

# HUMAN FERTILITY DATABASE DOCUMENTATION: BULGARIA

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**WARNING:** Due to the low quality of data prior to 1960, very detailed data are not reliable for this period. Cohort fertility indicators, including data on childlessness and parity distribution, should be used with the greatest caution (see section 5).

## **1 General information**

This report describes statistical data provided by the National Statistical Institute, Bulgaria, to the Human Fertility Database (HFD). The data include the number of live births by age of the mother, mother's year of birth, and birth order; the number of live births by month; and the female population by age and parity (number of live-born children) from the population census carried out on 1 March 2001. Data on birth counts provided for the HFD and described in this report originate from official vital statistics publications as well as from individual birth records.

### **1.1 Brief history**

Bulgaria is located in South-Eastern Europe and occupies the eastern part of the Balkan Peninsula. The borders of the present Republic of Bulgaria have not changed since 1946. Since 1991, Bulgaria has been a republic with a parliamentary form of government. Bulgaria joined the European Union in 2007.

According to the 2001 census, Bulgaria had 7,928,901 inhabitants, of whom 83.9% were of Bulgarian ethnicity, 9.4% were Turkish, and 4.7% were Gypsies (Roma). The remaining 2% of the population consist of around 40 ethnic minorities, and those who did not respond to questions about ethnicity. The population of Bulgaria has declined rapidly over the last two decades. The population was near to nine million in 1989, but this figure had dropped to 7.6 million at the end of 2008, especially due to emigration, but in part also because of very low fertility. As a result of ongoing socio-economic and political changes, as well as deteriorating living conditions since 1990, there have been significant shifts in the demographic behaviour of the population, resulting in natural population decline, very low fertility, and widespread emigration. Emigration, especially among ethnic Turks, peaked already at the turn of the

1980s and 1990, with a negative net migration estimated at over 470 thousand in the period 1989-1993 (Council of Europe 2006).

The Statistical Office and the Bulgarian State Statistical Organization were established in 1880-1881. The National Statistical Institute (NSI) was established by the Law on Statistics in 1991.

## **1.2 Data collection**

All statistical data on population and demographic events are processed and distributed through the NSI. Data on births are provided by the *Unified System for Civil Registration and Administrative Services of Population* (thereafter referred to as the “civil registration system”). An official document – *certificate of birth* – is issued for each birth. The document includes information about the newborn child, about the mother, and about the father (if he is known), irrespective of their marital status.

## **1.3 Territorial coverage**

There were no territorial changes in Bulgaria during the period covered by the data provided for the Human Fertility Database (since 1947).

The main category used in the current demographic statistics and population censuses is ‘resident population’. This category includes all the people who reside permanently in the country and have not left it officially as of December 31 of the respective year, for a period of more than one year. Foreign citizens who stayed in Bulgaria for less than a year are not included in the resident population.

The aggregate number of live births includes live-born children who are Bulgarian citizens, as well as those whose primary place of residence is Bulgaria, irrespective of the country of birth.

## **2 Birth count data**

Birth data included in the Human Fertility Database refer to the period spanning 1947–2009. Data for births in 1947–1985 are taken from the official demographic publications. For 1947–1959 the order-specific data include stillbirths and thus are available for total births only. Data on live births in this period are available only by the age-group of the mother, without information on birth order. In 1950-1952, live births were not registered by age of the mother at all, and only total numbers of live births are available for these years (see the file with monthly data). For the period spanning 1947–1985, the data on (live) births are classified by mother’s age group and birth order up to 9+. Starting in 1986, the data were extracted from the *Information System ‘Demography’* database (ISD) established at the NSI on the basis of individual birth records. All the data are specified by single years of age, birth cohort of the mother, and birth order; birth orders up to 11+ are distinguished.

Data on live births by months cover the years 1900, 1905, 1910, 1920, 1925, 1930 and 1935, and the period 1939–2009.

### **3 Population count data**

#### ***3.1 Population count data by age***

The annual age structure of women since 1947 is taken from the Human Mortality Database (HMD). The data from the HMD for 1989-2000 differ from official data of the NSI, as they are adjusted for underestimation of migration and mortality in inter-censal periods (for reference, see the file "About mortality data for Bulgaria", Philipov and Jasilionis 2002). The difference in the exposure causes the gap between the official TFR and that computed by the HFD of about 0.03-0.06 in 1996-2001.

