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# Human Fertility Database Documentation: Germany

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# Human Fertility Database Documentation: Germany

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**WARNING:**

Due to the improved procedure for splitting the input birth data (vertical paralelograms) into Lexis triangles, fertility rates and other indicators differ from the previous data release as of November 1, 2011.

## 1 General information[1]

This document describes the German data that have been made available for the Human Fertility Database (HFD). As the data for Germany in the HFD cover the period 1950-2010[2], a portion of the data in the HFD span the years when Germany was divided into the Federal Republic of Germany (FRG) and the German Democratic Republic (GDR). The two states had their own statistical offices and separate legal frameworks that governed data collection. In the GDR, this office was called the *Staatliche Zentralverwaltung für Statistik* until 1990, when it was renamed the *Statistische Amt der DDR* (Statistisches Bundesamt 1999a: 75ff.; Oettel 2006: 53). In the FRG, the *Statistisches Bundesamt*, which was established in 1949, organized the data collection. Because the two statistical offices had different data collection procedures, data availability differs quite substantially between the two countries. Most notably, the statistical office of the GDR collected data on births by biological (lifetime) birth order. This practice was, however, discontinued in October 1990, when the German Unification Treaty prescribed that the legal framework (including regulations that governed the collection of data) was now applicable to the eastern part of Germany as well. This means that 1989, the year of the fall of the Berlin Wall, marks the last year for which order-specific fertility data are available in the vital statistics of East Germany. The Federal Republic of Germany never collected data on births by biological birth order; births were registered by birth order within the current marriage. Very recently, the German government passed a law stipulating that order-specific fertility should be collected in the vital statistics

[1] We would like to thank Ines Wlosnewski, who supported us in preparing the input files for the HFD.
[2] There are birth counts for the years 1946-1949 as well, but no age-specific data are available for this time period. For detailed description of the available data, see Table A2 in Appendix 2.

(Deutscher Bundestag 2007). The first year for which these data have been made available is 2009. Because the order-specific data for the year 2008 were not of suitable quality, the Statistisches Bundesamt has not released these data.

### *1.1 Territorial coverage*

In 1990, the Unification Treaty, which merged the two previously separate states of Germany into one entity, was ratified. Within the group who prepared the input files of the HFD, of which we were members, we had a lively discussion about how to present fertility data for the period after unification. It was clear that we would like to present the data for Eastern and Western Germany separately, both before and after unification. However, it was unclear how Berlin should be treated. There were four options available:

- In the first option (**Option A**), we would have continued to publish the fertility data based on the pre-1990 borders. West Berlin would have been included in the territories of West Germany, even after 1989. East Berlin would have been included in Eastern Germany. This approach presented problems, however, because of a major regional reform that went into effect in 2000. Following this reform, some districts that used to belong to West Berlin were merged with districts that used to belong to East Berlin. This regional reform makes it very difficult to maintain a strict distinction between Eastern and Western Germany along the old borders. Furthermore, it can be argued that the substantial migration between the eastern and western parts of Berlin makes it less and less reasonable to maintain this distinction. After taking all of these arguments into account, we opted against this approach.

