HUMAN FERTILITY DATABASE DOCUMENTATION: ESTONIA

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1 General information

This report documents Estonian post-war fertility data assembled for the Human Fertility Database (HFD) project, namely age- and birth order-specific data on births as well as data on exposure population (women by age/birth cohort and number of live-born children). The data for earlier periods will be added in a later stage.

The data were extracted from several sources, including unpublished vital statistics tabulations, individual birth records from Statistics Estonia, microdata of population censuses from Statistics Estonia (ESA) and the Estonian Interuniversity Population Research Centre (EKDK), harmonised age structures and newly computerised archival birth records from the Estonian Population Databank at EKDK.

Time series on live births by age of mother and biological (true) birth order of the child were included in the greatest possible detail. Time series cover the periods 1945–2010 for age of mother; 1947–2010 for age of mother and birth order; 1970–1979 and 1989–2019 for age of mother, birth cohort and birth order. Monthly data on the number of live births are available for 1947–2019. Data for female population by age and parity are available from four population censuses (1979, 1989, 2000, and 2011).

The data used for the HFD calculations are specified in Appendix 1.

2 Territorial coverage

Estonia is located in the northern part of Europe. It is bordered to the north by the Gulf of Finland, to the west by the Baltic Sea, to the south by Latvia and to the east by the Russian Federation. The Republic of Estonia was declared on February 24, 1918. The state boundaries of Estonia were recognised by the 1920 Tartu Peace Treaty with the Soviet Russia and by the subsequent agreement with Latvia. In its pre-war borders, the territory of Estonia covered 47,549 km^2 and remained the same until 1944. In 1944, Estonia was incorporated into the Soviet Union, and 2322 km^2 of its territory, including most of the former Petseri county and the lands in the north of Lake Peipsi, across the Narva River, together with Ivangorod (Jaanilinn), was made a part of the Russian Federation.

Estonia regained its independence in 1991. The territory of Estonia is currently 45,227 km^2, and the borders have remained unchanged since late 1944 (some minor changes were introduced in the process of preparing the border agreement with the Russian Federation). This implies that for the period from 1945 onwards, the time series refer to the same territory (45,227 km^2). However, sizeable population transfers and deportations that took place in the aftermath of the Second World War had considerable impact on the accuracy of population estimates for the late 1940s and early 1950s.

At the beginning of 2021, the population of Estonia stood at 1.33 million (http://www.stat.ee/). In the early 1990s, it witnessed a sharp downturn in fertility rates and temporary increase in mortality rates; furthermore, since the turn of the millennium, the negative balance between births and deaths has been gradually decreasing, approaching zero growth in recent years. Following the return migration of a part of the immigrant population in the 1990s, the country has experienced a moderately negative migration balance over the present decade.

According to the results of the 2011 population census, ethnic Estonians form 68.7% of the total population (http://www.stat.ee/). Most of the remainder consist of post-war immigrants, mainly from the Russian Federation, and their descendants. Notably, the patterns of family formation and childbearing characteristic of ethnic minorities are found to be substantially different from those observed in the native population (e.g., Katus, Puur and Sakkeus (2000b, 2002); Katus, Puur and Põldma (2002)).

3 System of vital registration and data availability

To place the organisation of vital registration and statistics in the post-war decades in a broader context, it is useful to first provide a concise historical outline of demographic record-keeping. Knowledge of the origin and historical development of vital records forms the background against which more recent methods and procedures can be evaluated.

3.1 Until the Second World War

Mandatory registration of vital events dates back more than 300 years in Estonia. In 1686, the Swedish king Karl XI enforced the Church Act, according to which all births (baptisms), deaths (burials) and marriages (weddings) had to be recorded in parish registers (Andresen 1998). In 1694, the Church Act was extended to Estonia and Livonia, which belonged to the overseas provinces of Sweden in the 17th century.

