

HUMAN FERTILITY DATABASE DOCUMENTATION: THE CZECH REPUBLIC

Author: Kryštof Zeman

Vienna Institute of Demography, Austrian Academy of Sciences

E-mail: krystof.zeman@oeaw.ac.at

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1 General information

This report documents the data for the Czech Republic collected for the Human Fertility Database project, including age and birth order-specific data on births, total births by calendar month and year, and data related to the exposure population (women by age/birth cohort and the number of live births). The Human Fertility Database (HFD) for the Czech Republic is based on the official data on birth counts published in vital statistics publications and records on individual births provided by the Czech Statistical Office, as well as on the official results of population censuses.

Data on births by age of mother and birth order were included in the greatest possible detail. Time series cover years 1925–1937 and 1945–2009. Monthly data on births are available for 1919–1937 and 1945–2009. Population data cover the periods of 1920–37 and 1945–1949; for the period starting in 1950, data have been processed and documented in the Human Mortality Database (HMD, www.mortality.org). Data for female population by parity are available for six censuses in 1950–2001.

In the initial stage of Human Fertility Database project, only data for 1950-2009 were included, because of problems with earlier periods (see below).

Registration of births is considered complete and covers the whole territory of the Czech Republic. Data on births include all births to permanent residents of the Czech Republic, as well as births that were registered abroad (see below).

In 2007, the population of the Czech Republic was 10.4 million, of whom 3.8% were of foreign citizenship (CZSO 2008). The three major groups of foreign residents are citizens of Ukraine, Slovakia, and Vietnam.

The area of the Czech Republic covers 78,866 km². Since the last major administrative division change in 2000, the territory of the Czech Republic has been divided into eight territorial units (NUTS2), 14 regions (NUTS3), and 77 districts (LAU1). In 2007, the number of municipalities was 6,249.

According to the 2001 census, 93.8% of the population is of Czech ethnicity (this figure also includes persons declaring Moravian and Silesian ethnicity), while 1.8% are of Slovak ethnicity, 0.5% are of Polish ethnicity, and 0.4% are of German ethnicity.

1.1 Territorial coverage

The territory of the Czech Republic (historically also known as the “Czech Lands”), which was part of Czechoslovakia in 1918–38 and 1945–92, and constitutes an independent country since January 1, 1993, has had the same borders since 1920. During the period of 1919–1937, Czechoslovakia included, in addition to the territory of the present-day Czech and Slovak Republic, the region of Subcarpathian Rus (Zakarpattia Oblast of Ukraine, also known as Carpathian Ruthenia). Data were collected separately during this period for Bohemia, Moravia with Silesia, Slovakia and Subcarpathian Rus. The historical regions of Bohemia, Moravia, and Moravian Silesia form the territory of the Czech Republic.

In 1939, the German-controlled “Protectorate of Bohemia and Moravia” emerged after the territory of “Sudetenland,” located on the Czech border with Germany and Austria (with a majority of ethnic German inhabitants) was incorporated directly into Germany in 1938. In 1945, Czechoslovakia was reconstituted within its former borders, with the exception of Subcarpathian Rus, which was incorporated into the Soviet Union, and with some minor changes on the Slovak-Hungarian and Slovak-Soviet border. The area of the Czech Republic was not affected.

In 1958, minor territorial changes affected two small settlements across the Czech-Polish border. After the breakdown of Czechoslovakia in 1993, minor territorial changes affected two small settlements over the Czech-Slovak border, with negligible effects on population statistics.

The official name of the Czech Republic changed several times over the course of the last century, and the way it is addressed in official publications changed accordingly. All of the following names refer to the same territory: Čechy, Morava a Slezsko (1925–1948), České země (1949–1954 and 1966–1968), České kraje (1955–1965), and, after the federalisation of Czechoslovakia, Česká socialistická republika (1969-1989). Since 1989, the official name has been Česká republika.