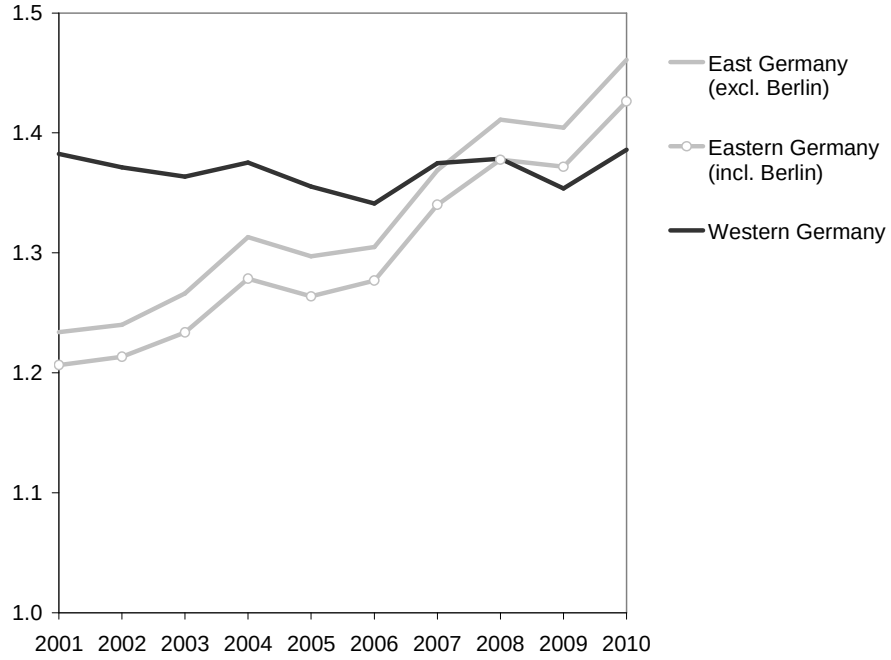
- In the second option (**Option B**), we would have distinguished between East and West Berlin until 1999 only. Until this date, East Berlin would have been considered part of East Germany, while West Berlin would have been seen as part of Western Germany. After 2000, when the reform of the districts took place, Berlin would have been excluded from the time series. Despite the fact that this is the approach the Federal Statistical Office of Germany (Statistische Bundesamt) uses in reporting fertility rates, we decided against this option because we did not want to exclude Berlin from the time series after 1999.

- In the third option (**Option C**), Berlin would have been considered part of East Germany for the entire period after 1989. Geographically, this might appear to be the best solution. Furthermore, this approach is used in the compilation of other statistics, such as the labour market statistics (see also Gnoss 2004). However, West Berliners make up quite a large share of the Eastern German population. As fertility rates in West Berlin are quite low, assigning the western part of the city to East Germany would have affected the East German total fertility rate (see Figure 1). For this reason, we decided against this approach as well.

- We finally decided to provide separate data for Germany as a whole, for Eastern Germany (without Berlin), and for Western Germany (also without Berlin) (**Option D**) for the period since 1990. We chose this approach for two reasons. First, it is the most flexible option because it allows the researcher to include or exclude Berlin from his or her time series.[3] Second, the cut-point in the data coincides with unification.[4]

[3] Berlin can be generated by subtracting the sum of Eastern and Western Germany from Germany as a whole.

**Figure 1** Total Fertility Rate (TFR) in Eastern and Western Germany, 2001-2010




Source: Statistisches Bundesamt, own calculations

Ultimately, this led us to identify three post-unification geographical units: Western Germany, Eastern Germany, and Berlin. In creating these categories, we used contemporary Germany as our starting point. **Eastern Germany** refers to the eastern states of Brandenburg, Mecklenburg-Western Pomerania, Saxony, Saxony-Anhalt, and Thuringia; while **Western Germany** refers to the western states of Schleswig-Holstein, Bavaria, Bremen, Hamburg, Hesse, Lower Saxony, North Rhine-Westphalia, Rhineland-Palatinate, Saarland, and Baden-Württemberg. **Berlin** is treated separately.

For the period before unification, the territorial definitions correspond to the old territorial borders of the Federal Republic of Germany (FRG) and the German Democratic Republic (GDR). This means that, for this time period, West Berlin is considered part of West Germany and East Berlin is considered part East Germany. **East Germany** is used synonymously here for the German Democratic Republic (GDR), and **West Germany** for the Federal Republic of Germany (FRG).