#### ***3.2 Population count data by age and parity***

The distribution of the female population by age and the number of live-born children is currently available from the 2001 census only. These data are tabulated by single years of age and number of live-born children up to parity five and higher. Similar data were also collected in the 1985 census, but the results were not published and thus are not available. The 1992 census did not collect information on the number of live-born children.

### **4 Specific details**

#### ***4.1 Definition of live birth***

A live-born child weighs at least 1,000 or more grams, and shows signs of life (breathing, functioning of the heart, pulsation of the umbilical cord or voluntary movement of the muscles) after the completion of a pregnancy, irrespective of its duration. If the foetus weighs less than 1,000 grams, it is considered live-born only if it survives for at least six days. A child is classified as stillborn if it shows no signs of life, if it is 35 or more centimetres long at the completion of the pregnancy, or if the duration of pregnancy was at least 28 weeks. This definition was adopted in 1970, and differs from the WHO recommendations. Some of the births that would be considered live births or stillbirths in other countries may therefore be recorded as miscarriages in Bulgaria. For extensive discussion of this problem see Philipov and Jasilionis 2002.

In 1947-1959 the data were published for total births, i.e. include stillbirths. For HFD purposes, numbers of live births for this period were estimated using the method described in Appendix 2.

#### ***4.2 Age***

Data on births by age of the mother refer to age in completed years. Data for 1947-1959 are only by 5-year age groups, including the broad age group  $\leq 19$ . Since such a broad age group cannot be satisfactorily recalculated into single years of age using the present HFD methodology (see the HFD Methods Protocol), data were first recalculated into narrower age groups 12-14 and 15-19 using the method described in Appendix 3.

Data for 1978–1985 (for all birth orders combined) and for 1986–2009 (both by birth order and for all birth orders combined) are specified by Lexis triangles, i.e. by both age of mother and mother's birth cohort. However for some years in 2000-2009 the schedule of births by Lexis triangles resemble the "zig-zag" pattern, indicating a possible wrong allocation of small proportion of births (up to 2%) into wrong Lexis triangle. Since it was not found that the pattern of error is systematic, the HFD nevertheless uses the original data by triangles (which also conform to Eurostat database data).

### **4.3 Birth order**

Birth order is defined by the total number of live-born children a woman has previously delivered, without counting stillbirths. In case of multiple deliveries, each child born is assigned a separate birth order.

### **4.4 Unknown cases**

The number of cases with unknown age of the mother and/or unknown birth order of the child varies during the period covered. In 1947–1980, the number of unknown cases was gradually decreasing from about 300 to less than 100 a year. In 1981–1994, only a very few cases with unknown age of the mother were recorded, and there were practically no cases with unknown birth order of the child. For foundlings (abandoned children) whose mother was unknown, the age of the mother was imputed as 17 and the birth order was set to one. No unknown cases were recorded in 1995-1999. Since 2000, births to Bulgarian residents living abroad have been recorded as births of unknown birth order. The number of births with unknown birth order has risen since 2007, when Bulgaria entered the European Union and the number of Bulgarian women living and bearing children abroad increased substantially. While between 2000 and 2006 there were only about 20-50 cases with unknown birth order per year, in 2007 they were 680, in 2008 – 728, and in 2009 – 645.

In 1960-1977, the order-specific data classified by 5-year age groups include a category of unknown age, while the non-order specific data classified by single age groups do not have such a category. This leads to a slight disagreement between the totals by 5-year age groups from the both sources. However, the differences are very small.

### **4.5 Specific details**

There are different subpopulations in Bulgaria with distinct fertility behaviour. Women with three and more children are mainly of Roma ethnicity, who begin their reproduction at a young age. The recent postponement of births is much more prevalent among Bulgarian women than among Turks and Roma (Koytcheva and Philipov 2008). This can explain why the mean age at second childbirth has exceeded that of the third one in 2009. In this year, the peak age for third birth rates was at age 21-23, while the peak in second birth rates was reached at age 30.