1.2 Data collection and availability

The relevant historical starting point of Czech statistical data collection is the formation of Czechoslovakia on October 28, 1918, and, subsequently, the establishment of the State Statistical Office (Státní úřad statistický), which collected data on marriages, divorces, births, deaths, abortions, internal and external migration, and population counts¹ for the whole territory of Czechoslovakia during 1919–1937 and 1947–1992.

A break in the data series on births occurred in 1938–45 due to World War II. Vital statistics for the whole territory were not published during 1938–1944, and the existing statistics cover only part of the present territory of the Czech Republic, the “Protectorate of Bohemia and Moravia.” Data on the territories annexed by Germany have not been reconstructed, and thus the data for the complete territory of the Czech Republic are not available for this period. After the Second World War, the expulsion and exodus of 2.8 millions ethnic Germans (Srb 2004) contributed to the significant decrease in the population living in Czech territory from 10.9 million in 1938, to

¹ Data on marriages, births and deaths for Czech Lands are available starting in 1785, but only as total numbers or with little detail (e.g., live and still births, non-marital births, deaths until one year of age). Data on divorces are available from 1919 onwards. Data on abortions are available from 1953 (spontaneous abortions and induced abortions for medical reasons) and 1957 (induced abortions for social reasons). Recently, data on abortions have been collected by the Institute of Health Information and Statistics of the Czech Republic. Data on international migration are available for 1922-37 and from 1947 onwards. In the years 2005-2006, the migration data source was Alien Information System (Alien and Border Police Service). Since 2007, the migration data source has been the Central Population Register Record (Ministry of Interior). (CZSO 2007)

8.8 million in 1948 (as of January 1). The number of war-related casualties among the population of the Czech Republic was estimated at 425,000 (Srb 2004).

For the years 1945 and 1946, the officially published statistics on births by structures do not include women with German ethnicity (Srb 2004). Therefore, the sum is 17.9% lower than total number of births in the Czech Lands in 1945, and 5.5% lower in 1946. However, the population count data for 1945 and 1946 do not cover the German population (CZSO 1981). Therefore, the data for 1945–46 should be used with caution.

The statistical office was renamed repeatedly, especially during the 1960s. In 1960, it was called “Ústřední úřad státní kontroly a statistiky” (Central Office of the State Control and Statistics); in 1961–1963, “Ústřední komise lidové kontroly a statistiky” (Central Commission of the People’s Control and Statistics); in 1964–1965, “Státní úřad statistický” (State Statistical Office); and finally, “Federální statistický úřad (Federal Statistical Office) for the period 1966–1992. The Federal Statistical Office was divided into the Czech Statistical Office and the Slovak Statistical Office. The State Statistical Office and, later, the Federal Statistical Office, published vital statistics for the whole of Czechoslovakia, and separately for the Czech and Slovak Republics. In 1974–1985, the Czech Statistical Office published vital statistics publications for the Czech Socialist Republic only. Data on population change have been available in electronic form since 1991. Since 1993, the Czech Statistical Office (CZSO) has been responsible for collecting and processing the vital statistics data in the independent Czech Republic.

The statistical office also prepares and conducts population censuses, and processes and publishes census results. Eight censuses took place since 1919 (1921, 1930, 1950, 1961, 1970, 1980, 1991, and 2001), and the next one is being prepared for 2011. Census data covered population present at the time of the census during the period 1921–1950, and resident population in 1961–1991 (all inhabitants with a permanent residence permit for the Czech Republic were included). For 2001, the definition of the population covered was as follows: “resident population of the Czech Republic, irrespective of citizenship, and foreigners with long-term stay (i.e., the stay based on visa over 90 days, as stipulated by Act No. 326/1999 Coll.) and foreigners with granted asylum status (in compliance with Act No. 325/1999 Coll.)” (CZSO 2007).

