

ABOUT MORTALITY DATA FOR LITHUANIA

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Last Revised: 06 October 2020

GENERAL

The earliest reliable historical data on the population of Lithuania are available from the first population census of the Grand Duchy of Lithuania, which took place in 1790 (Jasas & Truska, 1979; Stankuniene, 1989). At the time of the census, so called “Handling commissions” were established, which could be considered the first official institutions responsible for collecting statistical data in Lithuania (Jasas & Truska, 1979). Registration of vital events was then very fragmentary, as the parish registration system had never been established at the state level.

After the third partition of the Polish-Lithuanian Commonwealth (in 1795), Lithuania became part of the Russian Empire and was divided into three governor’s districts (“gubernias”). Following the Order on Statistics passed in 1863, statistical committees were established at the *gubernia* level in the second half of the 19th century (Gozulov, 1972). The Statistical Committee of the Russian Empire started publishing data on the population and vital events at the *gubernia* level (including the three Lithuanian governor’s districts). The quality of registration of vital events was relatively poor at the time as it was usually based only on the Church records (Gozulov, 1972). Lithuania took part in the first population census of the Russian Empire in 1897. Data on population by age and sex, ethnicity, religion, occupation and other characteristics were published at the *gubernia* level following the census (Isupov, 1994; Gozulov, 1972).

Lithuania regained its independence from Russia in 1918. Several important territorial changes took place during the inter-war period (1918-1940). First, as a consequence of the war with Poland (1919-1920), a significant part of the territory where the historical capital, Vilnius, is located was lost for the period 1920-1939. It was a significant loss in terms of population: according to the data for 1931, about 18% of the total Lithuanian population resided in that region (Gaucas, 1978). Second, the Klaipeda region was regained by Lithuania in 1925, adding 145 thousand people to the total national population of 2.03 million (not including the Vilnius region) (Central Statistical Bureau, 1926, 1937). However, after Hitler’s ultimatum, this region was lost again when Germany took control of it in 1939. Part of the Vilnius region including the capital city was returned to Lithuania in 1939 (shortly before the country lost its independence in 1940).

During the inter-war period there were many attempts to create and maintain a fully functioning registration system of vital events in Lithuania and to systemize the statistical data according to international standards. A General Department of Statistics was established in 1919, which was reorganized into the Central Statistical Bureau in 1921. In 1923, a Population Census took place in Lithuania (except in the Vilnius region, which was then under the control of Poland, and the Klaipeda region, where the enumeration of population took place in 1925). The first issue of the Lithuanian Statistical Yearbook was published in 1922 and the yearbook has been published at least semi-annually since 1928. The published data on vital events were relatively detailed, including classification by age, sex, and often by other social characteristics (ethnicity, education, religion, urban/rural residence, county, etc.).

However, the data on population are not reliable since the population estimates were based only on vital events (migration was not considered at all). Thus, except for the 1923 census (the only census taken in Lithuania during the period of its independence, 1918-1940), reliable data on population are missing for the inter-war period.

Lithuania was incorporated into the Soviet Union as the Lithuanian Soviet Socialist Republic (SSR) in 1940, and the Central Statistical Bureau became part of the Central Statistical Office of the Union of Soviet Socialist Republics (USSR). The first data on vital events covering the entire territory of Lithuania became available in 1953. However, the completeness of the data is unclear because a guerilla war against the Soviet army lasted until the mid-1950s in some rural areas (Kiaupa et al., 2000). At 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, especially concerning registration of deaths (Stukonis, 1958). The statistical data on vital events were kept in special "secret" files ("Report on the Natural Increase and Migration in the Lithuanian SSR"), which were compiled on an annual basis. Although the Statistical Office of the Lithuanian SSR has published population yearbooks since 1966, the data were made available only at the aggregate level and they were restricted to "internal use". Four population censuses (1959, 1970, 1979 and 1989) took place in Lithuania during the period of Soviet rule (1940-1989). Continuous population data series based on census data and inter-censal estimates became available for Lithuania starting in 1959. However, detailed data on population (e.g., by single years of age) were never been published during the Soviet period (except for census years). They are available only from unpublished manuscripts or tables.

