). At the same time, Kovno and Vilno gubernias were close to this average.

Data obtained by the first census in 1881 was used by L. Besser and K. Ballod (1897) to calculate male and female life tables for the Baltic gubernias (Estliandia, Lifliandia, and Courliandia) as a whole for the years 1880-1883 that resulted in a life expectancy of 39.1 years for male and 42.7 years for females (Table 2). Such results can be suspected to overestimate Baltic life expectancy. Not very surprisingly they are much better than in Russia (Orthodox population only) but not only they seem too close to those of France and unlikely higher than those of Bavaria and Prussia.

Table 2. Estimates of life expectancy in Baltic gubernias (Estliandia, Lifliandia, and Courliandia) all together in 1880-83 according to Besser and Ballod (1897) as compared to other European countries

Country	Life expectancy at birth		Period
	Males	Females	
Baltic gubernias	39.1	42.7	1880-1883
Russia (Orthodox population)	27.3	29.9	1867-1890
Prussia	37.6	40.7	1881-1890
Bavaria	34.9	37.9	1881-1890
France[(1)]	41.6	44.4	1882-1886
England and Wales[(2)]	43.8	47.0	1880-1889

[(1)] According to Vallin and Meslé (2001), for the exact period 1880-83 life expectancy was 41.6 for males and 44.1 for females. For 1882-86, it was 41.6 and 44.2 respectively.
[(2)] The Human Mortality Database, 2011.

II. What about inter-war period (1918-1940)

After October Revolution and Brest-Litovstk treaty, the Baltic region turned out into three independent new states that organized their own statistical systems, improving data collection and performing their own demographic estimates.

1 Data collection

Soon after independence national statistical offices in the Baltic countries started producing, for the first time in the region, rather detailed mortality statistics according to fundamental characteristics like age at death and cause of death. For cause-specific tabulations, the International Classification of Diseases (ICD) was applied. Furthermore, population statistics, including mortality data and indicators were regularly published on an annual basis.

Let us have the look on principal decisions taken in order to improve the data registered on death certificates, particularly cause of death, using Estonia as an example. First, and most importantly, in that country, there was the reform of vital registration in 1926. Responsibilities were transferred from church authorities to the newly established state structure, Civil Registration Office (*Perekonnaseisuamet*). Among others, the office was given responsibility over the data quality filled in certificates by the registrators. Civil Registration Office received instructions from the statistical office in order to apply appropriate classifications for producing statistical output. Concerning the cause of death, however, it was not sufficient, and medical knowledge had also to be mobilized.

Already in 1919 the medical death certificate filled in by doctor (according to principles approved internationally in 1903) was made compulsory for all death cases in urban areas. In 1929 the compulsory arrangements of the medical certificate were widened to cover larger rural settlements, and also in the remote rural areas for several categories of death cases (not

only violent and accidental deaths, deaths related to abortion, etc. but also every deaths of persons apparently healthy before the fatal event were listed).

In 1935 a new regulation on registration of cause of death was introduced with the aim to harmonise the procedures of registration and increase the quality of data. The regulation included instructions to doctors on ways to integrate medical and statistical requirements when specifying the cause of death. Also, the heads of Civil Registration Offices were stressed to supervise the correctness of medical certificates and consult doctors. The attention was also paid on registration of death not covered by compulsory medical conclusion. The Offices were given instructions to proceed with inquiry with relatives on health status and illnesses of the dead people in order to fill in the certificate.

The statistical arrangements were not exactly the equivalent in the other two Baltic countries but the general direction of development was similar. Before WW II, mortality statistics in the region had met international standards of the time, and was made available for public use.

2. Available data and studies

During the inter-war independence (1918-1940) the mortality statistics started to be published systematically in the Baltic countries for the first time. In Estonia it was published in regular reports in the monthly statistical journal (*Eesti Statisitka Kuukiri*, 1921-1943) and in Latvia and Lithuania in their statistical yearbooks (LCSB, 1927-1940; LVSP, 1920-1939).

During this period the number of mortality studies increase. For example, in Lithuania, Oželis (1934) published crude mortality estimates for the period 1915-1933 and studied age, sex, and ethnicity-specific differences in numbers of deaths. Vilytė-Manelienė (1939) discussed trends and determinants of infant mortality in Lithuania, including seasonality of infant deaths. Central Statistical Bureau of Latvia published the *Latvian Statistical Atlas* (CSBL, 1938), where infant mortality and crude death rates were analized by ethnicity and region. The *Latvian Statistical Atlass* also provided the first official life expectancy estimates by sex for Latvia and compared to the corresponding figures of other European countries. Bulmerinks (1932) published a comprehensive report on population trends in Riga covering the period 1911-1930. This reports contains analyses and rather detailed data on annual deaths and death rates by age, sex, cause of death, ethnicity, religion, and month of death in Riga city.

Figure 2 provides official estimates of infant mortality (unadjusted for underregistration) for the three countries between 1924 and 1938. All three countries showed much higher (1.5-3 times) infant mortality than in Sweden. While Estonia and Latvia were quite close to Finland. Lithuania maintained much higher (1.5 – 1.7 times) infant mortality than in other two Baltic countries throughout the whole period covered. In addition, there were notable peaks in infant mortality in Lithuania in 1929, 1932, and 1934, whereas other two countries showed systematic declines (since the end of the 1920s). Very likely, higher mortality in Lithuania than in Latvia and Estonia reflect reality. The proximity of Estonia and Latvia with Finland is not impossible and the much lower levels of Sweden are indicating the rather high quality of Baltic data. However the persistence of under-registration of infant deaths in Baltic countries is still in question.

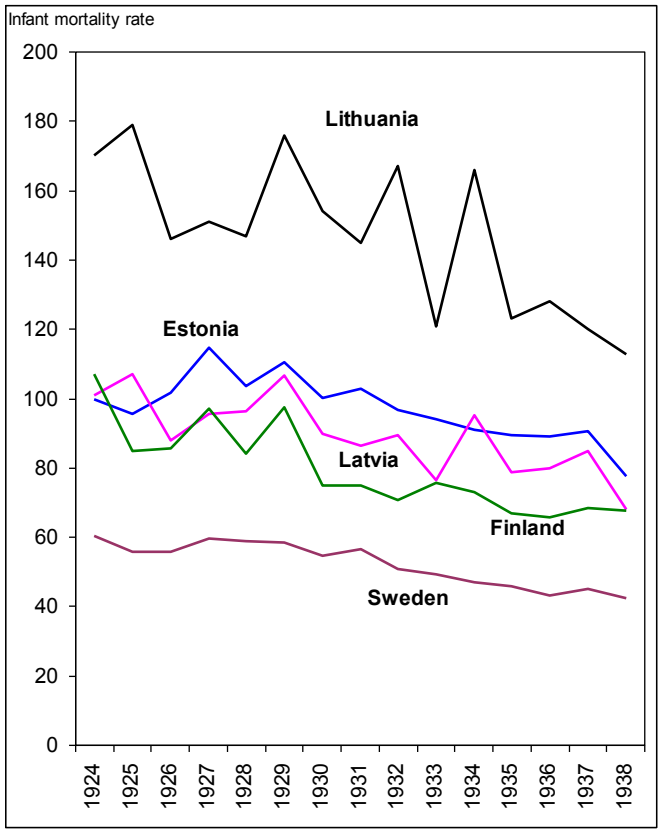

Figure 2. Official infant mortality rate in Estonia and Latvia (unadjusted for underregistration) and in Finland, and Sweden, 1924-1938.
Sources: LCSB, 1939; CSB of Latvia, 2012; Statistics Estonia, 2012.

Life Tables

Official national life tables were published in the three countries in Latvia and Estonia. In Latvia full life tables were calculated for the periods 1929-1932 and 1934-1936 (LVSP, 1936; Skujenieks, 1938). In Estonia full life table was prepared on the basis of mortality data for three successive years of 1934-1936 (RSKB, 1937). The life table calculations, nevertheless, had not become a routine task yet and the development in this specific field could be even regarded in dissonance with rapid progress in availability and quality of other age and cause-specific mortality indicators.

As far as known to the authors, no life tables were calculated by the Lithuanian statistical office at that time. However, Merčaitis (1967) has analysed the earlier decades of the 20th century and calculated a life table for the period 1925-1926. He combined the 1923 Lithuanian census data together with the 1925 enumeration in Klaipeda region to obtain the population stock statistics while deaths by broad age groups were already available by that time from the vital statistics. This life table is still the only one available for the first half of the 20th century in Lithuania.