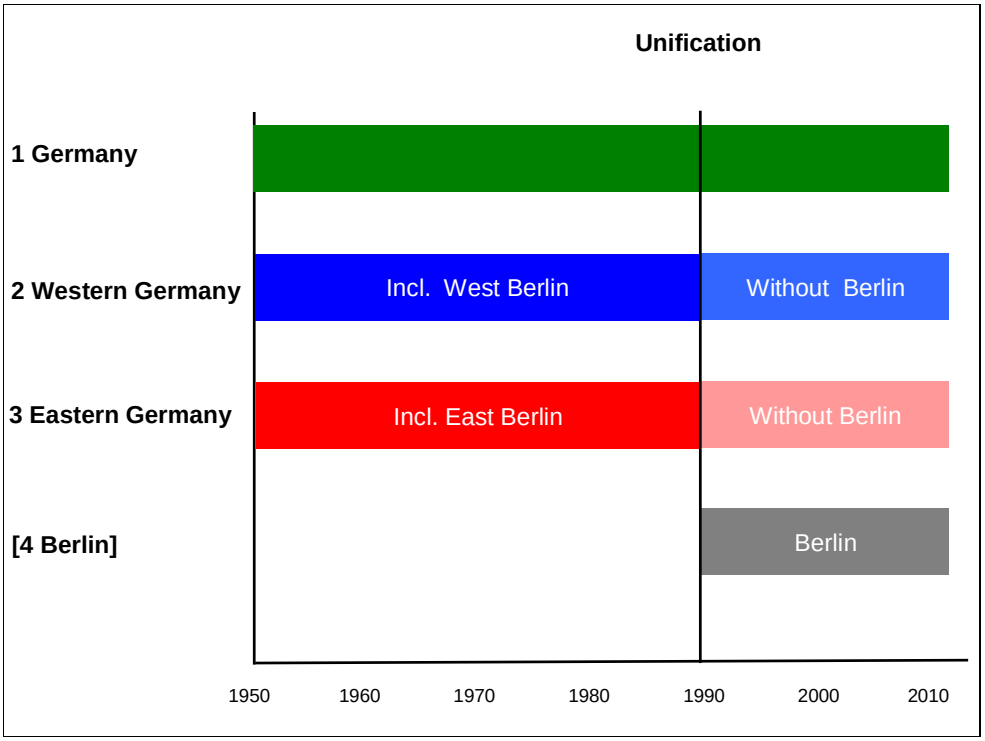
The point at which we change the definitions is 31 December 1989. This means that, for the full year 1990, the data sheet for Western Germany no longer includes West Berlin, and the data sheet for Eastern Germany no longer includes East Berlin. This disregards the fact that unification did not occur until October 1990.

[4] The drawback is, however, that there will be a break in the cohort data. In addition, Option B involves a break in the cohort data. However, this break is at a later point in time. Therefore, the cohort data from Option B span a longer time horizon without any breaks. Nevertheless, it was pointed out that excluding Berlin at unification from the total East-West time series results into a very “mild” break. Before unification, fertility in East Berlin did not differ significantly from fertility in the rest of East Germany. Omitting West Berlin from Western Germany does not affect the TFR much either because of the relatively small size of West Berlin.

We also provide data for all of Germany for the time before 1990. During this time, Germany consisted of two separate political regimes with different fertility patterns. Given that we are dealing with two distinct entities, it might not appear to be very meaningful to calculate a joint fertility rate for pre-unification Germany. However, we decided that, because there may be cases in which the researcher needs to display long time trends, it could be useful to provide such data.

Figure 2 provides a visualisation of this classification scheme. Please note that we do not provide a separate data sheet for Berlin after 1989 because the numbers for Berlin can be generated by subtracting the sum of Eastern and Western Germany from Germany as a whole.

**Figure 2** Territorial definitions




Note: No birth counts or fertility estimates are provided for Berlin as a separate unit in the HFD. However, data for Berlin (birth and population counts) for the period after 1989 can be easily obtained by calculating the difference between Germany as a whole and the sum of Eastern and Western Germany.