After restoration of independence in 1990, the main body responsible for population statistics in Lithuania was the Department of Statistics of the Government of the Republic of Lithuania (Statistics Lithuania). One of the first priorities became to improve the quality and comparability of national demographic data by following international standards, which were often ignored during the Soviet period. For example, the World Health Organization (WHO) definition of live birth was adopted in 1991 and the International Classification of Diseases replaced the Soviet classification in 1992. More detailed data on vital events have become available to scientists and the public from publications such as the Demographic Yearbooks of Lithuania or other more specialized statistical abstracts published annually by Statistics Lithuania. Data on population by single years of age and by urban/rural residence have been published in the special statistical abstracts ("Lithuanian population by age groups"). Since the beginning of the 2000s, very detailed demographic data by various characteristics are available in the online database maintained by Statistics Lithuania.

Taking into account that there is no continuous and reliable data series on the Lithuanian population and vital events prior to 1959, only data for the period 1959-2019 are included in the Human Mortality Database (HMD).

Source of data

Data on deaths for the period of the Soviet rule (1959-1989) have been collected at the State Archive. Statistics Lithuania provided unpublished manuscripts with population estimates for the 1960s, 1970s and 1980s. Newly recalculated population estimates for the period from 1989 to 2001 have also been obtained from Statistics Lithuania (in computerized datafiles). Data from the 1970, 1979 and 1989 censuses come from the materials published by the Statistical Office of the Lithuanian SSR or the Central Statistical Office of the USSR. Relevant data on deaths and population for the 1990s come from the publications, unpublished manuscripts or computer files provided by Statistics Lithuania. Birth data have been published in the statistical abstracts of the "Natural increase and migration of the population of the Lithuanian SSR" and the Demographic Yearbooks of Lithuania for the most recent years. All the data used for the HMD were collected and prepared by V.Stankuniene and D.Jasilionis. Most of the data for the period 2001 onwards have been obtained via the online databases maintained by Statistics Lithuania (<http://www.stat.gov.lt>) and the Institute of Hygiene (<http://www.hi.lt>).

TERRITORIAL COVERAGE

There were no territorial changes in Lithuania during the period 1959-2019. Numerous such changes took place prior 1945, as discussed above (see 'General' section).

DEATH COUNT DATA

Coverage and completeness

Death registration has covered the entire territory of Lithuania since the end of the 1950s. The registration system improved by the late 1950s following special orders from the central and local Soviet statistical and health authorities (Stukonis, 1958).

In general, the vital registration system has been highly centralized in Lithuania. Since the beginning of the 1990s, several new laws and regulations have been passed regarding the registration of deaths, yet the main principles remain largely similar to those used during the period of Soviet rule.

The following procedure for the registration of deaths has been in force in Lithuania. First, a medical death certificate is issued by a medical or judicial institution. Afterwards the certificate must be forwarded (usually by relatives) to the local Civil Registry office. The latter institution issues a death certificate (on the basis of the medical death certificate) and enters the information into the Central Database of the Population Register of Lithuania. Every 24 hours, death record information (together with medical death certificate data on causes of death) is downloaded from this database by Statistics Lithuania via an on-line access method.

Specific details

There are two major concerns related to the reliability of the Lithuanian death statistics during the period of Soviet rule. The first arises from the use of a more restrictive

definition of infant death than in the international standard. Until the end of 1990, the definition of an infant death differed from the one recommended by the WHO. Early neonatal deaths (i.e., those occurring within the first 7 days of life) were not registered if the birth weight was less than 1000 grams, the period of gestation was shorter than 28 weeks or the body length was shorter than 35 centimeters. Due to this restricted definition, a significant proportion of early neonatal (and total infant) deaths was underreported. Since 1991, the WHO definition of an infant death has been used to register infant deaths. According to some estimates, based on the experience of the three Baltic States (Lithuania, Latvia and Estonia), the shift in the registration procedures has resulted in a 23% increase, on average, in infant mortality statistics (Anderson & Silver, 1997).

A second concern is related to the quality of mortality statistics at older ages, especially before the end of the 1960s. Problems of age heaping in the former USSR have been documented and discussed for Russia and other countries of the former USSR (Anderson & Silver, 1997; Shkolnikov, Meslé & Vallin, 1997; see also Zakharov's notes in the HMD *Background and Documentation* files for Russia). To our knowledge, no scientific study has been conducted to check the quality of the Lithuanian old-age mortality data. Preliminary results indicate that there may be some age heaping at ages "60", "70", "80", "90" and "99" during the first half of the 1960s. For more details, see the section "Data quality issues" below.