## **5 Quality of the data**

The civil registration system covers in detail all newborn children in the country, as well as births to Bulgarian residents temporarily living abroad. The data are considered to have a high degree of reliability and completeness. The data go through formal and logical tests, both in the National Civil Registration System and at the National Statistical Institute (Information System 'Demography', ISD). Quality checks are made for each record, and individual registrations of births are compared with the population numbers recorded in the ISD.

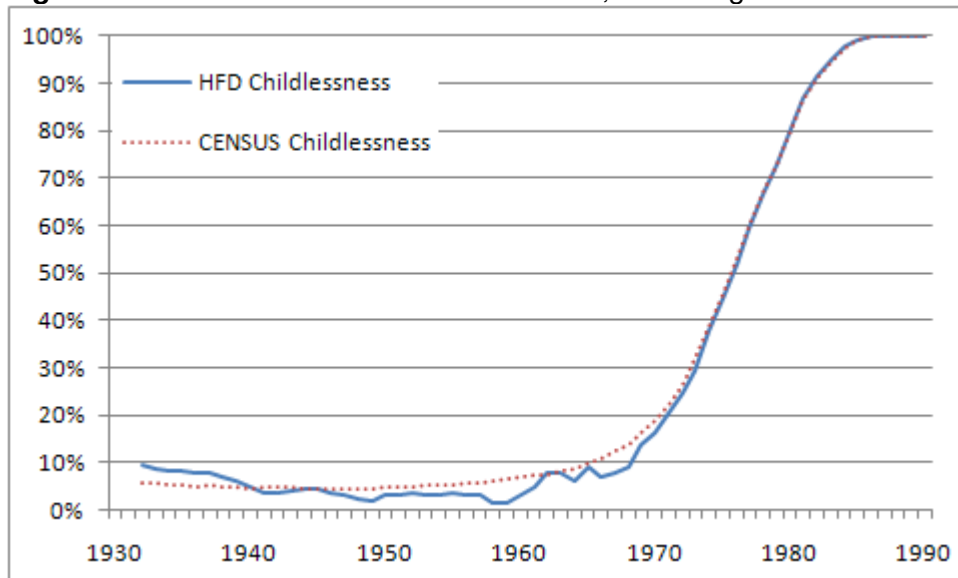
In cases where the data need to be corrected, birth certificates are used. The birth certificate is an official document of the civil registration system and has legal value.

The quality of population data is affected by high and undocumented migration in the period after 1989. In 1989 and 1990 about 300,000 persons left the country, and around 200,000 returned during the next 2-3 years. High emigration continued into the 1990s and even intensified after 2007, when Bulgaria entered the European Union. These

issues are also discussed in the country documentation for Bulgaria in the Human Mortality Database (Philipov and Jasilionis 2002).

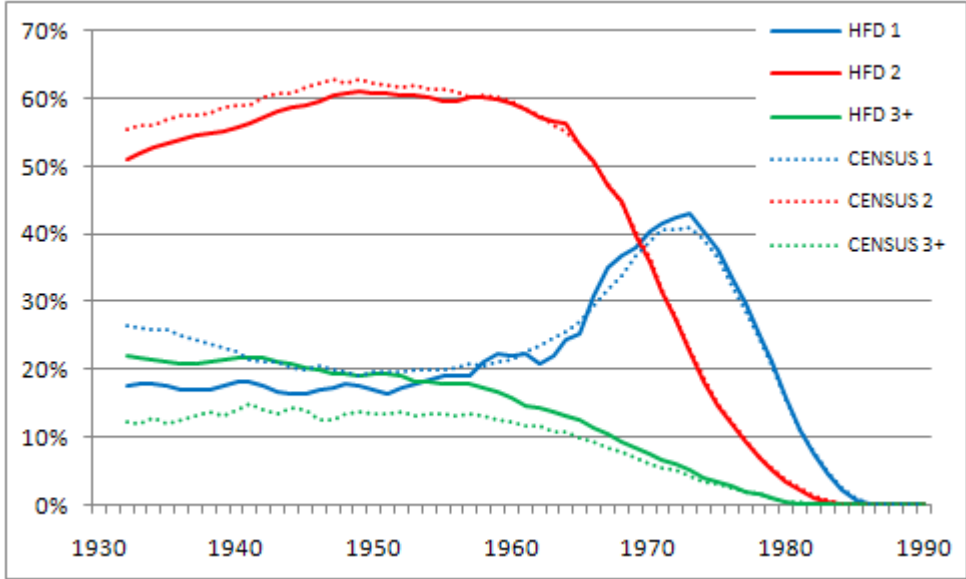
Due to the problems in matching occurrences (live births) with exposures (female population), and lower quality of the data prior to 1986, cohort data may reach implausible results. For instance, childlessness among the cohorts 1940-58 is lower than 5% and fluctuating between cohorts. Even though the 2001 census results show very low childlessness of 4-6% for the cohorts 1940-60 (Koytcheva and Philipov 2008), the HFD computations show yet lower, and often implausible, values (see Figure 1).