Vital statistics data refer to the resident population of the Czech Republic, irrespective of citizenship. Since 2001, the figures also include (in accordance with the Population and Housing Census 2001) foreigners with long-term stay (i.e. the stay based on visa over 90 days, as stipulated by Act No. 326/1999 Coll.) and foreigners with granted asylum status (in compliance with Act No. 325/1999 Coll.). Since May 1, 2005, in accordance with amendment No. 326/1999 Coll., the figures include citizens of the European Union with temporary stay on the territory of the Czech Republic, and citizens of other countries with long-term stay. The data contain also information on events (marriages, births and deaths) of permanent residents of the Czech Republic that took place abroad (CZSO 2007).

2 Birth count data

2.1 Birth count data by age of mother and birth order

Birth count data included in the Human Fertility Database cover periods 1925–1937 and 1945–2009. Data for the periods 1925–1937 and 1945–1990 come from the official publications; since 1991, the figures were recalculated from individual birth records provided by the CZSO. A detailed list of references to the sources is included separately in the reference file. While vital statistics publications containing data on births date back to 1919, births were not specified by birth order until 1925.

The design of the vital statistics publications changed several times over the period 1925–1990, and these changes influenced the level of detail of the available data on births by age in completed years (ACY) of mother and birth order, as shown in Appendix 1. In that period, the birth count statistics were also affected by the changes in the definition of vitality of births. Until 1985, only total births were recorded by age and birth order, but, since 1986, these statistics have been available for live births.

In 1925–1973, data on births by single years of age of mother and birth order were published separately by marital status (births within and outside marriage, both categories recorded by biological birth order). Examples of the original table layouts as published in the official demographic yearbooks are available on request in the special Excel file (both the original Czech version and its English translation are provided). While data for marital births were available for birth orders 1 through 10+, data on births out of wedlock were available for birth orders 1 through 7+. Therefore, it is possible to obtain order-specific data only up to the 7+ birth order category. Since 1974, data by birth order were shown irrespective of the marital status of the mother for births up to birth order 10+.

Less detailed data on live births are available for the period before 1986, and will be used for estimating the number of live births by birth order and by single years of age of the mother². Since 1949, age-specific data for live births have been available (not specified by birth order). Vital statistics records since 1959 also included a table on live births by birth order and age of mother in five-year age groups. For 1919–1948, live births are tabulated in no greater detail than five-year age groups, for all birth orders combined.

For the period of 1991–2009, files on individual birth records were used to tabulate live births by Lexis triangles (both age in completed years and birth cohort of mother are distinguished) and birth order. A similar table has been published in the official vital statistics publications since 2004, and is available online at the CZSO website³.

2.2 Birth count data by month and year of age

Totals of live births by calendar month and year of birth are available for 1919–1937 and 1945–2009. For 1945 and 1946, the data do not include births to women of German ethnicity.

² See Appendix II for details on iterative proportional fitting procedure (IPF).

³ E.g., for 2007 see Table D.06 *Live births: by age and year of birth of mother, sex, legitimacy and birth order* at <http://www.czso.cz/csu/2007edicniplan.nsf/engp/4019-07>.