POPULATION COUNT DATA

Coverage and completeness

Four population censuses (1959, 1970, 1979 and 1989) took place in Lithuania during the period of Soviet rule (1940-1989). Two censuses (2001 and 2011) have been conducted since the restoration of Lithuania's independence in 1990. Official population estimates as of January 1st, based on census data and vital statistics on deaths, births and migration have been produced by the Statistical Office of the Lithuanian SSR and the Central Statistical Office of the USSR for the periods 1960-1969, 1971-1979, and 1980-1988. Newly recalculated inter-censal population estimates for the two inter-censal periods from 1989 to 2000 and from 2001 to 2011 have been provided as Excel files by Statistics Lithuania or downloaded from the online database maintained by the national statistics office.

The official January 1st estimates for the census years 1959 and 1970 are not available to us.

All the population data for the period 1970-2019 correspond to the "permanently resident" population.

Specific details

Population estimates for the 1960s are based on data from the census of 1959 and from the number of births, deaths, and migration for the years 1959-1969. Both the census and population estimates correspond to the “actually present population” (“Nalichnoe naselenye”). The estimates have never been published except by 5 year age groups for the period 1959-1965. However, the Statistical Office appears to have used smoothing procedures in order “to improve” data after the age of 20. Furthermore, similar adjustments have been carried out for the official population estimates of the 1970s and 1980s. Unfortunately, the procedures implemented by the Statistical Office of the Lithuanian SSR in performing such calculations (for more details see below the section on “Data quality issues”) are not documented. Therefore, for further calculations of the mortality surface we decided not to use the official estimates for the period 1960-1988.

Thus, the official population estimates have been used for the period since 1989, while for earlier years (1960-1988) we calculated new inter-censal estimates following the HMD methodology (see the Methods Protocole).

New inter-censal population estimates for the periods 1989-2001 and 2001-2011 supersede previously published post-censal population estimates (1990-2001 and 2001-2011). The latter population estimates do not account for the unregistered emigration, which was substantial during the 1990s and 2000s. For example, earlier published post-censal estimate for the total population on January 1st, 2001 (based on the 1989 census) were about 6% higher than the new inter-censal estimates based on the 2001 census (3,692,645 vs. 3,486,998, respectively).

Official inter-censal population estimates for 2001-2011 are provided by single year of age up to age 84 only. Normally, the HMD uses the official population estimates for cohorts that are younger than age 90 at the end of the observation period. The HMD standard method for deriving population estimates for almost-extinct cohorts who are aged 90+ years at the end of the observation period is the survivor ratio method. Thus, we decided to apply this same method in Lithuania for all ages 85 and older in 2001-2019.

Emigration statistics substantially improved in Lithuania following the administrative reform implemented in 2009-2010. This reform introduced additional taxes and fines to persons residing abroad and keeping their permanent residence status in Lithuania (e.g., not declaring emigration). Consequently, substantial improvement in reporting departures to the authorities have been observed (Jasilioniene, Stankuniene, Jasilionis, 2014).

The most recent population estimates from the Population Register also improved as the Population Register had also been harmonized with the 2011 census data. Additionally, Statistics Lithuania performs regular checks based on linkages between Population Register data and data from the other registers in order to identify residence status more precisely (e.g., to identify residence status of a baby born abroad but registered in Lithuania) (Jasilioniene, Stankuniene, Jasilionis, 2014).

BIRTH COUNT DATA

Coverage and completeness

The registration of births has also been highly centralized (as in the case of deaths). The following procedure has been in force in recent years. First, for each newborn a birth document is issued by a medical institution. Within three months this document must be forwarded to the local Civil Registry office, where the birth is registered and a birth certificate is issued for the child (Statistics Lithuania, 2000). Afterwards, copies of the documents are sent to the local branch of Statistics Lithuania. The latter institution sends copies of the documents to the central office of Statistics Lithuania in Vilnius, where this information is computerized and added to the special database (Statistics Lithuania, 2000).