Following the entry of Estonia into the Russian Empire in 1710, the Lutheran Church maintained the registration system, although the Great Northern War (1700–1721) and the population crises accompanying it introduced the discontinuity of record-keeping in many parishes. The completeness of registration was gradually restored, and starting from 1834, complete records have been preserved for the entire country (Palli 1995). Historical studies have demonstrated a relatively good quality of parish register data in Estonia. Three parishes — Karuse, Otepää and Rõuge — have been studied by means of the family reconstitution method (Palli 1973, 1984, 1988). Earlier, Hyrenius (1942, 1958) published a study based on data taken from the registers of six parishes in Estonia inhabited by Swedes, covering the period 1840–1937. When perfecting the method of family reconstitution, Louis Henry was aware of the work of Hyrenius and made a generous acknowledgment of it (Henry 1961).

Against the relatively early onset of vital registration, statistics on vital events are relatively poor in Estonia for the 19th century. There was no attempt to produce regular statistics on vital events up to the middle of the 19th century. In the 1860s, the provincial authorities were ordered to compile statistical reports on the basis of parish registration for all religions combined, that is, for the total population. The task of producing statistics was assigned to statistical committees at the provincial level of administration. This period could be regarded as the start of vital statistics in Estonia. In this period, the territory of modern Estonia was divided between two provinces (*gubernias*) — the northern part of the country was Estland and the southern part belonged to Livland (the latter also covered northern Latvia).[1] Statistics were published in yearbooks which step-by-step progressed towards a standardised format and became known as ‘overviews’ (SCE 1867–1916; SCL 1863–1915). The first population census, covering the provinces of Estland, Livland and Courland, was carried out in 1881, a

[1] With the exception of Narva, which belonged to St-Petersburg Gubernia until 1918.

decade and a half earlier than the first all-Imperial census of Russia in 1897. Earlier censuses of urban population had taken place in Livland (1867) and Estland (1871).

The availability of regular statistics gave rise to analytical studies, partly or fully based on the reports of the statistical committees. Among general studies focusing on the European part of Russian Empire, at least four deserve attention as important sources of historical demographic statistics for Estonia (Besser and Ballod 1897; Novoselski 1916; Ptuha 1960; Rashin 1956). Focusing more specifically on Estonia and the Baltic region, one must recognize the Tartu school of biostatistics. This school in the University of Tartu was developed under the headship of Bernhard Körber. In 1860–1886, a series of case studies analysing mortality and fertility were prepared. Those works addressed, among other matters, the population of Tartu, Tallinn, Narva and other cities as well as several rural parishes from 1834 onwards (Haller 1886; Hübner 1861; Kluge 1861; Körber 1883 and others).

Despite the achievements, however, statistical committees had a limited mandate and few resources to produce detailed demographic statistics. With respect to vital events, for instance, official summaries included only absolute numbers of events, without any breakdown by age. In other words, relatively complete and reliable data from parish registration remained largely underutilised for statistical purposes. This discrepancy was overcome only with the development of a national statistical system in Estonia after the First World War. The newly-established Central Statistical Bureau (CSB, 1921) put a great emphasis on the introduction of modern statistical methodology and procedures, and hence international comparability of the data. No less importantly, it coordinated activities related to the collection of statistical information with other agencies of central and local government.

As for vital registration, to provide an alternative to church registration, municipalities in major towns started to keep civil registers in 1920. A full-scale reform followed in 1926, transferring the responsibility for registration from ecclesial authorities to the newly-established government agency (the Civil Registration Office) under the jurisdiction of the Ministry of Interior. The reform implied the introduction of a new legal framework and standardised registration procedures, regardless of religion. Under the new system, the duty of keeping the registers of vital events was placed on local governments: major towns established specialised local registration offices for that purpose, and in smaller units the duties of registrar were performed by the secretary of the local government.[2]

For statistical purposes, the system foresaw that aside from a legal record, for each vital event the registrars filled in a separate statistical form, which was subsequently transmitted to the CSB for centralised processing.[3] Vital statistics reports, following a predefined tabulation programme, appeared regularly in the monthly statistical journal of the CSB (RSKB 1921–1943) and thematic statistical publications. Considerable effort was invested in improving the efficiency and quality of vital registration, including the coordination and supervision of registrars. As a consequence, according to contemporary assessments the completeness and accuracy of records were of high standard. A detailed account of civil registration and vital statistics in Estonia 1926–1940 is provided by Teder (1939).