3 Population count data

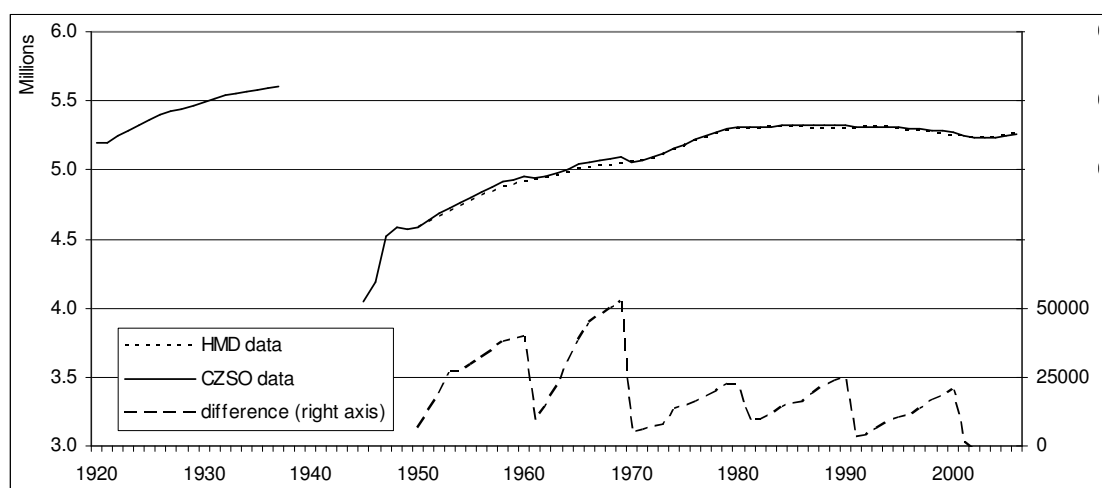
3.1 Population count data by age

The annual age structure of women since 1950 is taken from the Human Mortality Database (HMD); for reference, see the file “About mortality data for the Czech Republic” (Rychtaříková and Jasilionis 2006) the HMD website (www.mortality.org).

Official mid-year population counts of women by single years of age are available for the period 1920–1937, and since 1945. Mid-year population estimates by sex and age were reconstructed from original manuscripts by the Czech Statistical Office for the years 1920–1979 (CZSO 1981). The official data on population for the post-war period of 1945–1947 do not include people of German ethnicity, and are of poor quality due to large-scale unregistered migration (Srb 2004).

The data taken from HMD differ from official data of CZSO, as they are adjusted for underestimation of migration and mortality in intercensal periods (see Figure 1).

Figure 1: Population counts according to the Human Mortality Database and the Czech Statistical Office and the difference between the two sources (total female mid-year population)



3.2 Population count data by age/cohort and parity

Distribution of women by the number of live births is available from the census data. Women aged 15 and over are asked to report the number of live births they have ever had, as well as the number of children they have borne in their current marriage⁴. Data on the number of women by the number of children have been collected since the census of 1930. For the purposes of the HFD, data from censuses 1950, 1961, 1970, 1980, 1991, and 2001 are used. In the 1930 census, only married, widowed, and divorced women were asked about the number of children they had given birth to during their current (or most recent) marriage.

⁴ Women were asked to answer a question on “the number of all live born children” they ever had. The phrasing of the question was the same through period 1950-1991; in 2001, respondents were asked to indicate “the number of all born children”.

The data on the parity and age composition of the female population are available for all these censuses, in the same level of detail as the data published in the official census publications (usually with open-ended intervals). Furthermore, the available data for the 1980, 1991, and 2001 censuses, prepared from the electronic databases of the CZSO, are more detailed, specifying parity and single year of age or birth cohort for each woman. The numbers of women by number of live births are supplemented by the total number of live children born to women of a given age (denoted by “NOCH”).

Data from the earlier censuses show a low proportion of women with an unreported number of children (unknown) when compared to the 2001 census (see Table 1 and Figure 2). In 2001, the proportion of unknown cases was below 3% at ages above 35, but reached considerably higher values at younger ages, peaking at 26% among women aged 15. It is very likely that a large majority of women who did not report their number of children in 2001 were childless. In fact, when women with an unknown number of children in 2001 are added to those reported as childless, completed fertility rates and parity distributions are practically identical with the estimations based on the 1991 census, combined with the vital statistics data in 1991–2001 (see estimates of childlessness in Figure 3). Because the 2001 census data produce downward-biased estimates of childlessness when unknown cases are disregarded, these data should be used in the HFD computations only when all the women with an unknown number of children are assumed to be childless.⁵

Table 1: Percentage of women at age 15-49 with an unknown number of live born children, censuses 1950 to 2001

Census date	Unknown cases (15-49)
1.3.1950	2.8%
1.3.1961	0.7%
1.12.1970	0.6%
1.11.1980	1.3%
3.3.1991	1.5%
1.3.2001	8.6%

⁵ Although the problem of missing records on women’s parity status is relatively minor in the 1980 and 1991 censuses, we recommend treating women with unknown number of children as childless in these cases as well.