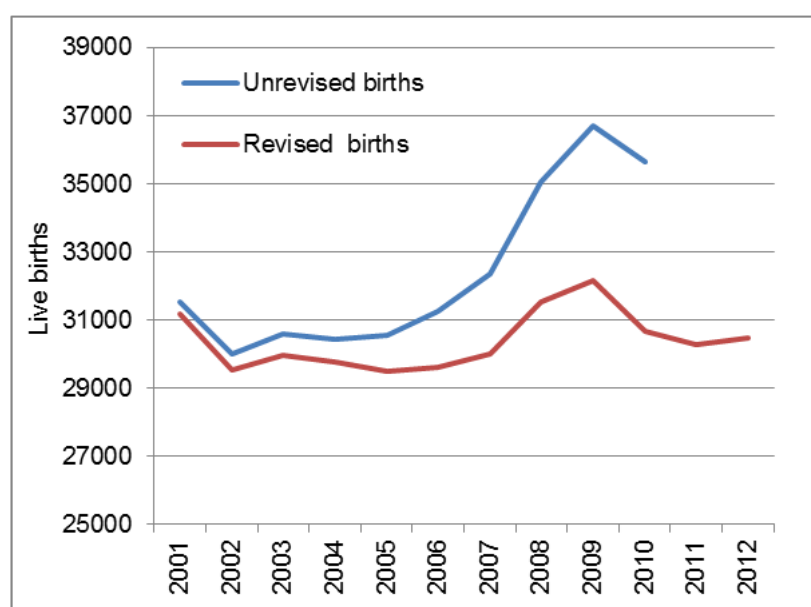
Specific details

During the period 1940-1991, the Soviet definition of a live birth was in force in Lithuania. Live births were defined based on the following criteria: evidence of life (respiration after separation from mother's body); birth weight of at least 1000 grams; period of gestation of 28 weeks or longer; and body length of 35 centimeters or more. Infants who did not meet these criteria and died within the first week of life were not counted as live births or as infant deaths but as stillbirths. Only if these newborns survived more than seven days were they registered as live births. This definition differed from that of the WHO, thus leading to an underestimation of the number of births.

The WHO definition of a live birth has been used since 1991. A live birth is defined as any delivered child showing evidence of life (respiration and heartbeat) (Statistics Lithuania, 2000).

Previously published official data on live births for 2001-2011 also included births occurring abroad to women *de jure* residing in Lithuania. The 2011 census disclosed that a substantial number of these women officially registered as permanent residents of Lithuania and having their births abroad were not *de facto* permanent residents of Lithuania. Statistics Lithuania identified and corrected the residential status of these mothers using data from the Central Population Register (last address, registered movements) and other registers such as the Social Security Register (reception if social benefits), the Health Insurance Register (use of health care services), etc. (Jasilioniene, Stankuniene, Jasilionis, 2014). The recalculation of birth counts for 2001-2011 by Statistics Lithuania excluded births that occurred to women who had been residing abroad for more than twelve months. It should be noted that the difference in the total number of births before and after revision reaches almost 5,000 births (about 13% of the total number of live births) in 2010 and had a substantial impact on aggregated fertility indicators (Fig. 1). The revised series includes live births for women permanently (*de facto*) residing in Lithuania (live births occurring abroad are included only if the mother of a newborn is still considered as a permanent resident, i.e. has been living abroad for a less than twelve months).

Figure 1: Comparison of unrevised and revised official counts of live births, 2001-2010



Source: Jasilioniene, Stankuniene, Jasilionis, 2014.

DATA QUALITY ISSUES

Lithuanian data on death and population counts cover the period 1959-2019. However, for the estimation of mortality surfaces in the HMD, the official population estimates were used only for the period 1989-2019.

Problems with the 1959 population census and official population estimates for the 1960s, 1970s and 1980s

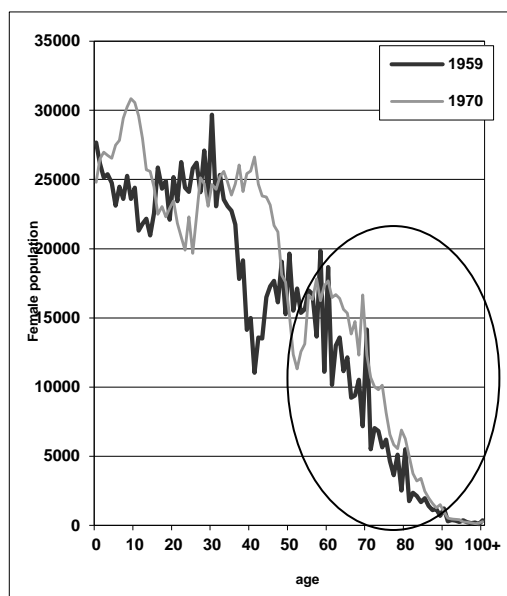
A primary concern was with the 1959 population census data. Figure 2 shows that significant and inconsistent fluctuations in population numbers by age are much more pronounced in this census than in the 1970 census (as well as than in the subsequent censuses of 1979, 1989 and 2001). Thus, it can be argued that reliability of the registration of age is questionable in the case of the first post-war census of Lithuania.