[2] Under the supervision of the Civil Registration Office, church officers were allowed to continue the registration of vital events; however, their responsibilities did not extend to all procedures. For instance, the keeping of local population registers by means of interrelating (linking) different vital events was entrusted to civil registrars exclusively.

[3] In fact, the individual statistical forms for each vital event were introduced in the early 1920s, before the 1926 reform and institution of the Civil Registration Office.

3.2 Post-war decades

Geopolitical rearrangements accompanying the Second World War and the incorporation of Estonia into the Soviet Union introduced a discontinuity into the national statistical system. In 1940-41, the CSB as an independent agency was dissolved and replaced by a subordinate branch office charged with the implementation of instructions from central authorities. Similarly to other areas of administration already in 1941, extensive changes were made in the staff, and from 1944 onwards only a few statisticians remained in service who had worked earlier in the CSB.

As regards the organisation of vital registration, in January 1941 the Family Code of the Russian Federation was enforced in Estonia.[4] It set forth the same provisions about the reporting and recording of vital events that had been developed in the Soviet Union in the 1920s and 1930s. From the organisational point of view, the new system introduced a distinction between the two levels of local registrars. At a higher administrative level, civil registration offices (ZAGS) were established in each county and major town; at the local level, civil registration remained the responsibility of municipal authorities. The competence of the latter was limited to simpler proceedings, while the amendment of records, the change of names and related procedures were reserved to registration offices.[5] As in the CSB, Sovietisation implied a drastic change the staff of local registrars — a recent analysis based on archival records shows that in 1941, some 87.5% of the registrars were new in their job (Katus, Puur and Põldma 2004). Fortunately, the same study revealed no major deterioration in the completeness and quality of registration.

The number of local registrars varied according to the changes in the administrative division (Uuet 2002). In 1940-41, vital events were registered in 274 units. A major increase in the number of registration units took place in 1950 when the historical administrative division was abolished and replaced with a new one which consisted of five so-called republican towns and 27 districts (*rajoon*), the latter divided into 49 urban (*linn, alev*) and 641 rural municipalities (*külanõukogu*). In the following decades, smaller administrative units were gradually merged into larger ones and since the 1970s the number of local registrars has been approximately at the same scale as before 1940.

The legally designated period for the registration of a child was one month. As a rule, the registration was based on the medical certificate of birth issued by a maternity hospital or attending medical personnel. Legal record and statistical report were combined into a single form (the content of the birth record is summarised in Appendix 2). The set of characteristics underwent several modifications in the period under consideration. From the viewpoint of HFD, the most important modification occurred in 1970 when the dates of birth of mother and father were added to the form. Until that year, only the ages (completed years) of parents were recorded. As for other characteristics, in 1970 a more detailed specification concerning the partnership status of parents was added, and since 1979 the educational attainment and duration of residence of parents.

Vital registration forms were written in two identical copies. On a monthly basis, county registration offices collected the forms and transmitted the second copies to the central civil registration office. The first copy of the record was retained in the county civil registration archive. Before being stored in the central archive at the Ministry of Interior, the second copies of the forms were sent to the Statistical Office for centralised data processing. The latter was

[4] During the German occupation of 1941–1944, the civil registration operated according to the same principles as before 1940. Except for 1944, the registration of births remained virtually complete but the compilation of statistics suffered seriously from repeated changes of administration (Puur 2004).

[5] Detailed account of the civil registration procedure is available from the instructions to civil registrars (NSVL SARK 1940; ENSV PSAB 1957a; 1957b; 1971; 1986).

based on a programme of standard tabulations, defined by central statistical authorities (for a concise overview of the tables produced for Estonia, see Katus and Puur 2003).[6]

Due to censorship imposed on statistical information in the Soviet Union, only strongly aggregated data could be published openly. A somewhat broader selection of data appeared in the publications for official use. In Estonia: four volumes were published that contained vital statistics — in 1975 for the period 1965–1973, with time series going partially back to 1950; in 1978 for 1971–1976; in 1982 for 1976–1980; and in 1987 for 1981–1985 (TsSU Estonii 1975–1987). However, the published data were often aggregated, thereby reducing their value for analytical use. The primary tabulations, therefore, represent the source of most appropriate and complete information available (that is, disregarding the microdata, as discussed in the next section).