Figure 2: Percentage of women with an unknown number of live born children by age, censuses 1980, 1991 and 2001

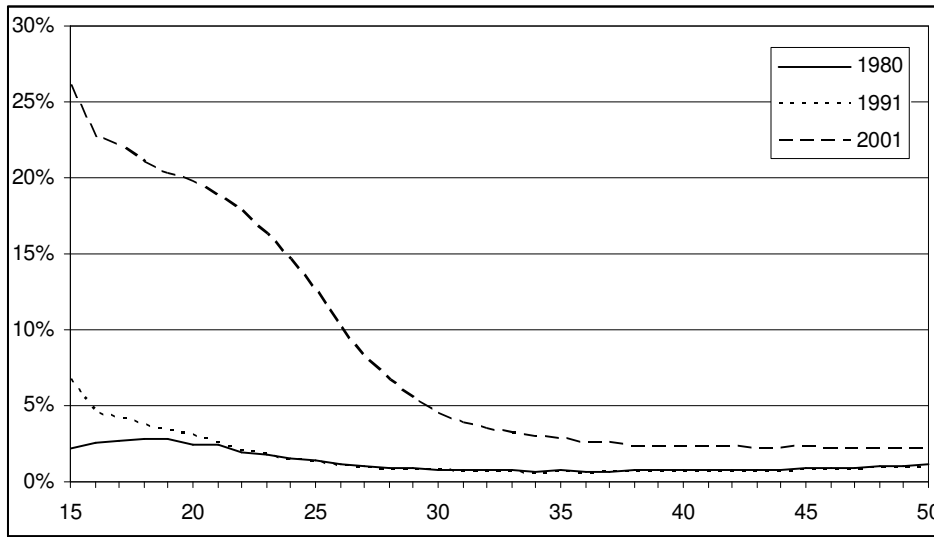
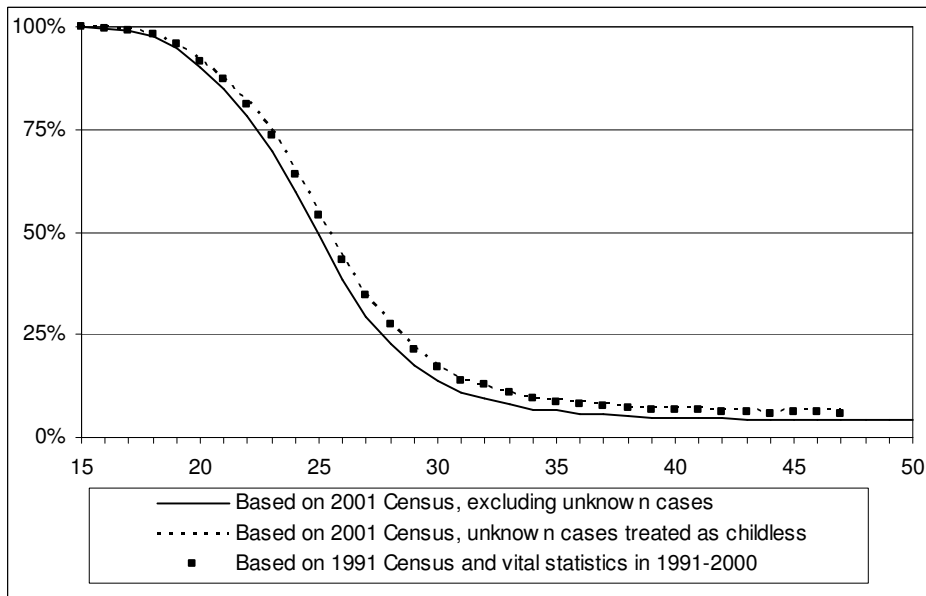


Figure 3: Estimated percentage of childless women by age on January 1, 2001, using different estimates based on the 1991 and 2001 Census and vital statistics data



4 Specific details

4.1 Definitions of live birth and stillbirth⁶

Different definitions of live birth applied in the period since 1925, influencing the number and the proportion of live births in the vital statistics. These definitions are relevant to the data in the HFD, since only the data on total births (not on live births) by birth order and age in completed years of mother age are available until 1985.