Table A1 in Appendix 2 provides the country and area codes that are used for the HFD. There are some territorial peculiarities regarding data availability for the time before 1956. For 1950-52, Saarland and West Berlin are not included in the fertility data for West Germany. For the years 1953-55, West Berlin is included, but Saarland is not. Due to these special issues, several area codes for West(ern) Germany were needed. Furthermore, we were unable to provide birth rates for the time before 1956 because we do not have reliable population counts or death rates for this time period.

## 2 Birth count data

### *2.1 Coverage and completeness*

#### *Live births by the age of the mother*

In Germany, births have mainly been recorded by the mother's year of birth. The age of the mother at birth is defined as the difference between the year of birth of the child and the year of birth of the mother (*Differenz zwischen Geburtsjahr des Kindes und Geburtsjahr der Mutter*), which corresponds to the age reached during the year (ARDY) (Caselli and Vallin 2006: 56). Data on live births by the mother's year of birth are available for East(ern) Germany for the period 1950-2010 and for West(ern) Germany for the period 1952-2010.

In East Germany for the period 1971-1989, births were published by the age in completed years (ACY) as well as by the annual number of live births by the mother's year of birth (ARDY) (Statistisches Bundesamt 1999b). Having the two datasets allowed us to recalculate the birth data for this period into Lexis triangles. However, because the distribution of births by the age in completed years (ACY) for the years 1971 and 1972 was slightly unusual[5], detailed birth estimates by the age of the mother and the mother's year of birth are available for the period 1973-1989 only.

Since 2000, the Federal Statistical Office of Germany has also provided data on births by the age and the year of birth of the mother (Lexis triangles). However, these more detailed data showed a jagged line in the distribution of live births over time, with a number of births that was too high in the lower Lexis triangle, and a number of live births that was too low in the upper Lexis triangle at each age (for more details, please see Section *4.2 Data quality issues*). For the HFD calculations, we therefore used the data that were provided in the ARDY format and split them into Lexis triangles using the standard HFD methodology.

#### *Live births by the age of the mother and the birth order*

The statistical office of the GDR collected data on births by the age of the mother and by the birth order. The period for which we were able to retrieve order-specific information on births is 1954-1989. Until 1988, the data are classified by the age reached during the year (ARDY). For the year 1989, the birth order data are available by the age in completed years (ACY).

It should be noted that, for the period 1954-1988, some small differences can be seen when we compare the data by the age of the mother and the birth order to the annual number of births by age. While the total number of births is the same in both files, the distribution of births across ages is slightly different. This applies to the years 1957, 1961-65, 1967-1968, and 1970. These differences are most likely caused by births with a missing birth order or a missing age of the mother. These births must have been redistributed by the Statistical Office using an algorithm of some kind for a number of years. However, there is no documentation available on this procedure. This problem affects fewer than 30 births per year. An exception is the year 1957, for which more than 400 births are classified differently in the two sources, most of them in the age category 45+[6]. For the computations in the HFD, we use only the

[5] It is possible that when the procedure for birth registration was changed in 1971, some births were assigned the wrong age.

[6] Although they looked implausible when compared to the age distributions in the neighbouring years, we made the decision to use the non-order specific data for that age category. The total number of

order-specific data. This means that, when we generated data on non-order-specific (total) births or birth rates for these particular years, we did it on the basis of the order-specific data.

The Federal Republic of Germany did not collect order-specific fertility data until 2008. The order of a birth was only recorded within the current marriage up to that date. In 2008, the registration procedure was modified and the collection of order-specific fertility data was initiated. However, in this first year, some registry offices (*Standesämter*) failed to provide correct data by birth order. Thus, reliable order-specific information did not become available until 2009. In the Human Fertility Database, order-specific data for Eastern Germany, Western Germany, and Germany as a whole are available from 2009 onwards.

### *Live births by month*

The annual number of live births by month is available for the period 1946-2010.