These life tables for early or mid-1920s, compared to rough estimates for selected regions of the Baltic states area for the end of the 19th century, suggest that life expectancies notably increased. Although direct comparison is not possible (due to differences in the area

coverage), it can be assumed that male and female life expectancies grew by about 8-10 years in all three countries.

Both Latvian male and female life expectancies remained the highest in the region, whereas the corresponding figures for Lithuania were the lowest (Table 3). Estonian males were almost at the same low level as their Lithuanian counterparts, but the Estonian females showed a considerable advantage if compared to Lithuanian females. By the mid-1930s Latvian reached remarkably high life expectancy levels (especially if compared to other neighbouring countries) and maintained longevity advantage against Estonia (2 years for males and more than 1 year for females).

Table 3. Life expectancy estimates for Estonia, Latvia, and Lithuania for the first half of the 1920s (unadjusted for under-registration)

	Years	Males	Females
Estonia	1922-23	48.7	54.9
Estonia	1932-34	53.1	59.6
Latvia	1925-26	50.7	56.9
Latvia	1934-36	55.4	60.9
Lithuania*	1925-26	48.6	51.9

* Without Vilnius region.
Sources: Lithuania : Merčaitis, 1967; Latvia : Skujenieks, 1938; Krumins, 1993; Estonia: RSKB, 1937; Katus and Puur, 1992.

Just before he died, Kalev Katus attempted to reconstruct continous series of age-specific population and death counts data. In the case of Estonia reconstructed data cover the period of 1922-1940, and are based on 1922 and 1934 censuses as well as vital statistics of the corresponding years. The similar calculations were carried out for Latvia 1925-1940. The accurate population statistics of that period, and small-scale international migration compared to the afterwar years formed the solid basis of rather consistent life tables. Concerning Lithuania, unfortunately, only one census has been done in the prewar decades (1923), and it did not cover the whole territory (Klaipėda was not included).

To take in account under registration of deaths, we applied to that period the same corrections done here above for the 1950s. as for the 1950s the resulting adjustment in terms of life expectancy is quite small except for Lithuania (Figure 3). It leads to lower life expectancy by 1.1 and 1.6 years for males and females, respectively. Adjustment is much less important for other two countries.

Between the mid-1920s and 1938, male and female life expectancy at birth increased in both Latvia and Estonia. The most remarkable growth in life expectancy was among the Latvian males and females (+6.6 and +6.9 years, respectively, from 1925 to 1938), whereas the corresponding progress in Estonia was less pronounced (+4.2 and +3.7 years). In both countries, improvements were fastest during the period 1929-1933, whereas there were some flattering trends and short-term decreases during the mid-1920s and during the second half of the 1930s. Particular exception of the generally positive trend concerns a striking dip in Estonian life expectancy (both sexes) between 1925 and 1927 (-4.4 and -5.4 years). There were no such notable decreases in life expectancy in Latvia (Figure 3).

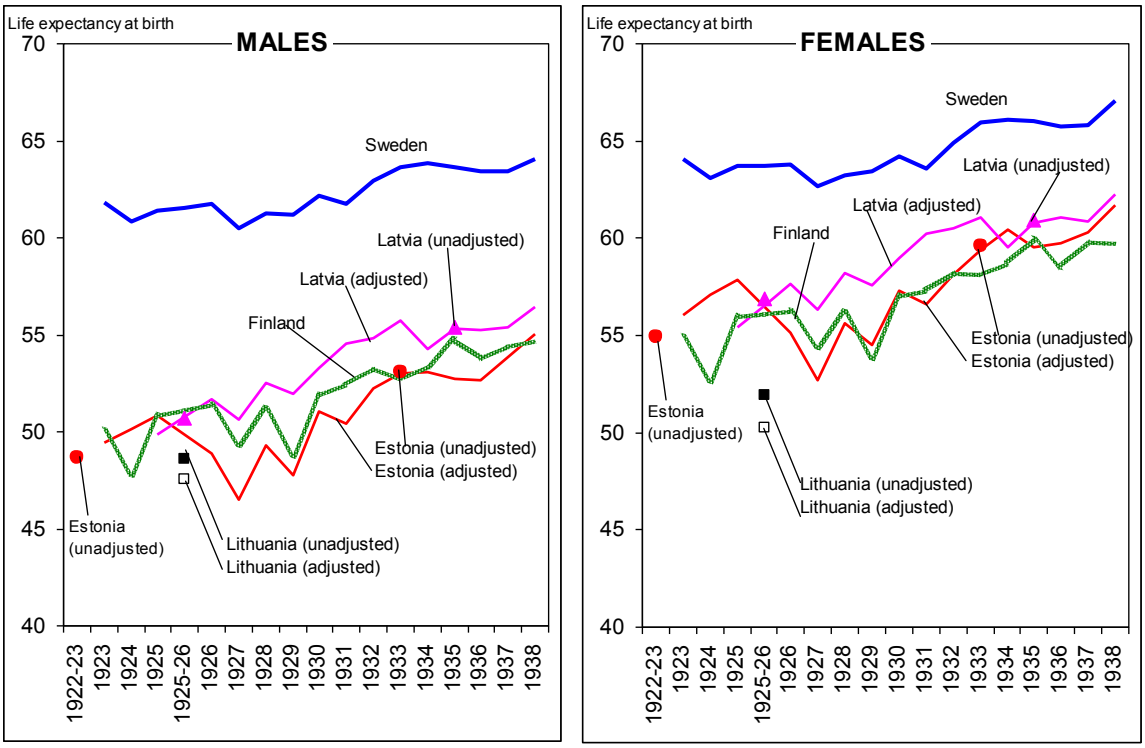

Figure 3. Unadjusted official and adjusted (for underregistration of infant deaths) male and female life expectancy at birth in Estonia, Latvia, Finland, and Sweden, 1923-1938

Source: for Estonia and Latvia : historical estimates produced by Kalev Katus (unpublished); for Lithuania (without Vilnius region): Merčaitis (1967).

If compared to Finland and Sweden, the three Baltic countries show a notable disadvantage against Sweden but they are close to Finland. From the late 1920s, Latvian males and females maintained higher life expectancy than in Estonia and Finland throughout almost the whole period covered. With the exception of Estonian females, the life expectancy growth in Latvia and Estonia was faster than in Finland and Sweden. As a result, the countries managed to diminish the huge male life expectancy disadvantage against Sweden from about 11-12 years in 1925 to 8-9 years in 1938. For females, the inter-country life expectancy gap decreased almost by half for Latvia (from 8.3 years to 4.8 years) and remained at the same level for Estonia.

III. More refined assessments for the period since WW-2

During Soviet time (1944-1990) mortality statistics could not be systematically found in the Baltic statistical publications. The age and cause-specific mortality data was officially classified for most of the referred period in the Soviet Union. Regulations were somewhat less tight in the years of 1962-1973 and from 1988 onwards, periods during which some statistics were available. More systematic statistics was published in classified demographic yearbooks that were the main source of published demographic data in the Soviet time in the Baltic countries. These editions became annual in Lithuania from 1966 and annual or semi-annual in Latvia from 1965 (TsSU Latvii 1965-1989; TsSU Litvi 1966-1990). In Estonia four classified yearbooks of that type were published (TsSU Estonii 1975-1987).

After independence such classified publications became publicly available in the three Baltic countries. Furthermore, large parts of those classified books have been re-printed. For the demographic research, nevertheless, it could be strongly recommended to derive the needed indicators directly from original annual demographic data files. This is necessary to re-build long time series of indicators, because many changes in definitions, classifications and calculation methods can be detected only from these files. In Latvia and Lithuania the older part of the annual population data files are archived in the Central State Archive, and files of later years in the Statistical Office, either in the local office archive or in the population department. In Estonia all the files are in the Statistical Office.

1. Available life tables and needs for the reconstruction of a complete set

The first official life tables of the Soviet period were based on the 1959 census data. Calculations were carried out by statistical services of the Baltic countries, according to the unified Moscow-based methodology. The results were fully published in Latvia and Lithuania at that time, but in classified editions (TsSU Latvii 1965; TsSU Litvy, 1963). A couple of years later a centralized unit was appointed to calculate life tables of all regions of the USSR and this organisation remained in power until the end of the Soviet rule. Baltics life tables were no longer computed by local statistical services, until 1991.

