

HUMAN FERTILITY DATABASE DOCUMENTATION: JAPAN

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1 General information

This report documents the Japanese data collected for the Human Fertility Database, namely age- and birth order-specific birth counts, monthly birth counts as well as age- and parity-specific distribution of the female population from the 1950, 1960 and 1970 population censuses. The complete list of the data provided for the HFD is presented below:

- Number of live births by single years of age of the mother for calendar years 1947-2016.
- Number of live births by single years of age of the mother and birth order for calendar years 1968-2016.
- Age-parity distribution of the female population from the 1950, 1960 and 1970 censuses.
- Number of live births by month for calendar years 1947-2016.

The data used in the HFD calculations are specific in Appendix 1 at the end of this document.

Statistics on the number of live births were collected from *the Vital Statistics of Japan*, which is regularly issued by the Ministry of Health, Labour and Welfare. The birth statistics are based on aggregations of birth notifications submitted according to the Family Registration Act for each calendar year and published in the form of cross-tabulations with basic attributes. The target population of *the Vital Statistics of Japan* are persons of **Japanese nationality living in Japan**.

1.1 Territorial coverage and target population

Since 1947 the official statistics of Japan has covered the territory of Japan, excluding a portion of Nemuro sub-prefecture in Hokkaido (the so-called northern territories) and Takeshima in Shimane prefecture. Okinawa prefecture was returned to Japan from US

jurisdiction in May 1972. Both the population and the vital statistics of Okinawa prefecture are included in the Japanese fertility statistics from 1973 onwards. In 1972 the total population of Japan was about 106,362 thousand people, of which the population of Okinawa comprised about 970 thousand or 0.9% (Andreeva and Horiuchi 2018).

A territorial adjustment factor is applied to the Japanese data to account for the difference in the territorial coverage of the population before and after the year 1973.

Table 1 Changes in the territorial coverage over time

Period	Area code	Territorial definition
1947-1972	2	Japan
1973 until present	1	Japan (including Okinawa prefecture)

1.2 Data collection

Two governmental organizations are involved in collecting fertility and population data in Japan.

The Vital Statistics of Japan are produced by the *Statistics and Information Department*, which is one of the internal subdivisions of *the Minister's Secretariat, the Ministry of Health, Labour and Welfare (the Ministry of Health and Welfare before 2000)*¹. The Vital Statistics of Japan aggregate births, deaths, stillbirths, marriages, and divorces of people of **Japanese nationality** living in Japan, occurring from January 1 to December 31 of the calendar year and notified to the local authorities by January 14 of the following year.

Population statistics of Japan are produced by *the Statistics Bureau at the Ministry of Internal Affairs (Bureau of Statistics, Office of the Prime Minister in the period 1949-1984 and Statistics Bureau, Management and Coordination Agency between 1984 and 2000)*. Based on data collected with the Population Census, annual, censal and inter-censal statistics are published every year in the "Annual Report on Current Population Estimates". The Population Census of Japan has been conducted on October 1 every five years since 1920 through the present (with the exception of 1945 due to the World War II).

2 Birth count data

2.1 Coverage and completeness

Data on births by calendar year and single-years of age of the mother are available for the period 1947-2016. The statistics are produced based on birth notifications and birth certificates reported to local authorities and include only live births. Age ranges between 14 and less and 55 and more.

Data on live births by single years of age of the mother and birth order are available for calendar years 1968-2016 (for a detailed description of the data see Table 2).

¹ <http://www.mhlw.go.jp/english/database/db-hw/index.html>

Both datasets cover only the population of **Japanese nationality** living in Japan, meaning that a newborn would be registered by the vital statistics only if she/he is eligible to receive Japanese citizenship. Special attention should be given to the changes in the legislation regulating the grant of citizenship to children born in Japan. Until 1984 a child could become a Japanese citizen only if his/her father was of Japanese nationality. In 1985 the citizenship law was revised so that either parent could give Japanese citizenship to his/her child. This issue is addressed in details in Section 4.2 Data quality issues.

Table 2 Data on live births, Japan, 1947-2016

Period	Age range	Age interval	Birth order	Source
1947 – 2012	≤14, 15...54, 55+, unknown	1-year	-	1-14, 33, 34
1968 – 2012	≤14, 15...54, 55+, unknown	1-year	1 to 4, 5+ ^{1,2}	11-14, 33, 34
2013 – 2016	≤14, 15...54, 55+, unknown	1-year	1 to 9, 10+ ¹	36-39

¹ The Vital Statistics division is linked to the Family Register; therefore officially there are no births of unknown birth order in Japan. In some very rare cases (e.g., a birth born to a foreign woman who is not registered in the Family Register), births with unknown birth order may be added to the birth order one. The number of such births is very small, however, and does not have any significant effect on fertility rates.