**Figure 1:** Childlessness of cohorts as at 2001, according to HFD data and census data



Even more problematic are the data for higher parities. As shown in Figure 2, a comparison of the HFD results derived from vital statistics data with the results recorded in the census of 2001 discloses huge differences between these two sources. While the cumulation of vital statistics data used in the HFD computations underestimates the proportion of women with one and two children, it overestimates the proportion with three and more children. This error is particularly evident for older cohorts. We attribute this difference to the low quality of data before 1986 (i.e., affecting the cohorts born before 1971) and also to the high emigration prior to the 2001 census. Cohort fertility indicators should therefore be used with extreme caution, especially for cohorts born before 1971.

**Figure 2:** Proportion of women with 1, 2 or 3+ children by cohort as at 2001, according to HFD data and census data



For 1987, the total number of live births based on age- and birth order-specific data is by 1 case higher than the sum of monthly birth data; for 1990, the total number of live births based on age- and birth order-specific data is by 2 cases higher than the sum of monthly birth data. The reasons for these discrepancies have not been identified.

## Data sources

1. Demographic Yearbook of Bulgaria (1961-1989). Sofia: NSI.
2. Information System 'Demography' database (ISD) – Individual birth records of NSI.
3. Population census in Bulgaria 2001. Sofia: NSI.
4. Data provided by the Observatoire Démographique Européen, who obtained them in 1983 from the Committee for integrated social information system to the Council of Ministers of Bulgaria

## References

- Council of Europe 2006. Recent demographic developments in Europe 2005. European Population Committee of the Council of Europe
- Philipov, D. and D. Jasilionis 2002. *About mortality data for Bulgaria*. Documentation report for the Human Mortality Database (updated 2 December 2010). Available online on [www.mortality.org](http://www.mortality.org)
- Koytcheva, E. and D. Philipov 2008. Bulgaria: Ethnic differentials in rapidly declining fertility. *Demographic Research*, Vol. 19 (13): 361-402. Available online on <http://www.demographic-research.org/Volumes/Vol19/13/>

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

**BIRTHS**

Period	Type of data	Age range	Birth order	RefCode(s)
1947-1959	Annual number of total births by age of mother and birth order (Lexis squares)	-19, 20-24, ..., 40-44, 45+, unknown	1, 2,..., 8, 9+, unknown	1
1947-1949, 1953-1959	Annual number of live births by age of mother (Lexis squares)	-19, 20-24, ..., 40-44, 45+, unknown	–	1
1960-1985	Annual number of live births by age of mother and birth order (Lexis squares)	-14, 15-19, ..., 45-49, 50+, unknown	1, 2,..., 8, 9+, unknown	1
1960-1977	Annual number of live births by age of mother (Lexis squares)	-14, 15, ..., 49, 50+	–	4
1978-1985	Annual number of live births by age of mother and mother's year of birth (Lexis triangles)	12, ..., 49, 50+, unknown	–	1
1986-1994	Annual number of live births by age of mother, mother's year of birth, and birth order (Lexis triangles)	10, ..., 50, 51+, unknown	1, 2,..., 5, 6+, unknown	2
1995-2009	Annual number of live births by age of mother, mother's year of birth, and birth order (Lexis triangles)	10, ..., 50, 51+, unknown	1, 2,..., 10, 11+, unknown	2
1900, 1905, 1910, 1920, 1925, 1930, 1935, 1939-2009	Annual number of live births by month	–	–	1