Definition of live birth before 1948:

Live birth was defined as any fetus showing signs of life: a heartbeat or breathing. Any fetuses delivered after a gestation period of 28 weeks showing no signs of life were considered stillbirths. In this period, the proportion of stillbirths among total births gradually decreased from 2.8% to 1.5%.

Definition of live birth valid 1949 to 1952:

Live birth was defined as any fetus showing signs of life: a heartbeat or breathing. Fetuses showing no signs of life and weighting more than 400 grams were registered as stillbirths. Those having a birth weight below 400 grams were considered spontaneous abortions. In this period, the proportion of still births among total births was 1.5% to 1.7%.

Definition of live birth valid from 1953 to 1964:

Live birth was defined as a birth of a fetus that showed signs of life (breathing or a heartbeat), born after 28 weeks of gestation, longer than 35 cm and weighing at least 1,000 grams. All fetuses not meeting the criteria of live birth, but surviving at least 24 hours, were considered live births. Those surviving less than 24 hours were registered as spontaneous abortions. A fetus of at least 28 weeks' gestation, with a body length of at least 35 cm, a birth weight of at least 1,000 grams, and that was not breathing, was considered a stillbirth. In this period, the proportion of stillbirths among total births gradually decreased from 1.2% to 0.8%.

WHO definition of live birth valid from January 1, 1965 to February 28, 1988:

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. In this period, the proportion of still births among total births gradually decreased from 0.7% to 0.4%.⁷

Definition of live birth valid since January 3, 1988:

Decree No. 11/1988 of the Ministry of Health of the CSR from January 22, 1988 defines a live-born child as a child fully expelled or removed out of the mother's body, who gives a sign of life and whose birth weight is (a) 500 g or more, or (b) lower than 500 g, if it survives 24 hours after delivery. The signs of life include respiration, heartbeat, umbilicus pulsation or active movement of muscles, even if umbilical cord is not interrupted or placenta delivered. A stillborn child is a child fully expelled or removed out of the mother's body, not showing any sign of life and whose

⁶ This section has been compiled from the following sources: Mészáros and Jasilionis (2007), Rychtaříková and Jasilionis (2006), Potančoková (2008), and CZSO (2007).

⁷ The 1965 administrative change in the definition of live birth resulted in an increase in the infant mortality rate in 1965 from 19.1‰ (based on the 1964 definition) to 23.7‰ (based on the 1965 definition). The difference was due to 700 live births in 1965 that would have been considered spontaneous abortions in 1964. (Rychtaříková and Jasilionis 2006).

birth weight is 1,000 g or more (CZSO 2007). In this period, the proportion of still births among total births was 0.3% to 0.4%.

4.2 Age

The age of the mother was recorded in completed years during the entire period of 1925–2009 (Lexis squares). Since 1991, the data are available by both age in completed years and birth cohort (Lexis triangles).

4.3 Birth order

Czechoslovak vital statistics publications distinguish between “birth order” and “birth order within current marriage” as early as 1919–1937. “Birth order” always refers to biological (true) birth order of a child to the mother, and is used in all tables included into HFD. Birth order within current marriage was tabulated only in tables concerning births in current marriage by time elapsed since marriage of parents.

4.4 Unknown cases

During 1925–1985, the reported births included unknown cases of age or order. Since 1986, there were officially no unknown cases, or the unknown cases were allocated into known values according to the intern algorithm of the CZSO.