The centralisation of life table calculations coincide with the development of computer techniques which made the work easier and faster. Calculations were performed by the Moscow Central Statistical Office, which main computing center was territorially located first in Riga, then in Rezekne, Latvia, and then transferred to Moscow in the early 1970s. Life tables for urban, rural and total population, males and females separately were prepared for almost every year since 1962. It became a tradition to use mortality data of two subsequent years to build annual life table. Starting from the 1971, the programme includes the calculation of full tables parallel to abridged tables.

The referred series of life tables in the Baltic countries were never published, with very few exceptions like the Latvian and Lithuanian tables 1958/1959 (TsSU Latvii 1965; TsSU Litvy, 1963). In classified editions of that time, nevertheless, some selected indicators were made available. Life expectancy at birth was the most frequently published indicator. In the late 1980s, political changes resulted in releasing existing data, and the Moscow Central Statistical Office published several issues containing life tables (including those of Baltic countries). Among others, for the first time a set of life tables by ethnicities were calculated and published (Goskomstat 1989).

After independence, Estonian, Latvian and Lithuanian statistical publications present larger fragments of the above mentionned life table series than earlier issues, but none of the three countries ever published the full set. Original life tables are archived in State or Statistical archives similarly to annual population data files but separately.

For the years 1990s and 2000s, naturally, life tables have been calculated by national statistical offices and are available on a regular basis in each Baltic country. But, unlike

the previous period, the data basis and methodology of calculations has become step by step different from country to country.

The scarcity of official life tables including various limitations of data accessibility for half a century are making any research activities on age- and cause-specific mortality analysis in the Baltic countries particularly valuable. In Latvia the research on mortality has been more developed compared to the other Baltic countries for several decades. In particular, Latvian age-specific mortality statistics has been summarised and analysed, including comparative perspective of the Baltics (Krumins 1990; 1993; 1994; Krumins, Zvidrins 1992; 1993; Krumins et al 1991). In Estonia, in the framework of other recalculation sub-programme, also regional life tables for all 15 Estonian counties has been prepared around the 1989 census (EKDK, 1994c).

Nevertheless, many problems reduce the actual interest of existing life tables. First of all, they do ot cover annually all countries and periods systematically. Second, life tables produced by the Moscow Central Statistical Office were unaccessible for a long time and not enough submitted to contemporary quality examination. Third, a considerable fraction of existing Baltic life tables have been calculated under different programmes and/or without analytical interest on mortality development. Fourth, at least for infant mortality, under registration of death was a not negligible source of bias until the years 1990s. Fifth, in the most recent decades population estimates were somewhat problematic and may have also distorted some results. For all these reasons, we decided to systematically recalculate annual national life tables for as far as possible for all the period since WWII. Knowing that we can also consider that it is better to systematically produce annual life tables instead of two-year life tables.

With regard to required data for life table calculations in Baltic countries three type of situation have to be considered. For some periods (varying according to the country) the necessary data are readily available. For other period/country groups, data are not directly available but could be reconstructed on the basis of existing statistics. For the remaining period/country group it is simply not possible to produce life tables of acceptable quality.

Expectedly, the latter category concerns the early post war period, but differently from country to country: until 1950 for Estonia, 1952 for Latvia and 1953 for Lithuania. In the second type of of situation it will be necessary to face mainly two problems: the uncomplete registration of death (at least at certain ages) and the uncertainty of population estimates.

2 No hope for reliable life tables in the early post-war

The early post-war period is a very interesting one, because of huge demographic changes, including important human losses that, among others, are an important precondition to understand the following population development, including the long-term mortality stagnation (Katus, Puur 1997; 1998). Unfortunately, demographic data are very problematic for the second part of the 1940s for the three countries and they still make life table calculation unresalistic in the early 1950s in Latvia and Lithuania.

The most forceful limitations to compute mortality indicators are about population stocks. Even the dynamics of total population in the 1940s is still under discussion, despite the series of extensive studies directly or indirectly related to the issue during the recent decades in each Baltic country. Such a situation already makes the attempts to calculate life table indicators impossible regardless the availability of data on death cases.

Mortality statistics are much better. First, civil registration system continued its work all along the war and post war period, and individual records were continuously kept. According to the registration procedures in the Soviet Union, the death cases of persons in prisons, camps, etc were documented at their places of usual residence. That resulted in registration of a dominant component of death cases of the Baltic people outside of the region similarly with the "regular" cases. But that individual-level information, even if excellent, was never processed and no statistical data are available.

The aggregated statistics on deaths by age is very scarce for the period for various reasons. Afterwar series of age-specific mortality data started in 1946 in Estonia but only in 1952 and 1953 in Latvia and Lithuania, respectively. The referred Estonian data has been never published. They are exclusively available from annual population files in archives. Moreover, we were not able to access those tables for the years 1945-1946 (archieved in Moscow).

During the last decade growing interest has been devoted to population losses in the Baltic countries[1], however, most investigations are still at the stage of collecting information and no reliable estimates of mortality can be produced at national levels. Our life table reconstruction cannot start before 1950 for Estonia and even 1952 and 1953 for Latvia and Lithuania. Yet, some problems have to be solved, even since then, either about population estimates or about deaths counts.

[1] Among others, special institutions have been founded for the purpose which include the Genocide Institute of Lithuania, Latvian Occupation Museum and S-Center and Memento in Estonia. The published and unpublished materials of the named institutions as well as various publications on official documents concerning the repressions, lists of arrested/deported persons, case studies, etc. are gathered, piece by piece. The 1941 and 1949 large-scale deportations and political arrests are investigated to reconstruct the lists of repressed in Lithuania (Gadeikis, 1992; Burauskaite, 1998), in Latvia (Latvijas Valsts Arhivis, 1995a; 1995b; 1995c) and in Estonia (Salo, 1993; Õispuu, 1996-1998). In addition, there are various publications at parish/county level (Kotkas, 1999; Nurk, 1999; Piir, 1991-1997; (Rahi, 1998), and for specific professional groups such as medical personnel, for example (Merila-Lattik 2000). Some studies were also carried out in the west during the Soviet time (Misiunas and Taagepera, 1983; Eesti riik 1954-1962).

3. Population estimates

The most crucial problem in terms of population estimates is related to the period preceeding the first Soviet census of 1959. Some adjustments are also to be made for the following periods.

a) Estimating population before 1959

Population numbers published by the Moscow statistical authorities for the years before the 1959 census for Baltic countries has proved to be very rough back-extrapolation without correspondence to real population changes. They are useless. Fully original estimates for 1950-1959 were calculated by Kalev Katus for all three Baltic countries. His basic tool was backwards component method by 1-year step using all vital and migration data available. This availability, unfortunately, was limited, and the quality of vital statistics varied in large scale, also by countries. If data on deaths has been of rather good quality for the 1950s, migration statistics appeared very poor. The decade has not only been the time of mass immigration into the Baltic countries from other regions of the Soviet Union but also the it has been still marked by the last mass deportations in the nearly 1950s and by the return of survivors in the second half of the 1950s.

Among others, two main coverage problems had to be taken in consideration. First, the registration of the 1950s did not cover the residential moves of rural population in Latvia and Lithuania. In Estonia, that coverage was restored in 1956, being actually the first in the Soviet Union, but the previous years of the most intensive migration were not covered either (Katus 1989; Sakkeus 1991; 1996). Second, rarely in- and out-migration flows are broken down to internal and international components.

As a result population estimates established by single year of age for the three Baltic countries for the 1950s are not perfect and vary in quality. Due to the more complete migration statistics, the results are more consistent for Estonia, less for Latvia and even less for Lithuania. However, as they will be used here only by 5-year age groups they can be regarded of sufficient quality for life table calculations as it will be seen all along our various analyses of reconstructed Baltic mortality trends discussed in the next chapters.

b) Population estimates after 1959

In the Baltic countries four soviet censuses in 1959, 1970, 1979 and 1989 took part. In addition, first censuses after independence were conducted in 2000 (Latvia and Estonia) and 2001 (in Lithuania)[2]. All the referred censuses support the data on population by single year age-groups.