3.3 The 1990s and beyond

The societal transformation of the 1990s implied profound changes in all sectors of governance, including the statistical system. With respect to birth statistics, in 1992 Estonia switched to the internationally comparable WHO definition of live birth. The latter replaced the former Soviet definition, according to which the product of delivery with birth weight less than 1000 grams, or with gestational age less than 28 weeks, or with length less than 35 cm, was not considered live birth unless surviving the first seven days. If a child born alive did not meet one of the above criteria and died within seven days, the case was omitted from live births and was instead considered late foetal death (miscarriage). The change had relatively limited bearing on the number of live births but exerted noticeable influence on the measures of infant and foetal mortality.[7]

In 1992, Statistics Estonia transferred the coding, data entry and processing of vital records from tabulation machines to personal computers. From that year onwards, all characteristics available from registration forms were systematically entered into an electronic database, using appropriate international classifications.[8] In 1993, the procedures of vital registration were revised and new forms introduced. The new system foresaw two separate forms for each vital event — the legal record and a corresponding statistical report. The scope of information collected was also somewhat expanded (see Appendix 2). For instance, the new forms included personal identification numbers introduced after the turn of the 1990s, birthplace, citizenship, and explicitly the partnership status of parents; in cases where parents were not living together (at the same address), the record showed with whom the child resided. As for married couples, the starting date (year and month) of the union was to be recorded for cohabitants. Of the characteristics included in the previous forms, the place of work of parents was dropped (although it was included in the forms, it had never been processed under the previous system).

The statistical forms were transmitted to Statistics Estonia for coding, data entry and processing. In recent years, local registrars have entered the information directly to the population register, from which it is then extracted for the production of vital statistics at Statistics Estonia. The basic information on vital statistics is available in the series

[6] When comparing the content of registration forms and tabulations, it becomes evident that several characteristics are not systematically represented. For example, educational attainment, economic activity and social class are tabulated only for a few years. Even ethnicity for births is not available for the entire period but starts from the late 1950s. Limitations also relate to the detail of scales used in tabulations; for instance, five-year age groups were often used instead of single-year.

[7] The calculations for the years 1992–1993 revealed that the new definition shifted the infant mortality rate 16.6% upwards, while the stillbirth rate increased by 25.6 per cent (EKDK 1994c).

[8] Subsequently, the Statistical Office also re-computerised birth and death records for 1989–1991 to cover the entire intercensal period 1989–2000 with comparable microdata. For the earlier period, microdata are available for 1986–1988 at Statistics Estonia, but these data are incomplete in the sense that not all characteristics were included in the electronic database.

demographic yearbooks published by Statistics Estonia (in Estonian and in English). In 1995–2001, the vital statistics series was published annually (ESA 1995–1999; 2000–2003), and later it switched to bi-annual publication (ESA 2006; 2007). Electronic data are available from the website of Statistics Estonia (http://www.stat.ee/). The website contains the time series of basic indicators, e-publications and other information. More detailed data for analytical purposes are available on special request.

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Another new development in the collection of fertility data in the 1990s was the institution of a Medical Birth Register (MBR). The latter represents a new registration system started in 1992. The MBR receives regular statistical reports from all hospitals that render obstetric services; aside from comprehensive medical information (including gestational age, birth weight, length of the newborn, pregnancy history of a woman, details of confinement, etc.) the register covers also the set of demographic and social characteristics identical to that recorded in the civil registration system. Currently the MBR is operated at the National Institute on Health Development. The register publishes regular reports with annual statistics and time series (EKMI 2002; TAI 2008). Some basic information is also available from the website of the NIHD (http://www.tai.ee/), but as yet the corresponding section is solely in Estonian. The MBR is used extensively for the purposes of medical research.

In the context of statistical system, the institution of the MBR implies that, since 1992, Estonia has had two parallel systems supplying individual-level information on births.[9] The records of MBR and the statistical database based on civil registration can be linked using personal identification number. Amongst other possibilities, this has opened up new opportunities for monitoring and analysis of the completeness and quality of the information collected by both systems (Katus *et al.* 2006).