Significant discrepancies have also been found between the 1959 and 1970 census data and official population estimates for the 1960s. It is clear whether smoothing procedures have been applied after age 20 in order to produce population estimates (Appendix 2, Figure 3A). Therefore, new inter-censal population estimates for the period 1960-1969 were calculated using HMD methods (see Methods Protocol for details). However, even the new population estimates for the 1960s must be treated with caution due to possible data quality problems with the 1959 census.

Similar problems of apparent smoothing have been revealed in the process of checking consistency of 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 (Appendix 2, Figures 3B and

3C). Thus, it was decided to also calculate new inter-censal estimates for the periods of 1971-1978 and 1980-1988.

Figure 2. Fluctuations in the numbers of the Lithuanian female population by age: differences between the 1959 census and the subsequent census of 1970.



Comment. Significant peaks in the number of females (for example, at ages 60 and 70) identified in the 1959 census data are missing at the corresponding ages (71 and 81) in the subsequent census of 1970.

Age heaping in deaths

Age heaping at older ages is often considered one of the most serious problems with mortality statistics in the former USSR (Anderson, Silver, 1997). For example, Zakharov has shown that age heaping is very pronounced at ages 70, 80 and 90 in the Russian data for the period prior to 1970 (see the *HMD Background and Documentation* file for Russia). Using the same procedures, a similar analysis was performed for Lithuania. The results suggest that there may be some age heaping prior to the mid-1960s. Figure 4 in Appendix 3 shows that mortality at ages 70, 80, and 90 seems to be higher than at most ages in between. However, due to the small number of deaths in Lithuania, it is difficult to distinguish age heaping problems from random fluctuations in age-specific mortality rates.

As in the case of Russia, a significant peak was found in the number of deaths at age 99 at the beginning of the 1960s and in 1979. At the same time, few, if any, deaths were registered at age 100+ (Table 1). In the mid-1990s, the situation was exactly the opposite: very few deaths were recorded at age 99, but considerably greater numbers were found for the surrounding ages (98 and 100+). It seems that in both cases these inconsistencies could be due to some particularities of the death registration procedures (several hypotheses on this issue are presented in the *Background and Documentation* file for Russia).

These findings should be treated with caution as the number of death in the respective age groups are relatively small in Lithuania. However, to avoid possible errors we used 99+ as the open ended age interval in further analysis of the mortality surface.

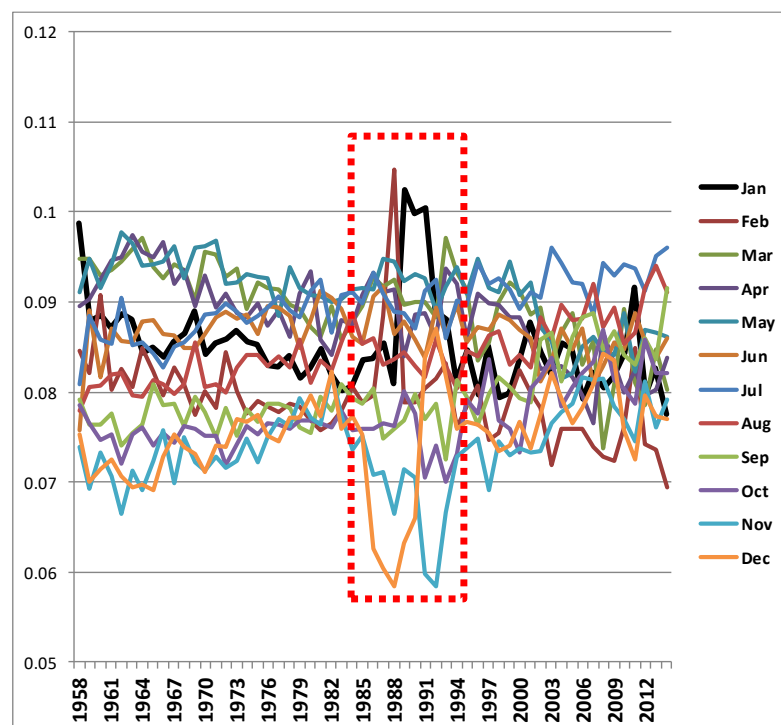
Table 1.Number of deaths at ages 98, 99 and 100+ .
Lithuanian males and females, selected years.