Intercensal population estimates are available from previous calculations by statistical authorities for selected periods. The major problem is that the calculations were produced exclusively on the basis of the data on two census points applying indirect methods, without consideration of available vital and migration data for the same years. An evalution of the results for Estonia revealed noticeable inaccuracies, particularly for the period of 1970-1979 (EKDK 1994a; 1994b). For Lithuania, significant inconsistency

[2] Results from those of the early 2010s were not yet available when writing that book.

has also been revealed between the census data (1959 and 1970) and the official population estimates for the 1960s. It has been found that some smoothing procedures have been applied after age of 20 in order to produce the population estimates for this period. Similar problems of apparent smoothing have been revealed for the official population estimates for the 1970s and 1980s. Several peaks in population numbers, which are present in the censuses 1959, 1970, 1979 and 1989 are missing in the inter-censal estimates

In the framework of the Programme for Harmonisation of Population Statistics the recalculations of population stock data have been recently accomplished covering the three intercensal periods of 1959-1970, 1970-1979 and 1979-1989 in Estonia. The last two periods have been subject to recalculation programme on the county level (NUTS3). The results as well as methods of calculation are presented in earlier publications (EKDK 1994a, 1994b). Additionally, and it is important to notice, the new set of continuous population stock data refers to "permanent population" for the whole period of 1959-1989 when the previous estimations embedded discontinuity: "present population" was replaced by "permanent population" in the 1970s (Anderson, Silver 1985).

In Latvia and Lithuania no similar harmonisation programmes have been launched locally, butwithin the Human Mortality Database project, recalculations were performed resulting in comparable across the countries population estimates for the years 1959 to 1988.

Several issues should be mentioned concerning population estimates after independance. In a first step, post-censal population estimates for the 1990s and 2000s did not account for unregistered emigration, which was especially significant in Latvia and Lithuania. But, statistical offices have recalculated population estimates backwards (to the years 1990 and 2000-2001) after the censuses of 2000-2001 and 2011. Estonia even revised the 2000 and 2011 population census figures (census base). This has been done in order to make corrections due to observed undercounts in both censuses. The revised population census data (census base) were used to re-estimate inter-censal population estimates for 1990-1999 and 2000-2011. Although using the data for 2002-2007 it has been shown that adjusting for unregistered migration have only negligible impact on the measurement of life expectancy (Jasilionis et al., 2011), this had an influence on these estimates during the most recent years before the 2011 census.

4 Have deaths been under-registered since the 1950s?

In general, the coverage of death by records seems to have been nearly complete from the beginning in Estonia and Latvia. Completeness for Lithuania is more problematic for the early post-war period because a guerilla war against the Soviet army lasted until the mid-1950s in some rural areas (Kiaupa et al., 2000). However, by the end of the 1950s, the Statistical Office of the Lithuanian SSR took several steps to improve the registration system following several orders from the central and local authorities (Stukonis, 1958). For the most recent period, several international data completeness studies conducted in the 2000s concluded that data on deaths and causes of death are of high quality (Mathers et al., 2005).

The quality of age determination seems to have been quite good. Under the Odense project on mortality of very old people, Väino Kannisto has analysed the data quality for oldest old

deaths in Estonia (aged 80 and above), from 1950 onwards, separately for the native-born and immigrant population. The outcome of his inquiry shows that the records on birth date were generally good but noticeably better recorded for native population compared to immigrant one (Kannisto 1993). Furthermore, the examination of quality of age registration in mortality data (conducted within the Human Mortality Database project) confirmed that age-specific data on deaths for Latvia and Lithuania does not show any signs of age heaping. The same study on Lithuania found some age heaping at ages "60", "70", "80", "90" and "99" during the first half of the 1960s (Jasilionis and Stankūnienė, 2012).

Nevertheless, some doubt still exists about the completeness of death registration, at least at certain ages. To appreciate such possible deficiency, it is usually referred to model life tables. As already shown for Ukraine (Meslé and Vallin, 2003) or for Russia (Meslé *et al.,* 1996), the specificity of adult mortality in most Soviet republics, including Baltic countries, makes such an approach difficult or even desperate. Nevertheless we cannot ignore that good authors questioned the completeness of death statistics at both the youngest and oldest ages (Anderson and Silver, 1986, 1989a, 1989b, 1990; Blum and Monnier, 1989; Velkoff and Miller, 1995). Let us examine the most sensitive cases of infant and old age mortality.

a) Infant mortality

Several problems have been reported about Soviet infant mortality (Anderson and Silver, 1986; Blum and Monnier, 1989; Velkoff and Miller, 1995). What can be said about Baltic countries?

The boundery between ages 0 and 1

A first question sometimes asked (Blum and Monnier, 1989; Ksenofontova, 1994) concerns errors of the classification of deaths between ages 0 and 1. If a several months old baby dies before his birth is registered, a natural tendency is to declare him/her as a one-year old child, even if he/she is actually less. Arguably, the problem, a classical one in developing countries, has been mainly the case of the Central Asia and Caucasus countries, or even in some parts of Russia. Indeed it is closely linked to the situations where births themselves are not completely registered, opening the door for age misreporting. According to the quality of birth registration in Baltic countries since the 1920s, the question seems not relevant for these countries. The only not registered births were likely those dead in the very first days of life, who are also those whose deaths were not registered as it will be seen in the next paragraphs. All

The 1974 change

A second problem comes from the change[3] that, according to Barbara Anderson and Brian Silver (1986), occurred in the registration system in 1974. According to these authors, it would have caused an increase in the number of registered infant deaths. Actually, a jump was observed in statistical series of several republics of the former USSR around 1974, but not systematically. The question was already mentioned by V. Petukhov and O. Nicolaev (1981, quoted in an unpublished document by Carlson and Bernstein, cited by Velkoff and Miller, 1995). But, for them, infant mortality increase, that lasted during several years, would

[3] In 1971, the Soviet Goskomstat decided to enumerate perinatal deaths and in 1974 a perinatal death certificate was issued.

have been at least partially caused by a change in health strategy adopted in the second half of the 1960s, consisting to cancel various activities supposed to be insufficiently profitable (like midwifes and paediatric beds in rural care units) in villages peopled by less than 700 inhabitants (90 % of the 1970 rural Soviet population). We showed that in Ukraine (Meslé and Vallin, 2003) and in Russia (Meslé *et al.,* 1996), both changes in the registration system and in the health strategy caused their own part of the mortality increase and we tried to measure as carefully as possible the improvement in the registration of infant deaths resulting from the former. What about Baltic countries?

The increase in registered infant mortality lasted several years in Lithuania (from 1972 to 1975) and Latvia (from 1973 to 1975), without any particular rupture in 1974, while in Estonia, the whole phenomenon takes place in 1974. That means that in the first two countries not all the observed infant mortality increase is caused by a registration change, as it is probably the case in Estonia. That hypothesis is partly confirmed when looking more specifically at neonatal and post-neonatal mortality (figure 4). While a clear jump is observed in the three cases for neonatal mortality, it is quite different for post-neonatal mortality : no increase was observed in Estonia nor in Lithuania and only a rather moderate part of the 1973-1975 increase observed in Latvia occurred in 1974.

The confirmation is even more obvious when looking at infant mortality by cause of death (figure 5). In the three countries, only mortality by congenital malformations and perinatal deaths is marked by a jump quite specific to the year 1974, while for all other major causes (respiratory diseases, infectious diseases, others) the year 1974 shows no peculiarity. It is rather clear that 1974 changes in the registration rules had an impact on the number of registered infant deaths but also that only the year 1974 is concerned by the artificial increase in the observed infant mortality rate, and that the increase observed during previous or following years in Latvia and Lithuania is real and cannot be attributed to the artefact.