**FEMALE POPULATION: Distribution by age and parity**

Period	Type of data	Age range	Year of birth, range	Parity	RefCode(s)
01.03.2001	Number of women by age and parity	0, ..., 99, 100+	–	0, 1, 2, 3, 4, 5+	3

**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

### ADJUSTMENT OF ALL BIRTHS TO LIVE BIRTHS

For the years 1947-1959, birth counts by age of the mother and birth order are available only for all births, including stillbirths. However, for the years 1947-1949 and 1953-1959<sup>1</sup>, the total number of live births in each age category is available, and for the years 1950-1952, the total annual number of live births is available.

Since the likelihood of stillbirths may vary with age, for the years where the number of live births by age category is available, an age- and period-specific calculation was performed to estimate the number of live births at each birth order. For the years where only the total number of live births is available, a period-specific calculation was performed. Note that both calculations may result in a non-integer estimate of the number of live births by age.

#### Age- and period-specific calculation

In order to produce an estimate of the number of live births by age and birth order  $B_i^*(x, t)$  for the years for which both live births  $B(x, t)$  and total births  $B^A(x, t)$  are available by age of the mother, we make a two-step computation. First, we calculate the ratio of live births to total births for a given age and year  $r(x, t)$  (formula 1). Then we multiply the counts of total births specific for age and birth order  $B_i^A(x, t)$  in the given year by this ratio (formula 2).

$$r(x, t) = \frac{B(x, t)}{B^A(x, t)} \quad (1)$$

$$B_i^*(x, t) = r(x, t) \cdot B_i^A(x, t) \quad (2)$$

#### Period-specific calculation

In order to estimate the number of live births by age and birth order  $B_i^*(x, t)$  for the years for which only total (in respect to birth order) counts of both live births  $B(t)$  and total births  $B^A(t)$  are available, we perform a similar procedure. We calculate the ratio of live births to total births for a given year  $r(t)$  and then we multiply the counts of total births specific for age and birth order  $B_i^A(x, t)$  in this year by the estimated ratio (formulae 3 and 4).

$$r(t) = \frac{B(t)}{B^A(t)} \quad (3)$$

$$B_i^*(x, t) = r(t) \cdot B_i^A(x, t) \quad (4)$$

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<sup>1</sup> In 1954 the recorded number of live births with unknown age of mother (313) is higher than the recorded number of total births (i.e. including stillbirths) with unknown age of mother (280), resulting in  $r(UNK, 1954) > 1$ . The reason of this discrepancy is unknown. HFD uses the first figure (313).

### APPENDIX 3 ADJUSTMENTS OF AGE CATEGORY ≤19

For the years 1947-1959, birth counts by age and birth order are available only for the age category ≤19. Because such a broad age group cannot be satisfactorily recalculated into single age groups using the HFD methodology (see the HFD Methods Protocol), the data are split into two age intervals 12-14 and 15-19 using a simple method described below.

First, the ratio of births in the age interval 12-14 to births in the age interval 12-19 is estimated for each birth order  $i$  using the known values for the years 1960-1969:

$$r_i(12 \leq x \leq 14) = \frac{B_i(x \leq 14, t = 1960 - 1969)}{B_i(x \leq 19, t = 1960 - 1969)}, \text{ for } i = 1, 2 \quad (5)$$

$$r_i(12 \leq x \leq 14) = 0, \text{ for } i = 3, 4, 5+, \text{ UNK} \quad (6)$$

The obtained values used in the further calculations are  $r_1(12 \leq x \leq 14) = 0.76\%$  and  $r_2(12 \leq x \leq 14) = 0.08\%$ .

Then the number of live births in the age interval 12-14 for each year of the period 1947-1959 and each birth order is estimated as:

$$B_i(12 \leq x \leq 14, t) = r_i(12 \leq x \leq 14) \cdot B_i(x \leq 19, t) \quad (7)$$

The remaining births from the age interval ≤19 belong to the age interval 15-19.