² In the publications listed in the references, birth order data can be obtained in detailed birth orders 1, 2, ..., 9, 10+.

3 Population count data

3.1 Population count data by age

The annual age structure of the **female population of Japanese nationality** for the period 1947 onwards is available from the Human Mortality Database (www.mortality.org).

3.2 Population count data by age and parity

In 1950, 1960, and 1970, the Population Census of Japan contained special surveys on the number of live births per women in the past. The result of 10% sample tabulation was published in 1950; 20% sample tabulations are available for 1960 and 1970. Age-parity distribution of women from the censuses is available only by 5-year age groups. In addition the questions were asked only to ever-married women; therefore female population counts by age and parity among ever-married women are available in the input data section, but are not used in the HFD calculations which pertain to all women of reproductive age. The question about live-born children was eliminated from the survey in 1980 and was no longer asked thereafter.

4 Specific details

4.1 Definitions

Definition of a live birth

The definition of live birth in Japan follows the definition given by the World Health Organization: "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." (<http://www.who.int/healthinfo/statistics/indneonatalmortality/en/>)

Definition of age

In the Japanese data on births, the age of the mother is always classified by the age in completed years (ACY), which is the age reached at the last birthday.

Definition of birth order

All births in the Japanese fertility data for the HFD are ranked in the biological birth order, i.e. in relation to all previous live-born children of the mother.

4.2 Data quality issues

4.2.1 Inconsistency between birth counts and exposure population

As in most of the East Asian countries, the system of data collection in Japan generates preconditions for discrepancy between the vital events (e.g. birth counts) and the population exposed to the events. As noted in section 1.2, two different governmental institutions are involved in the collection of fertility and population data. In addition, both the vital statistics and population statistics pertain only to individuals of **Japanese nationality** residing in Japan.

According to the Japanese legislation that was in force in the period before 1985, a child could receive Japanese nationality only through his/her father. As a result, a child born to a Japanese mother and a foreign father was not counted in the vital statistics, while the mother contributed to the population statistics. The opposite was true in cases where the father was Japanese and the mother was a foreigner: the child born in such marriage was included in the vital statistics, whereas the mother was excluded from the population statistics (see Table 3 below).

In 1985 some changes were introduced in the Japanese legislation on citizenship that improved the registration of births. The implemented revisions allowed that the Japanese nationality could be transferred to a newborn baby by either of the two parents, under the condition that the baby was born in Japan (Retherford, R.D. and N. Ogawa 2005). One of the causes of the numerator-denominator discrepancy was thus eliminated, but the other remained. A baby born to a Japanese father and a foreign mother is included in the vital

statistics, while the mother is not registered in the population counts.

Table 3 Causes for discrepancies between vital events (e.g. birth counts) and population exposed to the event

	Japanese mother and foreign father	Japanese father and foreign mother
Until 1984	mother - included in population counts, baby - not included in birth counts	mother - not included in population counts, baby - included in birth counts
Since 1985	both mother and baby included in the population statistics	mother - not included in population counts, baby - included in birth counts

The matter had relatively small effect on the estimated birth rates before 1984, first because of the relatively small percent of births within mixed marriages in Japan (less than 1%), and, second, because the bias of not including a baby born to a Japanese mother and a foreign father into the birth counts was cancelled by the inclusion of the births that occurred to mixed marriages between Japanese men and foreign women (Table 3).

After 1985, and particularly in the second half of the 1990s and in the 2000s, the number of mixed marriages in Japan started increasing. The share of live births born to families in which one or both parents are non-Japanese increased from 1.3% in 1987 to 3.4% in 2007 and 2008 and slightly decreased thereafter (Table 4). In 2008 when a maximum share of such births was observed, approximately one third of these (1.3% of all births) were babies with Japanese nationality born to non-Japanese mothers, and another third (1.3% of all births) were born to parents of non-Japanese nationality. In the first case, the birth is counted in the vital statistics but the mother is not included in the population counts, whereas in the second case neither the birth nor the mother appears in the official population statistics.

In order to assess the magnitude of the bias in fertility indicators caused by the mismatch between different coverage of the vital statistics and population statistics in Japan, we calculated two types of alternative TFRs with corresponding births (nominator) and population exposure (denominator).