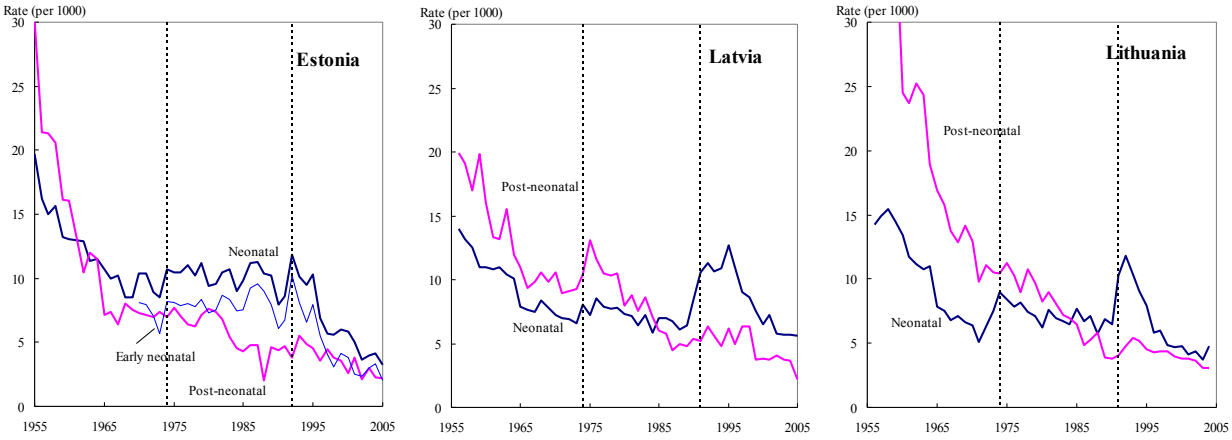

Figure 4. Trends in neonatal and post-neonatal mortality in Estonia, Latvia and Lithuania from 1955 to 2005

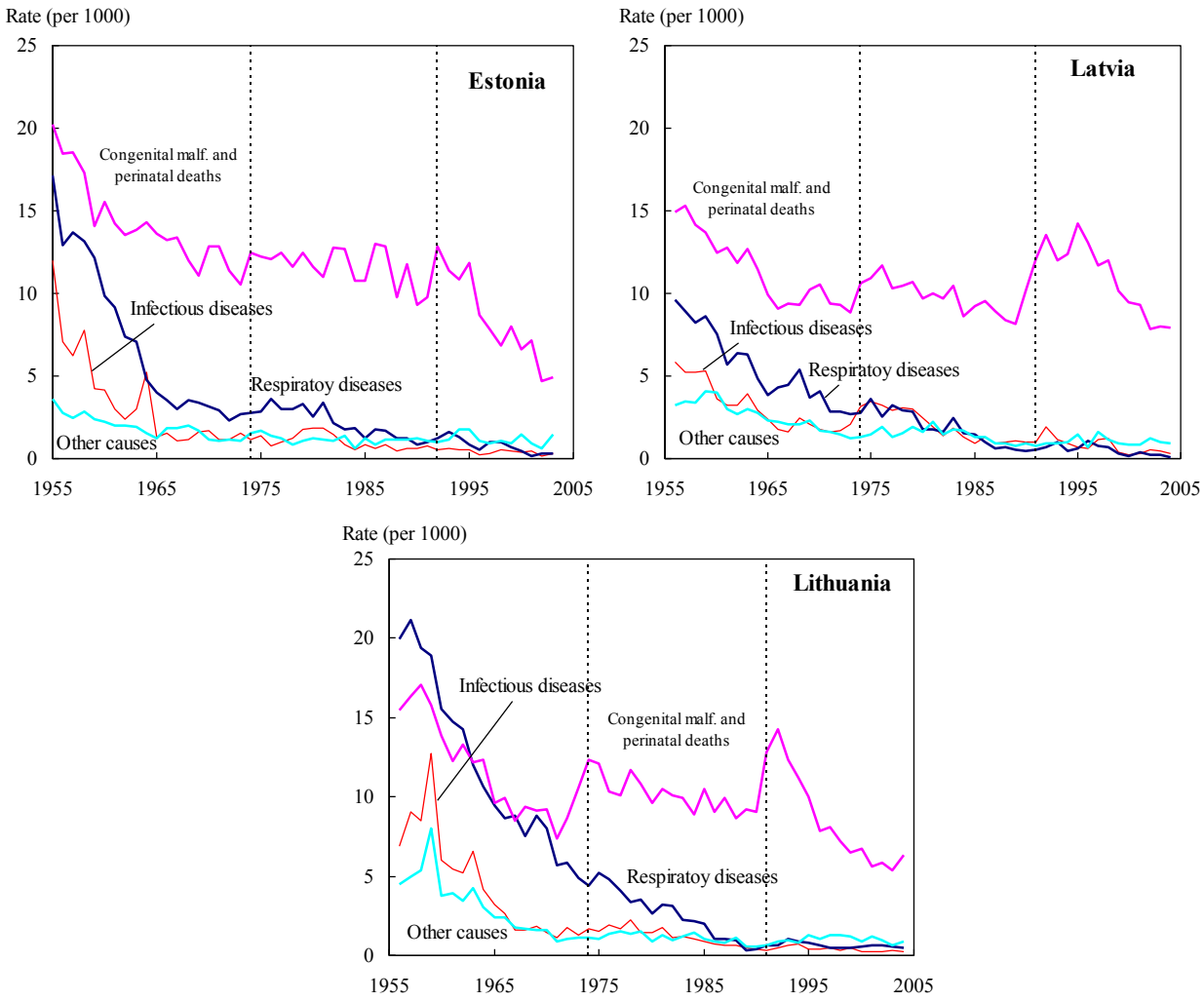

Figure 5. Trends in main causes of infant mortality in Estonia, Latvia and Lithuania from 1955 to 2005

Consequently, neonatal mortality rates were corrected for all the years prior to 1974 on the basis of the proportion that allows to cancel the abnormal 1974 jump observed in neonatal mortality. The correction was made independently for males and females, with significantly different correction coefficients. Of course, all additional deaths were attributed to the group of causes “congenital malformations and perinatal deaths”. The impact of that first correction on the total infant mortality rate is shown at figure 6, under the label “Corr 1”. In Estonia, the 1974 jump disappears totally, while a not negligible part of it remains in Latvia and Lithuania, as expected. It means that Estonia is probably one of the rare regions of the former USSR that was rather free from any real increase in infant mortality in the early 1970s, while Latvia and Lithuania were affected more likely.

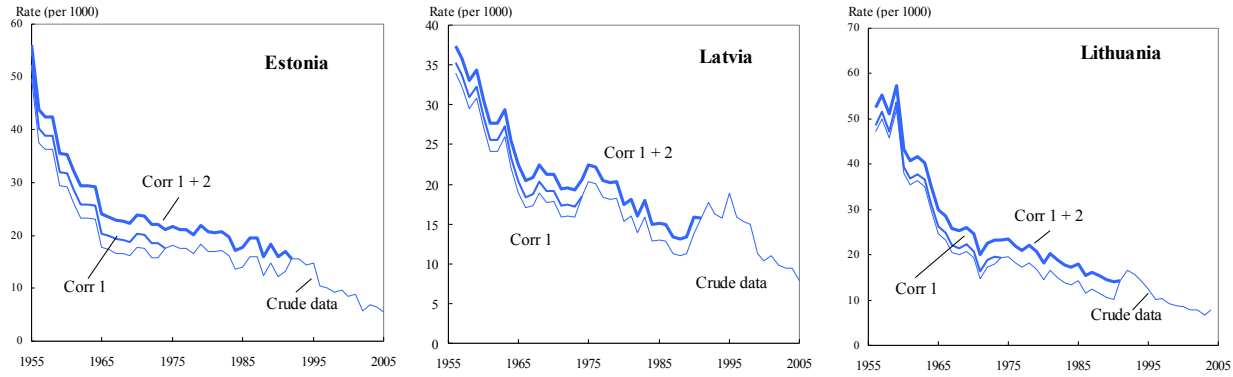

Figure 6. Trends (1955-2005) in infant mortality rate according to crude data and after two successive corrections ***up-dating to be discussed (before 1955 and after 2004***

"Corr 1" stands for correction suggested by the change of 1974

"Corr 1 + 2" stands for correction suggested by the adoption of WHO rules in 1991/1992

The adoption of WHO rules (1991-1992)

The third problem concerns even more explicitly neonatal deaths since it comes from the adoption by Baltic countries of the WHO definition of the live birth. Indeed the Soviet rule, in use in use until 1991 in Latvia and Lithuania and until 1992 in Estonia, was more restrictive than the WHO rule: babies born after less than 28 weeks of gestation or with a weight of less than 1000 gr or a size of less than 35 cm, were never reported as birth nor as infant death but only as stillbirths, if they died during their first week of life, while according to the WHO rule any newborn must be registered as birth (and eventually as infant death) if he/she presented any sign of life for a while. The adoption of WHO rules by the three Baltic countries resulted in an immediate increase in the number of registered infant deaths as it can be seen on Figure 7.