Detailed information about the birth data used in the HFD calculations is provided in Appendix 1. For more details on data availability, see Table A2 in Appendix 2.

## 3 Population count data

### *3.1 Population count data by age*

The official population count for Germany in 2010 was 81,751,602 (see Table 1). Roughly 20 percent of the population live in Eastern Germany (including Berlin). It should be noted that population count data are not very precise. The annual population size estimates for Western Germany are based on updates of the last population census in 1987. Data for Eastern Germany are based on updates of an extract from the population registers of 1990. We anticipate that the register-based census conducted in 2011 will provide a smaller population size figure than the one currently reported.

The annual age structure of women for West(ern) and East(ern) Germany, as well as for Germany as a whole, is estimated by using annual data on population size, deaths, and births by sex from the Statistisches Bundesamt.

As we explained in detail in Section 1.1, birth data for East and West Germany before 1990 include data for East and West Berlin, respectively. Starting in 1990, birth data on Berlin are excluded from the data files for East and West Germany. Territorial adjustment factors are applied to account for the differences in the territorial coverage of the population for both East(ern) Germany and West(ern) Germany before and after 1990.

The calculation of the female population exposure is then conducted using the standard methods presented in the HFD Methods Protocol. This means we include monthly[7] births

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births (285) was distributed over the birth orders proportionally to the birth order distributions in the neighbouring years. The differences between the total in the order-specific data, which was too high, and the total number of births in the non-order-specific data (463 cases) were classified as being of unknown age and birth order.

[7] It should be noted that, in some cases, the monthly births data used as weightings for each cohort in the exposure calculation do not exactly correspond to the population for whom the exposure is calculated because the monthly births data from 1989 and earlier include Berlin, whereas the

data where available to compensate for seasonal variations in births and the resulting effects on estimated population exposure.

**Table 1** Population size in East(ern) and West(ern) Germany (in millions)

| | **1950** | **1970** | **1980** | **1989** | **1990** | **2000** | **2005** | **2010** |
|---|---|---|---|---|---|---|---|---|
| West Germany | 50.3 | 61.0 | 61.7 | 62.7 | -- | -- | -- | -- |
| East Germany | 18.3 | 17.1 | 16.7 | 16.4 | -- | -- | -- | -- |
| Western Germany* | -- | -- | -- | -- | 61.6 | 65.0 | 65.7 | 65.4 |
| Eastern Germany* | -- | -- | -- | -- | 14.8 | 13.8 | 13.3 | 12.9 |
| Berlin | -- | -- | -- | -- | 3.4 | 3.4 | 3.4 | 3.5 |
| Total | 68.6 | 78.1 | 78.4 | 79.1 | 79.8 | 82.3 | 82.4 | 81.8 |

Notes: As of 31 December; data excluding Berlin
Source: Statistisches Bundesamt (2011-1 and 2011-2)

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

Data on the age distribution of women by the number of live-born children was not collected in the Federal Republic of Germany. For the GDR, such data are available from the 1981 census. However, as we are still in the process of checking the quality of these data for the purposes of fertility analysis, they are not used in the calculations.

## 4 Specific details

### *4.1 Definitions*

***Definition of a live birth***

The birth data collected for the HFD include all live births (*Lebendgeborene*). When there is a multiple delivery, each child is counted separately. In Germany, the registry offices (*Standesämter*) collect information on births, which they then report to the statistical offices of the federal states (*Länder*). All births delivered within the borders of Germany are registered. If a German citizen gives birth to a child in a foreign country, the parents can apply for the child to be included in the register (Personenstandsgesetz § 36). For a definition of a live birth, see Table 2.

population data from 1990 onwards do not. It is, however, unlikely that the monthly births in Berlin follow a significantly different seasonal trend than those in the rest of Germany, and this small discrepancy can therefore be ignored.