As detailed in sections 1.2 (see also Andreeva and Horiuchi 2018), two types of population counts are published annually by *the Statistics Bureau at the Ministry of Internal Affairs* in Japan – the *total population* and the population of *Japanese nationality*. In order to calculate a TFR that is not subject to the nominator-denominator bias, we need to have either the distribution of births having occurred to the *total female population* or the distribution of births to the *Japanese mothers only*. Vital statistics of Japan provides birth count data by age of mother for neither of these two categories. However, starting in 1987, the annual number of live births is available by any combination of parents’ nationality (see Table 4), without further breakdown by age of the mother. In the calculations below, we assume that the distribution of births born to Japanese fathers and foreign mothers or to parents who are both foreigners follow the same age pattern as in the officially published statistics, which includes children with Japanese nationality only.

Table 4 Distribution of live births by parents' nationality, Japan¹

	Both parents Japanese	Japanese father, foreign mother		Japanese mother, foreign father		Both parents foreign
		Number	Percentage	Number	Percentage	
1987	98.7	5538	0.4	4484	0.3	0.6
1990	98.3	8695	0.7	4991	0.4	0.6
1995	97.4	13371	1.1	6883	0.6	0.9
2000	97.1	13396	1.1	8941	0.8	1.0
2005	96.9	12872	1.2	9001	0.8	1.1
2006	96.8	14040	1.3	9423	0.9	1.1
2007	96.6	14474	1.3	9703	0.9	1.2
2008	96.6	13782	1.3	10174	0.9	1.3
2009	96.8	12707	1.2	9804	0.9	1.1
2010	96.8	11990	1.1	9976	0.9	1.1

Source: Statistics and Information Department, Ministry of Health, Labor and Welfare, *Vital Statistics of Japan*

¹ The table presents data on all births registered in Japan. Note that the target population of the Vital Statistics of Japan contains only persons of **Japanese nationality living in Japan**. Births that occur to a foreign father and a foreign mother (i.e. the last column in the table) are not included in the calculation of official fertility indicators in Japan.

In order to obtain *births to Japanese mothers* only, we exclude children born to a Japanese father and foreign mother (column 3 in Table 4 above) from the annual number of births published by the Vital Statistics of Japan. Similarly, to obtain the *total number of births* in Japan, we add children born to foreign parents residing in Japan (i.e., births to both foreign mother and father; column 7 in Table 4) to the officially published annual number of births.

The two alternative TFR were calculated for the years 1987, 1990, 1995, 2000, 2005, and 2010. The 'alternative' estimates of the TFR, together with the official TFRs as well as the TFRs derived in the HFD, using the same set of live births and population data are presented in Table 5.

Table 5 Official and "alternative" estimates of the TFR using different combinations of mother's and father's nationality; Japan, selected years 1987-2010

	official ¹ TFR	HFD computation ² (live births with Japanese nationality related to Japanese females)	Alternative TFR(1) live births to Japanese mothers by age related to Japanese female population only		Alternative TFR(2) total live births by age related to total female population	
			Number	% deviation	Number	% deviation
1987	1.69	1.689	1.684	0.41	1.684	0.38
1990	1.54	1.543	1.532	0.71	1.531	0.74
1995	1.42	1.426	1.406	1.13	1.407	1.05
2000	1.36	1.358	1.344	1.13	1.344	1.11
2005	1.26	1.247	1.245	1.21	1.241	1.49
2010	1.39	1.379	1.374	1.12	1.362	2.02

¹ Published by the Vital Statistics of Japan, www.e-stat.go.jp

² HFD data release of September 2016.

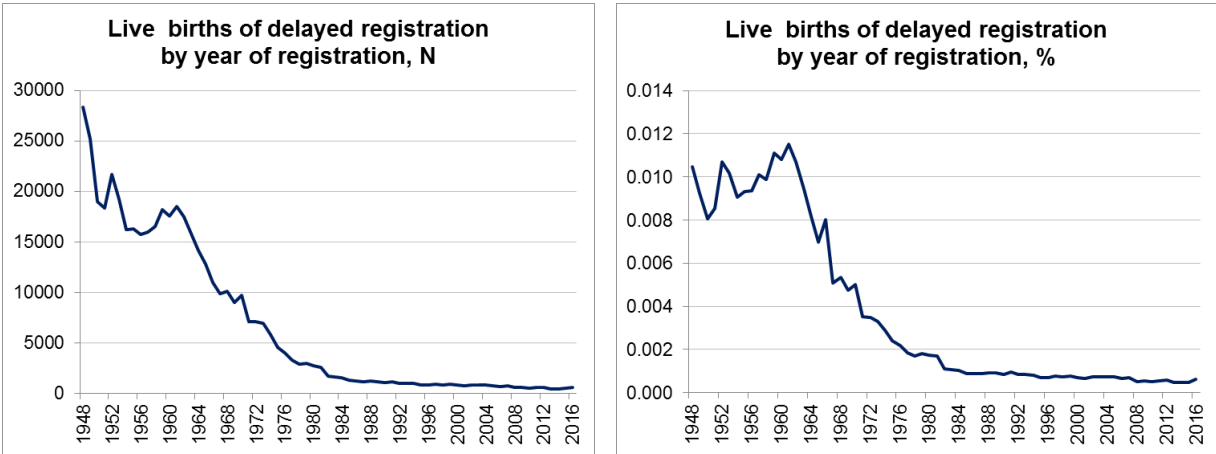
The two alternative estimates depict almost identical values except for the most recent year,