Once again, a certain confusion can be made here with a real increase during the years around the year of the change, since the latter is very close to the socio-economic crisis which followed the sweep to market economy. Fortunately, once again, trends in both neonatal mortality and/or infant mortality by "congenital malformations and perinatal deaths" (figure 5) and/or neonatal mortality (figure 4) appear to be quite specifically affected and open the door for adequate correction. In both cases a particularly important jump is observed the year of change (1992 in Estonia, 1991 in Latvia and Lithuania) and this jump is very specific to neonatal mortality with regard to post-neonatal mortality (figure 4) and to mortality by "congenital malformations and perinatal deaths" compared to all other causes (figure 5). As for the 1974 change, for each sex separately, numbers of neonatal deaths of the years 1955 to 1990 (Latvia, Lithuania) or 1991 (Estonia) were increased according to the proportion necessary to cancel the artificial jump observed in 1991/92 and all the additional deaths were attributed to the group of causes "congenital malformations and perinatal deaths".

Figure 6 shows the results for infant mortality rates as "corr 1 + 2", since it was applied on the series already corrected for the 1974 change. As for the first one, the second correction cancels the whole apparent increase of infant mortality in the early 1990s in Estonia, while some increase remains in Latvia and Lithuania. It means that Estonian infant mortality was probably not affected by the sweep to market economy while Latvian and Lithuanian ones suffered in some extent.

Though corrections were made on the basis of the abnormal jumps observed for neonatal mortality, they also correct almost perfectly the trends in infant mortality rate by "congenital malformations and perinatal deaths", as shown at figure 7. That mortality declines quite steadily in Estonia for the whole 50-year period studied. In Lithuania and even more in Latvia, some increase remains obvious in the early 1990s, that can reflect the impact of the sweep to market economy. In Lithuania, also some increase remains in the early 1970s, the period where a deterioration of infant mortality was observed for all the USSR. However, no specific jump remains neither for 1974 nor for 1991/92.

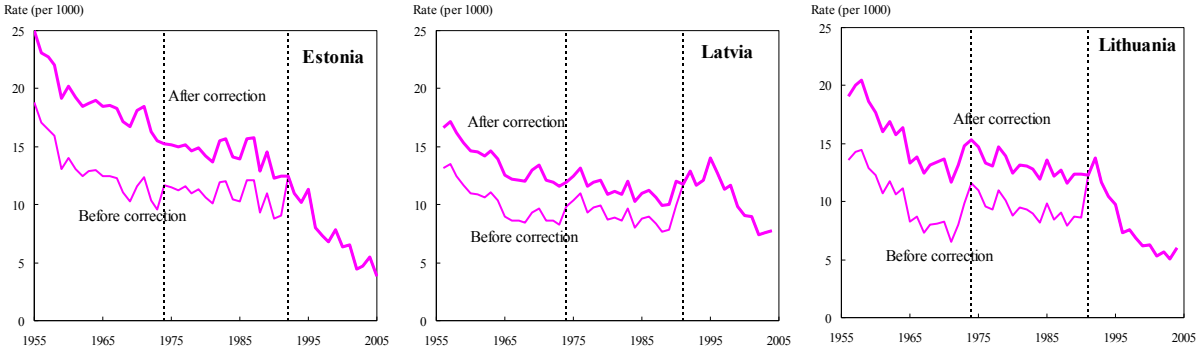

Figure 7. Trends in infant mortality rate by congenital malformations and perinatal deaths, before and after correction, in Estonia, Latvia and Lithuania, from 1955 to 2005

If the two corrections made here change significantly the trends in total infant mortality rates, they do not result in important changes in life expectancy at birth. The latter is only diminished by a maximum of 5 tenth of year in Estonia in 1970 for males (Table 4).

Table 4. Impact of infant mortality corrections on life expectancy at birth

Year	Estonia				Latvia				Lithuania			
	Males		Females		Males		Females		Males		Females	
	bc	ac	bc	ac	bc	ac	bc	ac	bc	ac	bc	ac
1950	53.6	53.2	63.6	63.3	-	-	-	-	-	-	-	-
1951	55.1	54.7	64.7	64.4	-	-	-	-	-	-	-	-
1952	56.4	56.0	65.8	65.5	60.8	60.6	68.1	67.9	-	-	-	-
1953	58.8	58.4	67.8	67.5	61.5	61.2	68.8	68.6	59.0	58.7	66.1	65.9
1954	60.8	60.3	68.6	68.3	62.4	62.1	69.8	69.6	61.0	60.6	67.4	67.1
1955	61.3	60.9	69.2	68.9	63.7	63.5	70.8	70.6	62.2	61.8	67.7	67.4
1956	62.6	62.2	70.7	70.3	65.0	64.8	72.1	71.9	64.7	64.3	70.8	70.5
1960	64.7	64.2	73.0	72.7	66.3	66.0	73.5	73.3	67.0	66.6	73.0	72.8
1965	66.3	65.8	74.2	73.9	66.8	66.5	74.9	74.7	68.2	67.8	74.8	74.5
1970	65.5	65.0	74.6	74.2	65.7	65.4	74.2	74.0	66.8	66.4	75.0	74.8
1975	64.9	64.6	74.8	74.5	63.9	63.8	74.2	74.0	66.4	66.1	75.6	75.5
1980	64.2	64.0	74.3	74.0	63.7	63.6	74.1	74.0	65.6	65.3	75.6	75.5
1985	64.7	64.4	74.5	74.2	64.8	64.6	74.0	73.9	65.8	65.4	75.5	75.2
1990	64.7	64.4	74.9	74.7	64.2	64.1	74.6	74.5	66.4	66.1	76.2	75.9
1991	64.4	64.1	75.0	74.7	63.7	63.7	74.6	74.6	65.1	65.1	75.8	75.8
1992	63.4	63.4	74.8	74.8	62.6	62.6	74.4	74.4	64.8	64.8	75.9	75.9

b) Old age mortality

For the USSR, assuming that mortality rates based on vital statistics were underestimated, Barbara Anderson and Brian Silver (1989a and b, 1990) proposed to correct the rate after age 60 by using model life tables corresponding to observed mortality at adult ages. Yet, all the recent studies demonstrate that Soviet adult mortality, especially for males, is unexpectedly high, and that abnormal level of adult mortality is the main specific health problem of the populations under Soviet or communist regimes. It seems to us that is a strong reason to avoid to use adult mortality levels to choose any model life table to adjust mortality at old ages. Such a correction would necessary result in an overestimation of old age mortality. Consequently, when dealing with Russian (Meslé *et al.*, 2003) or Ukrainian (Meslé and Vallin, 2003) life table series, we used infant mortality rates (after corrections) as the entry to select model life tables required to adjust old age mortality rates. More precisely, in each life table, observed life expectancy at age 70 was replaced by life expectancy at age 70 of the model life table corresponding to the corrected infant mortality rate[4], and a new series of mortality rates under age 70 was derived from the estimated life expectancy at age 70. Of course the correction was limited to the cases where observed life expectancy at 70 was higher than the estimated one, since only underestimation of mortality is supposed to be a problem. Consequently, no correction at all of old ages mortality rates were required for the years after 1965, and the corrections done for the most ancient years were smaller and smaller when approaching the early 1960s.

Are such corrections needed for Baltic countries? This is all the more uncertain. Indeed, to try to appreciate the situation as objectively as possible, we started to apply the same treatment to Baltic data as for Russia and Ukraine, and the conclusion was quite clear for Estonia and Latvia, since no estimated value of life expectancy at age 70 was ever significantly lower than the observed ones (figure 8). For these two countries, no justification appears to make any correction. The case of Lithuania is somewhat different. Values derived from model life tables are much lower than observed values for males for the years 1955-1970 about, and the gap is even greater for females, for a longer period. However, if the estimated values were used, it would result in trends quite contradictory with what is known about mortality in that region for that years: a so continuous and steady increase in life expectancy is quite unrealistic. And, even if the use of estimated values was limited to the years for which estimated values are lower than observed ones, the results would be the same for females and not much better for males. Consequently, we prefer to avoid to make any correction of old age mortality of the three Baltic countries. Would it be a wrong decision, as it can be clearly understood from corrections made for Russia (Meslé *et al.*, 2003) and Ukraine (Meslé and Vallin, 2003) that it would not have huge consequences on the following analyses, since the weight of mortality above age 70 on total mortality is very light as compared to adult or infant mortality. In Ukraine, for example, where the need for correction was much more obvious, the greatest correction made on life expectancy at 70 impacted life expectancy at birth by only half a year.