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The third development in the context of the HFD relates to the data harmonisation programme that was launched after the turn of the 1990s by the Estonian Demographic Association and the Estonian Interuniversity Population Research Centre. The programme is a long-term effort that aims at improving the comparability and availability of demographic statistics on Estonia. It involves evaluation and harmonisation of aggregate data, recoding and re-processing of microdata, and the computerisation of archival records.

With support from the Governmental Commission for Population and Social Statistics, a special subprogramme was launched in 1995 with the aim of bringing into scholarly circulation the archival birth records. The subprogramme has been accomplished in several stages, moving from one intercensal period to the next. The work started from 1959–1970 and has subsequently shifted to 1970–1979 and 1941–1959. Currently the data have been computerised and checked for the years 1953–1979. The data have been newly tabulated and, for each year, a separate volume of annual standard tabulations has been prepared. Unlike the official tabulations from these decades, the tabulations are provided also in regional breakdown, covering county as well as municipality level. Also, the data for intercensal periods 1959-1970 and 1970-1979 has been recalculated to the regional division of the 1970 census, to provide comparable time series.

Finally, in 2004 the Ministry of Interior initiated a programme of full-scale computerisation of the archival records of civil registrations (births, marriages, divorces, deaths, adoptions, changes of names, etc). When completed, the programme is expected to result in a complete

[9] The coverage of the events is not fully identical in the two registers. The MBR covers all births that occurred in medical institutions (and a few outside these institutions) in Estonia, including the births to foreign women temporarily staying in the country. On the other hand, compared to statistical register based on civil registration, it excludes the birth to Estonian citizens and residents that occurred abroad. The overlap between the births in two registers amounts to about 99%.

retrospective population register for Estonia that goes back to 1926 (the establishment of the Civil Registration Office).

4 Birth count data

Estonian birth count data included in the Human Fertility Database cover the period 1945–2017[10]. Registration of births is considered complete for that period and covers the territory in the post-1944 borders. Data on births include all births to permanent residents of the country, including the births registered in the Estonian consulates abroad (after 1991).

Data on live births, specific to age/birth cohort of mother and biological birth order are derived from three sources:
(a) unpublished primary tabulations at Statistics Estonia;
(b) microdata with birth records at Statistics Estonia;
(c) microdata with newly computerised birth records from the Estonian Population Databank at the Estonian Interuniversity Population Research Centre.

Since the data collection and tabulation programme have changed over time, and the newly computerised microdata are not available for all years, the level of detail of the data varies across sub-periods as indicated in Table 1:

Table 1: Description of the data: Births, 1945–2019

Period	Type of data*		Age of mother (completed years)	Birth order (biological)	Lexis element	Source
	Total birth orders	Order-specific data				
1945–1946	1	na	≤15, 16, 17, 18, 19...49, 50+, unknown	na	square	a
1947–1954	1	1	≤15, 16, 17, 18, 19...49, 50+, unknown	1,2,3...11+, unknown	square	a
1955–1977	1	1	≤15, 16-19, 20-24,.., 45-49, 50+, unknown	1,2,3...11+, unknown	square	a
1953–1969	1	1	13, 14, 15 16, 17, 18, 19...54, unknown**	1,2,3...12+, unknown	square	c
1970–1979	1	1	12, 13, 14, 15 16, 17, 18, 19...49, unknown**	1,2,3...12+, unknown	triangle	c
1978-1988	1	1	≤15, 16, 17, 18, 19...49, 50+, unknown	1,2,3...11+, unknown	square	a
1989-2019	1	1	12, 13, 14, 15 16, 17, 18, 19...55, unknown	1,2,3...10+, unknown	triangle	b

* Type of data: 1=live births, 2 = total births
** Upper and lower bound of the age scale varies depending on the lowest and highest age of the mother observed in a given period.