2010. The official TFR is structurally overestimated in the range of 0.4% in 1987 to 2.0% in 2010 (alternative estimate based on total live births and total female population). This is not a large bias, but it may continue to rise in the future, especially if immigration to Japan increases.

4.2.2 Delayed registration births

As noted in Section 1.2, Vital Statistics of Japan aggregate all vital events of people of Japanese nationality living in Japan, occurring from January 1 to December 31 of the calendar year and notified to the local authorities by January 14 of the following year. A certain number of births are, however, registered after this date. Live births of delayed registration are published annually by Statistics Japan in a separate table which includes the annual number of these births reported in the calendar year by the year of their occurrence (Ministry of Health, Labour and Welfare 2018), and without any further detail such as the age of mother or the birth order. According to the statistics published for the period 1948-2016, the proportion of late registration births among all live births registered in the given calendar year has never exceeded 0.02%, and towards the end of the 1970s this share becomes negligible (see Figure 1).

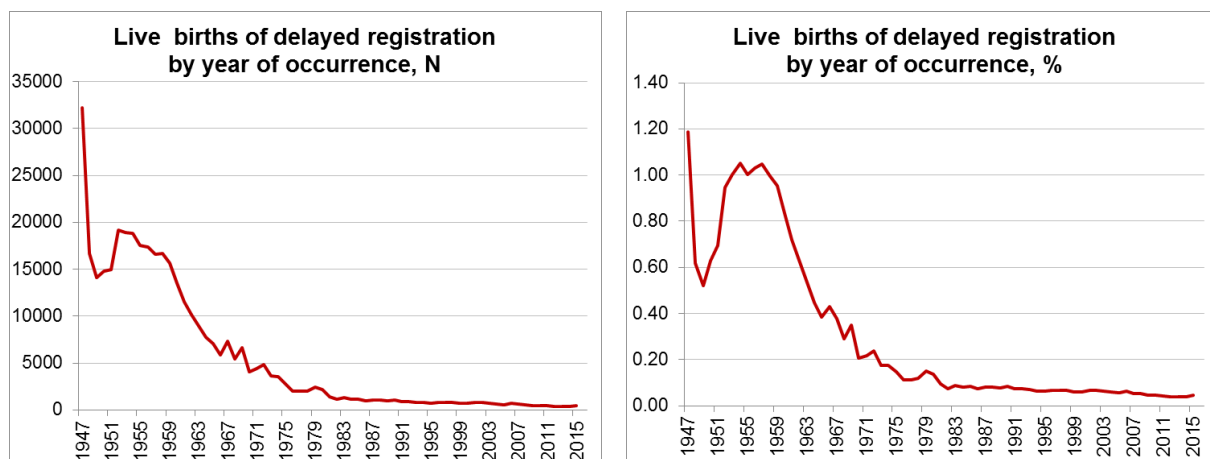
Figure 1 Live births of delayed registration by year of registration



Source: Ministry of Health, Labour and Welfare (2018). Portal Site of Official Statistics of Japan.

In the original table by Statistics Japan, covering the years 1948-2016, late registration births are organized by the number of years that they were born before the year of registration, i.e. born “1 year before”, “2 years before”, etc. The last category is always “9+ years before”, except for the years 1982 and 1987, for which it is “8+ years before”. In the HFD, live births of delayed registration are moved to the years of their occurrence (see Figure 2). For the births in the categories “8+ years before” and “9+ years before”, it is assumed that they were born 8 and 9 years, respectively, before the registration.