**Table 2**: Definition of a live birth used by the Statistical Offices of GDR, FRG, and Germany

| Territory | Period | Definition |
|---|---|---|
| GDR | 1946-1956 | natural breathing |
| | 1957-1961 | natural breathing or other indications of life (heartbeat, moving) |
| | 1962-1978 | complete expulsion from mother, breathing, and heartbeat |
| | 1979-1989 | complete expulsion from mother, heartbeat, and breathing, but irrespective of the cutting of the umbilical cord or the expulsion of the placenta |
| FRG | 1946-1957 | natural breathing |
| | 1958-1989 | complete expulsion from mother, heartbeat, or pulsating umbilical cord or natural breathing |
| Germany | 1990-2010 | complete expulsion from mother, heartbeat, or pulsating umbilical cord or natural breathing |

Source: Statistisches Bundesamt (1999b): 8-9

***Definition of age***

In Germany, births have mainly been recorded by the mother's year of birth. The age of the mother at birth is defined as the difference between the year of birth of the child and the year of birth of the mother (*Differenz zwischen Geburtsjahr des Kindes und Geburtsjahr der Mutter*), which corresponds to the age reached during the year (ARDY).

In East Germany in the period 1971-1989, births were classified by the age in completed years (ACY) or by the age reached at the last birthday.

***Definition of birth order***

Birth order refers to the total number of (previously) live children born to a woman. When there is a multiple birth, each child is assigned a separate birth order.

### *4.2 Data Quality Issues*[8]

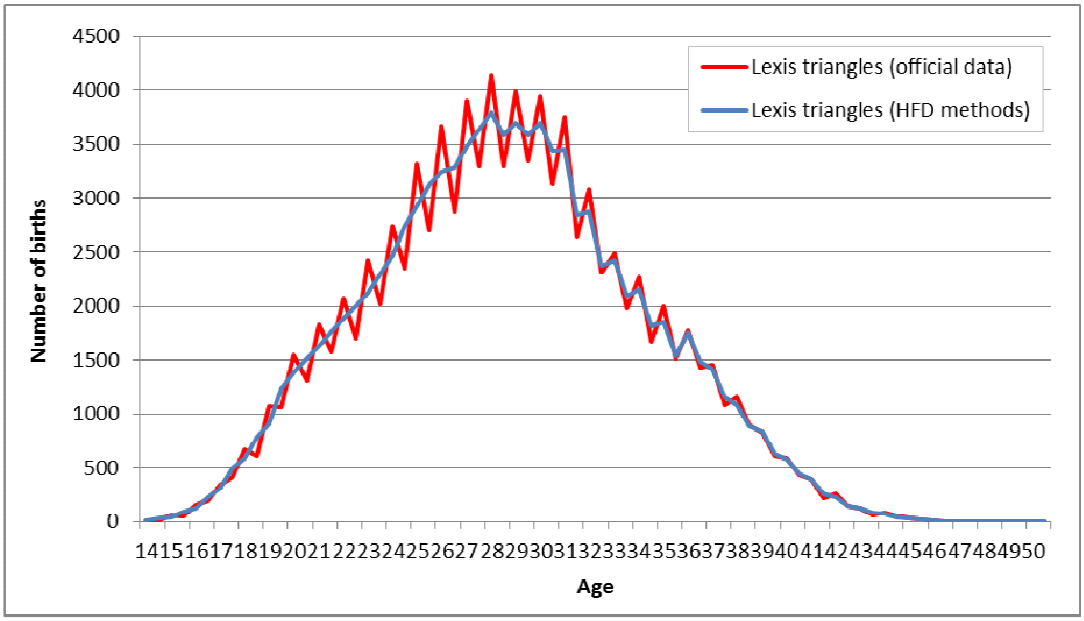
***Jagged line in the data by triangles 2000-2008***