[4] Coale and Demeny (1983) model life tables were used. Indeed, these tables are based on selected levels of mortality and no infant mortality rate of any model corresponds to a specific observed rate but each observed rate can be situated within an interval of model-life-table rates and estimated life expectancies at age 70 where obtained by interpolating values given by model life tables corresponding to the infant-mortality-rate interval. Also, different families of model life tables giving different results, the mean of the estimations given by the three most relevant models ("West", "North", and "East") was chosen.

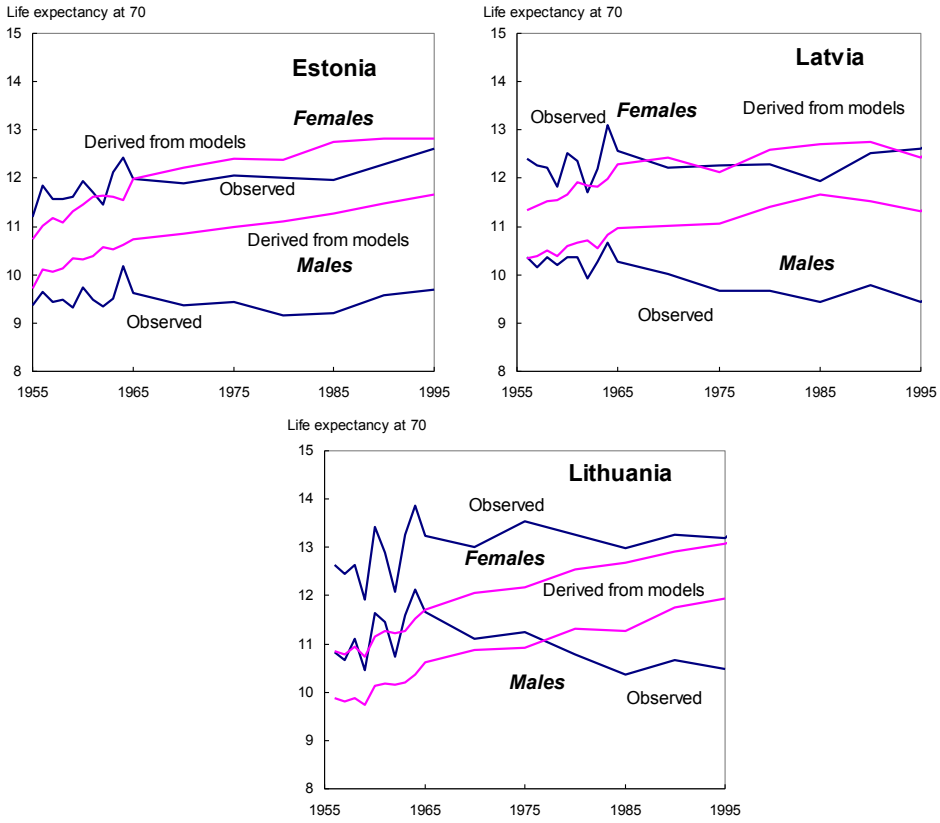

Figure 8. Trends in life expectancy at age 70 according to observed data and derived from the estimated levels of infant mortality rates through Coale and Demeny model life tables

5. A complete set of annual life tables from the early 1950s to now

The new set of life tables covers the periods of 1922-1939 and 1950-2013? for Estonia, 1925-1939 and 1952-2013? for Latvia, and 1953-2013? for Lithuania. The calculations were based on central mortality rates (m_x) by sex and five-year age groups, which were also subjected to the re-calculation procedures, based on age-specific deaths and population estimates discussed above. Figure 9 compares new life expectancy trends derived from these life tables to formerly available estimates.

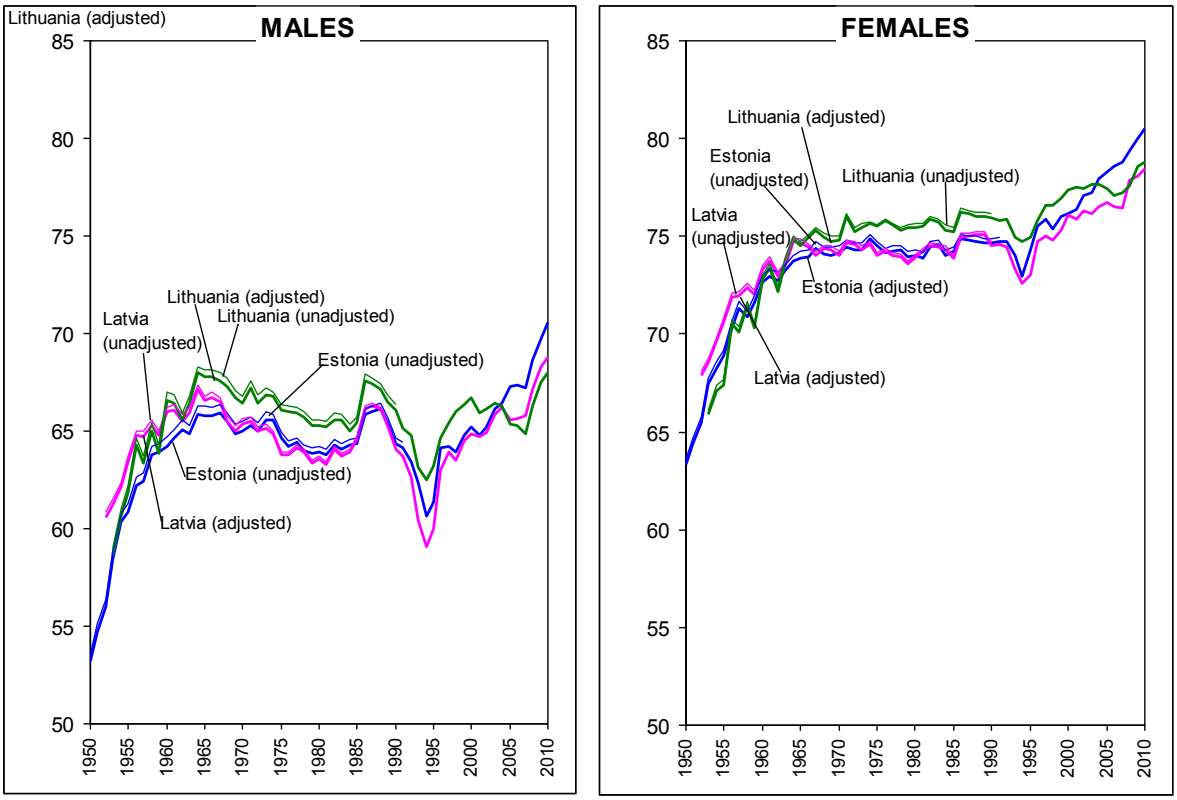

Figure 9. Unadjusted (based on official data on deaths and population counts) and adjusted (for definition of infant deaths) male and female life expectancy at birth in Estonia, Latvia, and Lithuania, 1950-2010.

Source: 1) until 1959 (1960 for Latvia): unadjusted estimates based on official numbers of deaths and estimated population by Kalev Katus; adjusted estimates calculated using official infant deaths, live births and age-specific mortality estimates above the age 0 by Kalev Katus; 2) from 1959 (from 1960 for Latvia) onwards: unadjusted and adjusted estimates are based on official deaths and population exposures based on official population counts from the Human Mortality Database. Adjustement estimates are based on adjustment factors by France Meslé and Jacques Vallin.

IV. A century life expectancy trends (1918-2014)

We can now link reconstructed annual series of life expectancy at birth for almost a century since WW-1 for the three Baltic countries (at the exception of the years dramatically disrupted by World War II and the integration to the Soviet Union), after taking in account the corrections made to face various causes of under-registration of deaths. Unfortunately, pre-war series exist for Estonia (1923-1938) and Latvia (1924-1938) only, since, for Lithuania, only one life table is available, that of the year 1925. Post-war series start in 1950 for Estonia, 1952 for Latvia and 1953 for Lithuania. Figure 10 provides an overview of Baltic trends as compared to those of France and Russia, for males and females respectively.