Age	1960	1961	1962	1965	1979	1993	1994	1995	1996
98	38	35	60	38	76	110	121	97	91
99	115	137	163	111	175	15	16	11	10
100+	3	0	0	0	0	368	341	305	283

Sudden changes in distribution of monthly births

There are some sudden fluctuations in the shares of monthly births during some years between 1986-1991. There are some dips in the share of births in December 1986-1987 and November 1991 as well as peaks in the share of births in January 1989-91 and February 1988 (Figure 1).

Figure 3. Distribution of monthly births in Lithuania, 1959-2014.



REVISION HISTORY

Changes with the September 2018 revision:

- **Life tables:** All life tables have been recalculated using a modified methods protocol. The revised protocol (Version 6) includes two changes: 1) a more precise way to calculate a_0 , the mean age at death for children dying during the first year of life and 2) the use of birth-by-month data (where and when available) to more accurately estimate population exposures. These changes have been implemented simultaneously for ALL HMD series/countries. For more details about these changes, see the revised Methods Protocol (at <http://www.mortality.org/Public/Docs/MethodsProtocol.pdf>), particularly section 7.1 on Period life tables and section 6 and Appendix E, on death rates. The life tables calculated under the prior methods (Version 5) remain available at v5.mortality.org but they have not been, and will not be, updated.

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APPENDIX 1:

DESCRIPTION OF DATA USED FOR THE LEXIS DATABASE

DEATHS

Period	Type of Data	Age grouping	Comments	RefCode(s)
1959-2007	Annual number of deaths to <i>de facto</i> population by sex and single year of age(1x1 rectangle).	0, 1, ..., 99, 100+, unknown	No adjustment has been made for age heaping or underestimation of infant deaths during the period 1959-1990	4, 5, 18, 21, 26
2008-2019	Annual number of death to <i>de facto</i> population by sex and single year of age(1x1 rectangle).	0, 1, ..., 94, 95+, unknown		33, 34, 38, 42, 46, 50, 56

POPULATION

Period	Type of Data	Age grouping	Comments	RefCode(s)
1959	Census counts of population by sex and single year of age as of January 15. Actually present (<i>de facto</i>) population.	0, 1, ..., 99, 100+, unknown		6
1970, 1979	Census counts of population by sex and single year of age as of January 15. Permanently resident (<i>de jure</i>) population.	0, 1, ..., 99, 100+, unknown		9, 11
1989-2000	Annual inter-censal population estimates by sex and single year of age. Permanently resident (<i>de jure</i>) population.	0, 1, ..., 99, 100+		14
2001-2011	Annual inter-censal population estimates by sex and single year of age. Permanently resident (<i>de jure</i>) population.	0, 1, ..., 84, 85+		39

POPULATION (CONTINUED)

Period	Type of Data	Age grouping	Comments	RefCode(s)
2012-2019	Annual post-censal population estimates by sex and single year of age. Permanently resident (<i>de jure</i>) population.	0, 1, ..., 84, 85+, unknown		40, 43, 47, 51, 55

BIRTHS

Period	Type of Data	Comments	RefCode(s)
1959-2000	Annual counts of births by sex. Actually present (<i>de facto</i>) population.	No adjustment has been made for underestimation of live births during the period 1959-1990	1, 2, 3
2001-2013	Annual counts of births by sex. Actually present (<i>de facto</i>) population: births abroad are included if a mother is residing abroad for less than 12 months.	Adjusted official data excluding live births occurring abroad to mothers <i>de jure</i> residing in Lithuania (<i>de facto</i> residing abroad for more than 12 months)	41
2014-2019	Annual counts of births by sex. Actually present (<i>de facto</i>) population: births abroad are included if a mother is residing abroad for less than 12 months.		45, 49, 53