For 1953–1979, the data were obtained from two parallel sources, primary tabulations at Statistics Estonia and the computerised archival birth records at EKDK, with different level of detail. The data in these two sources are not fully identical. With the exception of two years (1956 and 1960), the number of live births in archival records exceeds the corresponding figure reported in official statistics. In relative terms, however, the average difference in the counts is fairly small (0.23% of the total number of birth registered in official statistics). A bigger difference is characteristic of only the three earliest years with parallel data (1953-1955); in these years, it amounts to nearly 300 births annually (about 1.5%). We assume that this likely

[10] Since data on the age structure of the population, which are taken from the Human Mortality Database (www.mortality.org), are available since 1959 only, the birth count data for 1945-1958 are not used in the HFD calculations. These data, however, can be found in the input file for births *ESTbirths.txt* (see section “Input Data” on the country page of Estonia).

stems from the fact that in the late 1940s and 1950s, vital records of some settlements with special regimes (e.g., Sillamäe, the site of a uranium concentration facility) were excluded from official statistics. Disregarding these early years takes the average difference in birth counts down to marginal 0.09%.

Monthly data on the number of live births, based on official counts, are available for 1947–2017.

5 Population count data

5.1 Population count data by age

Population count data by age for Estonia are taken from the Human Mortality Database (HMD; www.mortality.org). The data cover the time period since 1959.

5.2 Population count data by age, birth cohort and parity

For the post-war period, the distribution of women by the number of live-born children is available from the 1979, 1989, 2000, and 2011 censuses in Estonia. The programmes of the 1959 and 1970 census did not include the relevant item.

Women aged 16 and over (15 and over in the 2000 and 2011 censuses) were asked to report the number of live-born children they had ever had. Information for women younger than the stated lower limit was only supposed to be recorded for those women who had borne children. In the 1979 and 1989 censuses, the question about the number of children ever born was part of the long-form questionnaire that was administered in households belonging to the 25% sample.

For the purpose of HFD, the female population counts by age, (when available) cohort and parity from the 1979, 1989 and 2000 censuses were derived from the microdata, available at the Estonian Interuniversity Population Research Centre (1979 and 1989), and Statistics Estonia (2000). The distribution of females by age and parity from the 2011 census was downloaded from the online database of Statistics Estonia. The level of detail of the data varies across censuses, as indicated in Table 2:

Table 2: Description of the data: Women by parity, censuses 1979, 1989, 2000, and 2011

Census date	Age of women (completed years)	Birth cohort	Parity (number of ever-born children)	Unknown cases
17.01.1979	15, 16, 17,...,99, 100+, unknown	NA	0,1,2,...,15+, unknown	0.1%
12.01.1989	15, 16, 17,...,104, 105, unknown	1973, 1972,...,1883	0,1,2,...,16+, unknown	0.2%
29.03.2000	15, 16, 17,...,106, 107, unknown	1985, 1984,...,1892	0,1,2,...,19+, unknown	3.5%
31.12.2011	15, 16,…, 84, 85+	NA	0, 1, …, 9, 10+, unknown	2.6%

In the 1979 census, an exact birth date was recorded by enumerators; however, in the final database, only age in completed years is retained.

Very low incidence of unknown cases in the 1979 and 1989 census evidently reflects the practice to impute the missing data in these censuses. For instance, the coding instructions of the 1979 census recommend replacing a missing value for zero in a case a woman had never

married. In the 2000 census, imputing was not widely practiced, which explains the higher percentage of unknown cases. Examination of the age pattern of unknown cases reveals that these are typically young women in their late teens and 20s. It seems reasonable to assume that a large proportion of them are actually childless. It is also likely that some under-reporting of children occurs among older women, partially because of the omission of dead children and partially because of the omission of children who have left home. Finally, as with any retrospective data, the population counts are influenced by selection bias due to mortality differentials by birth order.

6 Specific details

6.1 Definitions

Definition of live birth

Different definitions of live birth were applied in the period since 1945, influencing the number and the proportion of live births in the vital statistics. The changes in definition influenced the level of infant and late foetal mortality but had no appreciable influence on the number of live births, and their distribution by birth order.