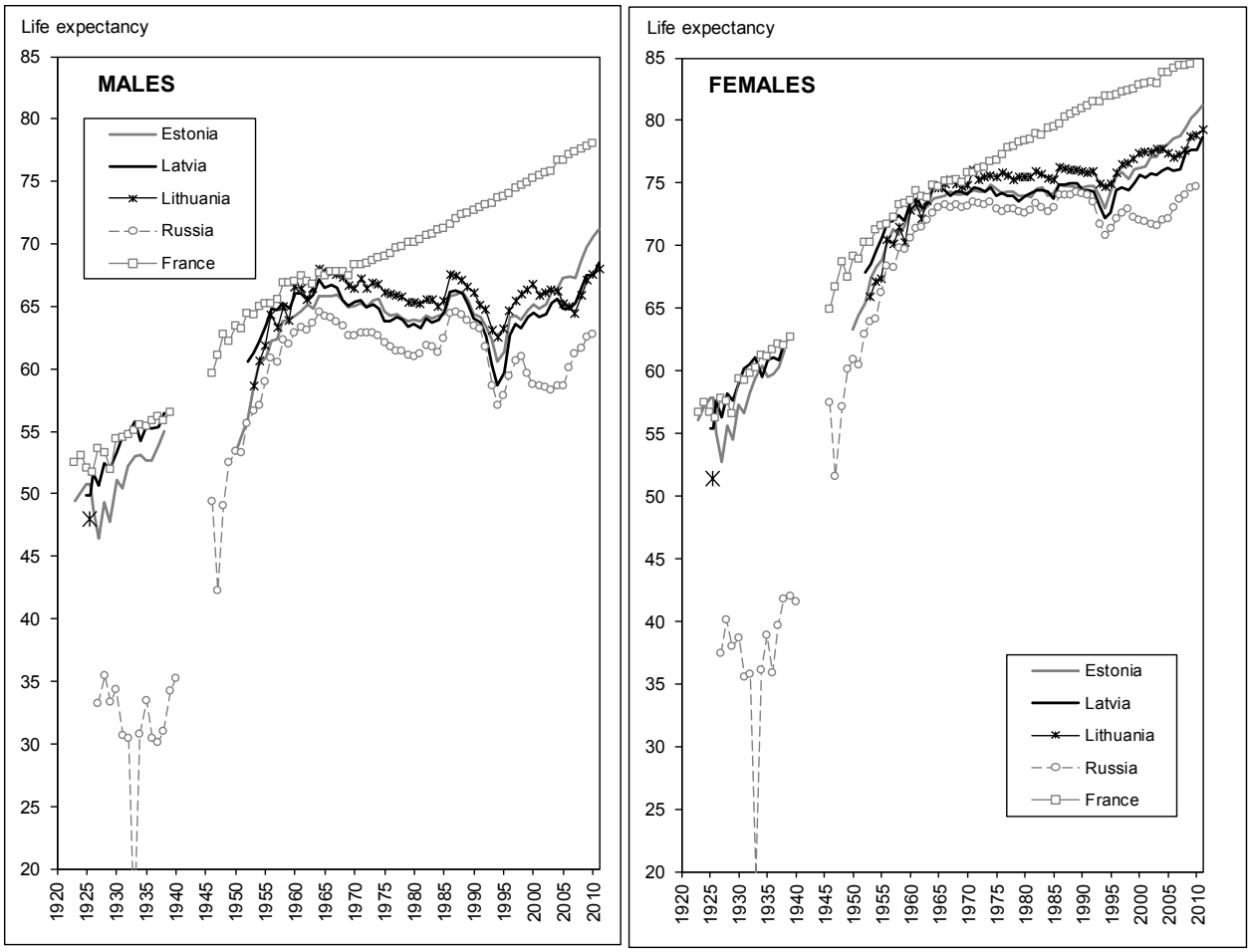

Figure 10. Annual trends in life expectancy at birth in Estonia, Latvia, Lithuania, Russia, and France, 1925-2011.

Sources: authors' reconstruction for the three Baltic countries, Meslé and Vallin 2001 updated for France, Meslé et al., 2003 updated for Russia.

Apart from the war and immediate post-war periods here omitted, this century of life expectancy changes is clearly divided into five contrasted periods.

1. Rapid progress in the 20s and 30s

From the early 1920s to the late 1930s, Baltic life expectancies progressed rather fast, until approaching the French trends closely, while the Russian ones fluctuate sharply without making any progress in the total. More precisely, life expectancy climbed up more rapidly in Estonia and Latvia than in France, so much that Latvia slightly overpassed France in 1938 (56.5 years versus 55.9 for males and 62.2 versus 62.0 for females), a year when Russian life expectancy was stagnating at 34 years for males and 41.8 for females only. It actually seems that the first independence period was beneficial to survival improvement of Estonia and Latvia. The Lithuanian case is less obvious, but, indirectly trends in infant mortality indicate that progress in life expectancy has should have been the same as in the other two countries.

2. The shock of WW-2 and Soviet occupation

The terrible shock of WW2 first aggravated by the forced incorporation into the Soviet Union took off a large part of Baltic progresses. This is not completely revealed here because of the lack of information between 1939 and 1949. Nevertheless, in Estonia, the only Baltic state for

which a life table is available for 1950, male life expectancy fell down at the level reached by Russia meanwhile: 53 years, 10 years less than in France the same year and 4 years less than the Estonian level of 1938!

3. The great success of the 50s and early 60s

From there, however, the Soviet regime appears to have been much more favourable to Baltic health progresses. This is related to the fact that communist system proved to be very efficient at that stage in fighting against infectious diseases. And improvement were even faster in Baltic republics, better equipped and organized in the field of public health, than in Russia. Once again, in the mid 1960s, Baltic life expectancies approached the French ones very closely. Male Lithuanian life expectancy (67.8 years) even overpassed the French one (67.4), more than 3 years higher than the Russian one. And globally, the main result at that time is the spectacular convergence of all these 5 countries, reducing the gap between them at its historical minimum (3.4 years for males between Russia and Lithuania in 1964; 2.0 years for females between Russia and France in 1965).

4. The Soviet Health Crisis

On the contrary, the mid-1960s to the mid 1990s, Russian and Baltic trends reversed entering either a deteriorating phase for males everywhere or at least a stagnating one for Lithuanian females. In 1994, the worst moment of the severe socio-economic crisis that followed the split of the USSR and the brutal sweep to market economy, the gap between Russia and France was 11.1 years for females (70.8 years versus 81.9) and even 16.5 years for males (57.1 years versus 73.6). And, at that time, Baltic life expectancies were much closer to that of Russia than that of France: 60.6 in Estonia, 58.7 in Latvia, and 62.5 in Lithuania for males; 72.9, 72.2, and 74.7 for females, respectively. As everywhere in the Soviet Union, Baltic Republics fell into the long lasting heath crisis that resulted from the fact that the Communist system was unable to enter the cardiovascular revolution that allowed Western counties to maintain rapid progress in life expectancy, as well as to implement sustainable policies against man made diseases like alcoholism, suicide or work accidents and violence. In the same time, life expectancy trends were also impacted by the large fluctuation caused by the Gorbachev anti-alcohol campaign that resulted in a life expectancy jump in the mid-1980s followed by a fall when anti-alcohol measures vanished and an acceleration of the fall when the communist regime collapsed in 1991 and population suffered from the dramatic socio-economic crisis of 1993-1994. Fluctuation was much more important for males than for females who were much less impacted by alcohol consumption changes. However, such fluctuations were slightly less acute in Baltic republics than in Russia, with important differences between them. Lithuania was the less strongly affected and Latvia the most.

5. The benefits from the second independence and integration to the EU

At the turn of the century, after a decade of new independent status and major economics reforms and finally their integration into the European Union, Baltic countries entered a new era where life expectancy continues to progress beyond the recuperation of their early 1990s level. As soon as at the end of the 1990s, Lithuania took the lead in that new direction, but not for long since Estonia in 2003 and then Latvia in 2007 caught it up. In the late 2000s, all the three countries were progressing faster than France with which they could fill the gap in a near future. In the total, from 1994 to 2011, male life expectancy increased by 10.5 years in Estonia, 9.8 years in Latvia and 5.5 in Lithuania. Progress was also decisive in female life

expectancy although more modest: 8.3 years in Estonia, 6.5 in Latvia and 5.5 in Lithuania. As a result, from 2007 to 2011, when all Baltic countries are progressing very fast, the gap between each Baltic country and France reduced by 2 years for females and by 3 years for males. Meanwhile, Russia started first to lose years of life expectancy until 2005. It resumed progressing only after 2006 and the sustainability of such progress is still questionable (Shkolnikov *et al.*, 2013; Grigoriev *et al.*, forthcoming). In 2010, the gap between Russian and French life expectancy was still of 15.3 years for males (instead of 7.4 in Estonia, 10.6 in Latvia, and 10.5 in Lithuania) and 10 years for females (instead of 4.0, 7.1, and 5.8).

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