4.5 Minor inconsistencies in the vital statistics records for 1981

The age and parity specific births published in the 1981 Demographic Yearbook (CZSO 1982) do not sum into the published totals. However, the HFD includes data as published. The inconsistencies are negligible, and should not have any significant influence on the level of fertility indicators:

- The sum of 1st order births by age is 61,083, but the printed total is 61,081.
- The sum of 8th order births by age is 106, but the printed total is 107.
- The sum of 9th order births by age is 67, but the printed total is 68.

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Data sources

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9. Census 2001, Number of women by age and number of all born children, output from the database of the Czech Statistical Office.

**APPENDIX 1
DESCRIPTION OF DATA USED FOR LEXIS DATABASE**

BIRTHS

Period	Type of data	Age range	Birth order	RefCode(s)
1950-1973*	Annual number of live births by age of mother (Lexis squares)	≤14, 15, ...,44, 45-49, 50+, unknown	1, 2,...,7+, unknown	3
1974-1985*	Annual number of live births by age of mother (Lexis squares)	≤14, 15, ...,44, 45-49, 50+, unknown	1, 2,...,10+, unknown	3
1986-1990	Annual number of live births by age of mother (Lexis squares)	≤14, 15, ...,44, 45-49, 50+	1, 2,...,10+	3
1991-2009	Annual number of live births by age of mother, mother's year of birth and birth order (Lexis triangles)	12,..., 61	1, 2,...,10+	1
1919-2009	Annual number of live births by month	—	—	1, 3

* Estimated using iterative proportional fitting procedure – see Appendix 2.

FEMALE POPULATION: Distribution by age and parity

Period	Type of data	Age range	Year of birth, range	Parity	RefCode(s)	Notes
01.03.1950	Number of women by age and parity	15, ..., 94, 95+, unknown	—	0, ..., 14, 15+, unknown	4	'Golden census' unknown parity to be distributed proportionally
01.03.1961	Number of women by age and parity	15, ..., 94, 95+, unknown	—	0, ..., 14, 15+, unknown	5	unknown parity to be distributed proportionally
01.12.1970	Number of women by age and parity	15, ..., 94, 95+, unknown	—	0, ..., 11, 12+, unknown	6	unknown parity to be distributed proportionally
01.11.1980	Number of women by year of birth and parity	—	1880, ..., 1980, unknown	0, ..., 25, unknown	7	unknown parity to be regarded as parity 0
03.03.1991	Number of women by year of birth and parity	—	1881, ..., 1991, unknown	0, ..., 20, unknown	8	unknown parity to be regarded as parity 0
01.03.2001	Number of women by year of birth and parity	—	1894, ..., 2001, unknown	0, ..., 15, unknown	9	unknown parity to be regarded as parity 0

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

IPF method

The **iterative proportional fitting procedure** (IPF, also known as RAS algorithm) is an iterative algorithm for estimating single values of a contingency table such that the marginal totals remain fixed. In Human Fertility Database (HFD) the IPF is used for estimating live births by age of mother and birth order $LB_{i,x}$, when these data are available only for the distribution of total births $TB_{i,x}$ (including stillbirths), whereas numbers of live births are specified by less detailed subtotals – namely live births by age of mother LB_x and live births by birth order LB_i . In the initial stage of HFD, this was the case for the databases of two countries, the Czech Republic 1950-1985, and Slovakia 1950-1985.

The iterative procedure repeats step (k) consisting of two estimations until certain criterion is reached. The estimations are:

- Estimate by rows: $B_{i,x}^{k'} = B_{i,x}^{k-1} / \sum_i B_{i,x}^{k-1} * LB_x$
- Estimate by columns: $B_{i,x}^k = B_{i,x}^{k'} / \sum_x B_{i,x}^{k'} * LB_i$
- in the first step ($k=1$), known values of total births by age of mother and birth order $TB_{i,x}$ are used as $B_{i,x}^0$
- The criterion is that for each $(i,x): |B_{i,x}^k - B_{i,x}^{k-1}| \leq 0.01$. After reaching this criterion in step k^{\max} , estimated values are used as numbers of live births by age of mother and birth order $LB_{i,x} \cong B_{i,x}^{k^{\max}}$