The data for 2000-2008 received from the Statistical Office by Lexis triangles show a jagged line in the distribution of live births over time, with a number of births that is too high in the lower Lexis triangle, and a number of live births that is too low in the upper Lexis triangle at each age (see the red line on Figure 3). This is explained by the fact that the date of birth of the mother was not used in the calculation of the age in completed years (ACY) by the Statistical Office of Germany. Instead, it was calculated based only on information on the year and the month of her birth. For approximately 4% of the cases in which the mother and the child have their birthdays in the same month and the mother's birthday is after the child's birthday, the data from the Statistical Office give a wrong age at birth. For the HFD we

[8] Section 4.2 on data quality issues was written with a contribution by Dora Kostova.

therefore use the data that were provided in the ARDY format and split it into Lexis triangles using the usual HFD methodology (see the blue line in Figure 3).

**Figure 3** Births by Lexis triangles, East Germany, 2008




Source: HFD calculations; Statistisches Bundesamt, unpublished tabulations


## Acknowledgments

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3. Statistisches Bundesamt Deutschland. Lebendgeborene, Monatliche Werte, 1946-2010. Unpublished tabulations supplied by Olga Poetzsch on 17.07.2008, 22.03.2010 and 02.02.2011 and Anja Conradi-Freundschuh on 02.08.2011.
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11. Statistisches Bundesamt. Lebendgeborene nach dem Geburtsjahr der Mutter. Deutschland, 2000-2008. (Live births by mother's year of birth, Germany, 2000-2008). Unpublished Tabulations supplied by Anja Conradi-Freundschuh on 08.09.2011.

**GERMANY (coded as DEUTNP)**

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

### BIRTHS

| Period | Type of data | Age scale | Birth order | Ref Codes |
|---|---|---|---|---|
| | | | | |
| 1956-1989 | Annual number of live births by mother's year of birth (vertical parallelograms)* | ≤14,15…44,45+, unknown | - | 4 |
| 1990 | Annual number of live births by mother's year of birth (vertical parallelograms)*/** | ≤13,14…48,49+, unknown | - | 1 |
| 1991-1997 | Annual number of live births by mother's year of birth (vertical parallelograms)* | ≤12,13…48, 49+, unknown | - | 1 |
| 1998-1999 | Annual number of live births by mother's year of birth (vertical parallelograms)* | ≤14,15… 48, 49+, unknown | - | 1 |
| 2000-2008 | Annual number of live births by mother's year of birth (vertical parallelograms)* | ≤13,14… 49, 50+, unknown | - | 11 |
| 2009-2010 | Annual number of live births by mother's year of birth (vertical parallelograms)* | ≤14,15… 50, 51+, unknown, | 1,2…8,9+ | 5 |
| 1956-2010 | Annual number of live births by month | - | - | 3 |

* Originally, the data were classified by the age reached during the year (ARDY), which equals the difference between the calendar year when the birth occurred and the mother's year of birth (see Section 2.1 and also Table A2). This data format is called vertical Lexis parallelograms. However, in the HFD input file for births, we take a different approach, and instead use the definition of age at the beginning of the year in the case of data sorted by vertical parallelograms. Thus, it is possible to see different age scales (with a difference of one year) for the same data in Appendix 1 and Table A2.

** For 1990-1999 the annual number of live births by the age reached during the year (ARDY, which is the calendar year minus the mother's year of birth) is available from the Statistical Office of Germany only for ages 15 to 49; there is no information about births at ages ≤14 and 50+. We included the difference between the total annual number of births and the sum of these data in the category of data with an unknown age of the mother. According to the Statistical Office, this difference represents the number of births to mothers younger than age 15 and older than age 49. In order to distribute these births realistically between these two age categories, the births were split according to the proportion of births at age 15 to the number of births at age 49 and assigned to the ages ≤14 and 50+, respectively. (Recall that the age scale in the input file is modified. See the note above.)

### FEMALE POPULATION: Exposure by age and year of birth

The female exposure population by calendar year, age, and year of birth is estimated using the methods protocol of the Human Mortality Database (HMD), available at http://www.mortality.org, based on data on population size, deaths, and live births by year and sex provided by Statistical Office of Germany (Statistisches Bundesamt).