Definition of live birth valid from January 1, 1941:
The instructions for civil registrars enforced in Estonia from January 1941 gave the following definition of live birth: “a birth of fetus that showed signs of life (breathing or heartbeat), born after 6 months of gestation period, and showed any signs of life, even if for a few minutes”. This definition was similar to the one that was applied in the inter-war period, except that the latter did explicitly mention breathing and crying as signs of life to be considered (Teder 1939).

Definition of live birth valid from 1945[11] *until December 31, 1991:*
Live birth was defined as a birth of fetus that showed signs of life (breathing or heartbeat), born after 28 weeks of gestation period, longer than 35 cm and weighing at least 1000 g. Also, the fetuses which did not meet (at least one of the above) the criteria of live birth but survived at least 7 days were considered live births. Those surviving less than 7 days were registered as spontaneous abortions.

Definition of live birth valid since January 1, 1992:
WHO definition: Live birth refers to the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of the pregnancy, which, after such separation, breathes or shows any other evidence of life – e.g., beating of the heart, pulsation of the umbilical cord or definite movement of voluntary muscles – whether or not the umbilical cord has been cut or the placenta is attached. Each product of such a birth is considered live-born.

Definition of age

The age of mother is recorded in completed years, and the reporting of age is considered accurate for the whole period considered. The exceptional cases are those in which the age of mother is unknown, and they mostly refer to foundlings.

[11] We are not able to define the exact date when the Soviet definition of live birth came into force in Estonia, but it could not be later than 1945, which is the beginning of birth data series available for Estonia.

Definition of birth order

The live birth order refers to the total number of live births the woman has previously given. In case of multiple deliveries, each child born is assigned a separate birth order.

6.2 Data Quality Issues

Warning: Cohort childlessness for selected cohorts has unrealistically low values and should be used with caution.

We would like to call attention to the very low levels of childlessness estimated in the HFD for the Estonian cohorts born in 1949-1962. Some of these cohorts of women have not completed childbearing yet, but the level of childlessness among them will apparently be very low. The estimated values of childlessness are as follows:

- cohort 1949 – 0.041;
- cohort 1950 – 0.044;
- cohort 1951 – 0.027;
- cohort 1956 – 0.037;
- cohort 1957 – 0.031;
- cohort 1958 – 0.022;
- cohort 1959 – 0.008;
- cohort 1960 – 0.003;
- cohort 1961 – 0.035;
- cohort 1962 – 0.045.

Extremely low levels of childlessness of cohorts born in 1958-1960 look especially alarming. Levels of childlessness estimated for the same cohorts based on data from the census 2000 are much higher:

- cohort 1949 (age 50/51): 0.066;
- cohort 1950 (age 49/50): 0.07;
- cohort 1951 (age 48/49): 0.065;
- cohort 1956 (age 43/44): 0.067;
- cohort 1957 (age 42/43): 0.073;
- cohort 1958 (age 41/42): 0.071;
- cohort 1959 (age 40/41): 0.069;
- cohort 1960 (age 39/40): 0.07;
- cohort 1961 (age 38/39): 0.073;
- cohort 1962 (age 37/38): 0.078.

Several biases could be pushing the level of childlessness for these specific cohorts down (most probably in combination with low true childlessness), including the quality of the population denominator and the overstatement of first births. The Estonian case is not a unique one. The problem of low cohort childlessness is very common in countries of Eastern Europe. The estimate of childlessness is very sensitive to the accuracy of and random fluctuations in population data, and cumulates all migration and data quality problems present in a particular cohort line.

6.3 Revision History

Changes with the May 2016 revision:

Data for 2014 were added. There are no other changes as compared to the data release of December 3, 2015.

Changes with the November 2018 revision:

Data for 2015-2017 were added. There are no other changes as compared to the data release of December 3, 2015.

Changes with the February 2021 revision:

Data for 2018-2019 were added.