BIRTHS BY MONTH

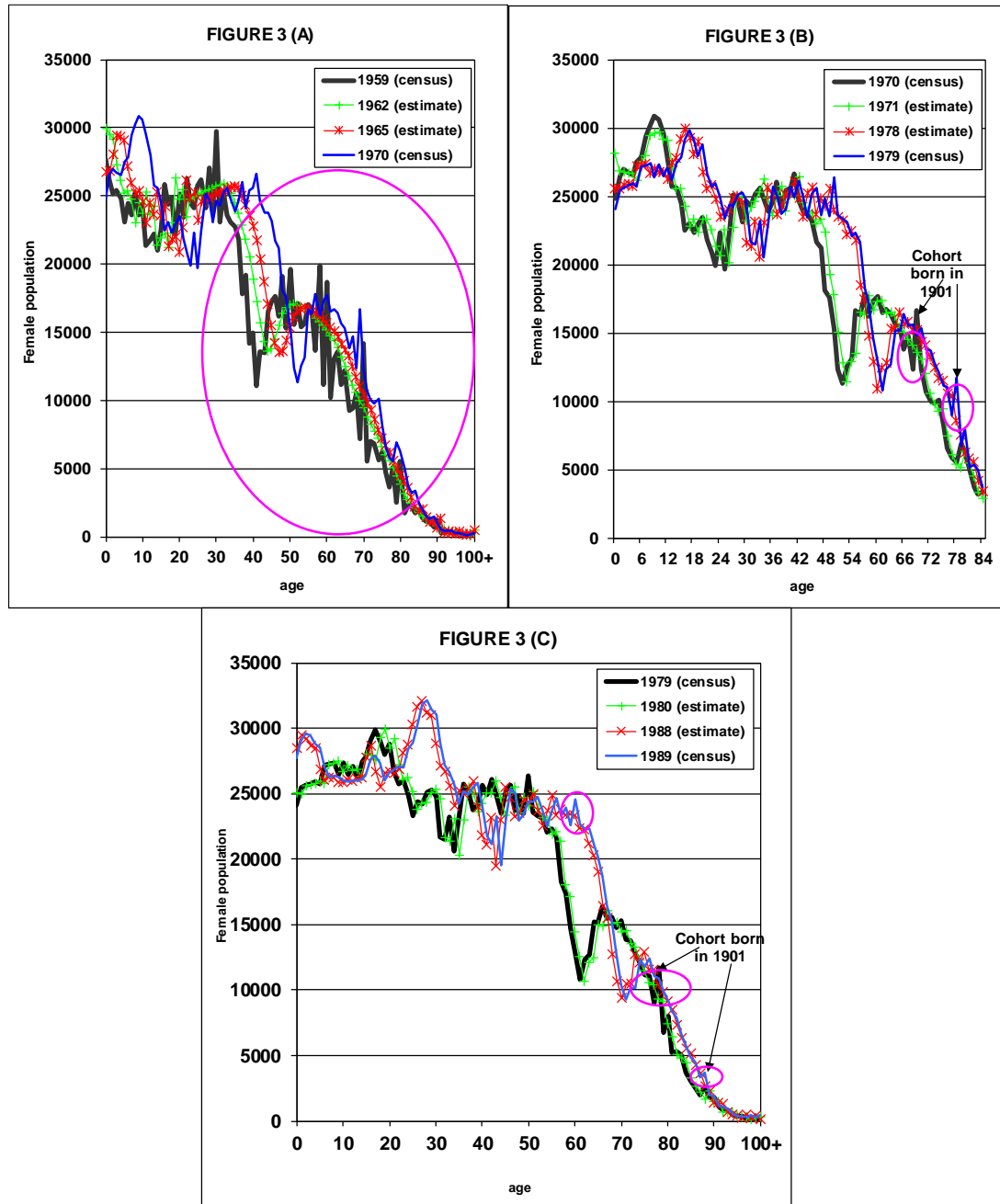
Type of data: Annual live birth counts by month.

Period covered: 1959-2019.

RefCode(s): 44, 48, 52, 54.

APPENDIX 2:

Figure 3 (A,B,C). Inconsistencies between population census data and official population estimates



Comment on Figure 2. Official inter-censal population estimates for the period 1960-1969 appear to have been smoothed after age 30 as significant fluctuations in the number of females in the corresponding age intervals are found in the 1959 and 1970 censuses but not in the population estimates for 1962 and 1965 (see Figure 2A). Similarly, peaks due to a larger number of females in the 1901 birth cohort have been smoothed in the official inter-censal estimates for the 1970s and 1980s (Figures 2B and 2C).

APPENDIX 3:

Figure 4. Mortality rates for selected ages, Lithuania, males, 1960-2001