## DESCRIPTION OF DATA USED FOR POPULATION ESTIMATES

### DEATHS

| Period | Type of data | Age scale | Comments | Ref Codes |
|---|---|---|---|---|
| 1956-1999 | Death counts by age, year of birth, and sex | 0,1…99,100+ | - | 6 |
| 2000-2010 | Death counts by age, year of birth, and sex | 0,1…109,110+ | - | 7 |

### POPULATION

| Period | Type of data | Age scale | Comments | Ref Codes |
|---|---|---|---|---|
| 31.12.1955-31.12.1963 | Population counts by age and sex | 0,1…89,90+ | - | 8 |
| 31.12.1964-31.12.1988 | Population counts by age and sex | 0,1…94,95+ | - | 8 |
| 31.12.1989-31.12. 2010 | Population counts by age and sex | 0,1…94,95+ | - | 9 |

### BIRTHS

| Period | Type of data | Comments | Ref Codes |
|---|---|---|---|
| 1956-2010 | Live births by sex | - | 10 |

**APPENDIX 2**
**DATA AVAILABILITY FOR GERMANY**

Table A1: Area and country codes used in the HFD input data files for Germany

| Country Code | Area Code | Territorial Definition |
|---|---|---|
| DEUTNP | 1 | Germany |
| DEUTNP | 2 | Germany (excluding Saarland) |
| DEUTNP | 3 | Germany (excluding Saarland and excluding West Berlin) |
| DEUTNP | 4 | Germany (including Saarland and excluding West Berlin) |

Table A2: Availability of live births, Germany (country code: DEUTNP)

| Period | Type of data* | Age scale | Area code | Birth order | Ref Codes |
|---|---|---|---|---|---|
| 1952 | Annual number of live births by mother's year of birth (vertical parallelograms)* | ≤15,16…45, 46+, unknown | 3 | no | 4 |
| 1953-1955 | Annual number of live births by mother's year of birth (vertical parallelograms)* | ≤15,16…45,46+, unknown | 2 | no | 4 |
| 1956-1989 | Annual number of live births by mother's year of birth (vertical parallelograms)* | ≤15,16…45,46+, unknown | 1 | no | 4 |
| 1990 | Annual number of live births by mother's year of birth (vertical parallelograms)* | 14,15…48, unknown | 1 | no | 1 |
| 1991-1997 | Annual number of live births by mother's year of birth (vertical parallelograms)* | ≤13,14…49, 50+, unknown | 1 | no | 1 |
| 1998-1999 | Annual number of live births by mother's year of birth (vertical parallelograms)* | ≤15,16…49, 50+, unknown | 1 | no | 1 |
| 2000-2008 | Annual number of live births by age of mother and mother's year of birth (Lexis triangles) | ≤14,15…49, 50+, unknown, | 1 | no | 2 |
| 2000-2009 | Annual number of live births by mother's year of birth (vertical parallelograms)* | ≤14,15… 50, 51+, unknown, | 1 | no | 2 |
| 2009-2010 | Annual number of live births by mother's year of birth and birth order (vertical parallelograms)* | ≤14,15… 50, 51+, unknown, | 1 | 1,2…8,9+ | 5 |
| 1946-1947 | Annual number of live births by month | - | 4 | no | 3 |
| 1948-2010 | Annual number of live births by month | - | 1 | no | 3 |

* Originally, the data were classified by the age reached during the year (ARDY), which equals the difference between the calendar year when the birth occurred and the mother's year of birth (see Section 2.1 and also Table A2). This data format is called vertical Lexis parallelograms. However, in the HFD input file for births, we take a different approach, and instead use the definition of age at the beginning of the year in the case of data sorted by vertical parallelograms. Thus, it is possible to see different age scales (with a difference of one year) for the same data in Appendix 1 and Table A2.