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APPENDIX 1
INPUT DATA USED FOR HFD CALCULATIONS

BIRTHS

Period	Type of data	Age range	Birth order	RefCode(s)
1959-1969[1]	Annual number of live births by age of mother and birth order (Lexis squares)	13,14,…,53,54, unknown	1,2,…,11,12, unknown	3
1970-1979[1]	Annual number of live births by age of mother, mother's year of birth and birth order (Lexis triangles)[2]	12,13,…,48,49, unknown	1,2,…,11,12, unknown	3
1980-1988[1]	Annual number of live births by age of mother and birth order (Lexis squares)	≤15,16,…,49,50+, unknown	1,2,…10,11+, unknown	1
1989-2019	Annual number of live births by age of mother, mother's year of birth and birth order (Lexis triangles)	12,13,…,54,55, unknown	1,2,…,9,10+, unknown	2, 9, 10, 12, 15, 18-20
1947-2019	Annual number of live births by month	total	total	4, 8, 11, 13, 16, 17, 21

[1] Unpublished data.
[2] Mother's year of birth is unknown in some cases, and thus data can have double classification – births can be classified by Lexis triangles and Lexis squares.

FEMALE POPULATION: Distribution by age and parity[2]

Period	Type of data	Age range	Year of birth, range	Parity	RefCode(s)	Notes
17.01.1979[1]	Number of women by age and parity	10, 11,…, 59, 60	–	0, 1,…,9, 10+	5	'Golden' census. Unknown age and parity were redistributed proportionally
12.01.1989[1]	Number of women by age, year of birth and parity	10, 11,…, 59, 60	–	0, 1,…,9, 10+	5	Unknown parity was redistributed proportionally
29.03.2000	Number of women by age, year of birth and parity	10, 11,…, 59, 60	–	0, 1,…,18, 19+, unknown	6	
31.12.2011	Number of women by age and parity	15, 16,…, 84, 85+	–	0, 1, …, 9, 10+, unknown	14	

[1] The question about the number of children ever born was given only to a 25% sample of households in the census. The obtained distribution of women by parity was applied to the entire female population of Estonia. Additional adjustments include redistribution of women of unknown age and unknown parity proportionally across the corresponding categories with known information.

FEMALE POPULATION: Exposure by age and year of birth

Female exposure population by calendar year, age, and year of birth (Lexis triangles) is estimated using data on population size and deaths from the Human Mortality Database, which is available at http://www.mortality.org or http://www.humanmortality.de.

APPENDIX 2: Main characteristics in the birth record, Estonia 1945-2009

	Characteristics	Years (if not registered during the entire period)
1	Municipality (local registrar)	
2	Birth record's number	
3	Date of registration	
	Characteristics of newborn	
4	Surname of child	
5	First name of child	
6	First name of father of child	1957-1992
7	Sex of child	
8	Date of birth of child	
9	Personal identification number of child	1992-2009
10	Place of birth of child	
11	Number of children born (single, twin, triplet)	
12	Child was born alive or dead	
13	Birth order of child	
14	Child goes to reside with mother/father/elsewhere	1993-2009
15	Citizenship of child	1993-2009
	Characteristics of parents	
16	Surname of mother	
17	First name of mother	
18	Name of father of mother	1945-1992
19	Surname of father	
20	First name of father	
21	Name of father of father	1945-1992
22	Date of birth of mother	1970-2009
23	Personal identification number of mother	1992-2009
24	Age of mother in full years	1945-1992
25	Date of birth of father	1970-2009
26	Personal identification number of father	1992-2009
27	Age of father in full years	1945-1992
28	Place of residence of mother	
29	Place of residence of father	
30	Years lived in the current place of residence of mother	1979-1992
31	Years lived in the current place of residence of father	1979-1992
32	Ethnicity of mother	
33	Ethnicity of father	
34	Citizenship of mother	1993-2009
35	Citizenship of father	1993-2009
36	Educational attainment of mother	1979-2009
37	Educational attainment of father	1979-2009
38	Main activity of mother	
39	Main activity of father	
40	Place of work of mother	1945-1992
41	Place of work of father	1945-1992
42	Occupation of mother	
43	Occupation of father	
44	Legal basis for recording the father's information (marriage, joint declaration of parents, decree of court, mother's application)	1970-2009
45	Marital status of mother	1993-2009 (1945-1992 married or unmarried)
46	Date of marriage	1957-2009
47	Start date of consensual union (month and year)	1993-2009

Note: For 1993-2009, the information provided refers to statistical report.