Figure 2 Live births of delayed registration as moved to the year of their occurrence



Source: HFD estimates based on data from Ministry of Health, Labour and Welfare (2018). Portal Site of Official Statistics of Japan. [

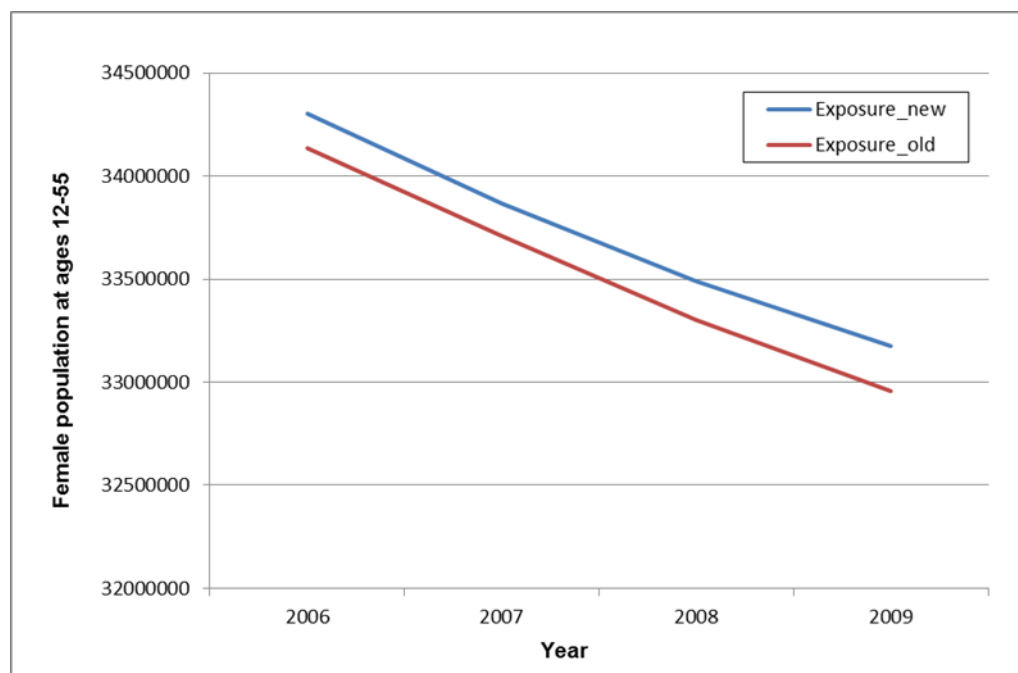
4.3 Revision History

Changes with the revision of March 2015:

At the HFD update of March 2015, revised HMD population exposures incorporating the 2010 population census counts were employed. The official current population estimates for the period 2006-2009, which had been used in the previous revision as of February 2013, were replaced by HMD inter-censal population estimates (for more details, see Andreeva and Horiuchi 2014). This resulted in slight changes in some HFD output fertility indicators for these years. Differences between “new” and “old” population estimates were in the range between 0.33% and 0.65% (see Figure 2). Consequently, the TFR decreased by up to 0.013. The largest change in the TFR, from 1.361 to 1.348, was recorded for the year 2009.

Further corrections (see Andreeva and Horiuchi 2014, p. 3) were applied for the years 1947-1949, 1996-1999 and 2001-2004, which caused some negligible changes both in the population exposure estimates and in the birth estimates. However, the TFRs and the other aggregated fertility indicators remained unchanged.

Figure 2 The old and the new (adjusted with the 2010 census data) estimates of female population exposure, 2006-2009



Changes with the revision of September 2016:

There are small changes in the birth estimates for 2012 (ranging up to 3 births in the data by Lexis triangles), which result from changes in the HMD population exposure estimates for this year. The changes in the population exposures have to do with the post-censal population estimates for January 1, 2013 having been replaced by the population estimates generated using linear interpolation (linear interpolation between 01.10.2012 and 01.01.2013)². Note that changes of this kind happen at every update of HMD data for Japan because the official population estimates always pertain to the 1st of October (see the HMD Methods Protocol for how such cases are dealt with in the HMD).

Changes with the revision of November 2018:

In addition to having data for 2015 and 2016 added, the data release of November 2018 contains relatively significant changes as compared to the data released in September 2016. The changes are noticeable both in the birth estimates as well as in fertility rates and summary indicators for the relevant years.

The sources of the changes are the following:

- 1) Data on live births of delayed registration were included. For more details, see section 4.2.2.

² Note that changes of this kind happen at every update of HMD data series for Japan because the official population counts always pertain to 1 October. For the last year available, the population for 1 January is estimated using the post-censal method, and at the next update these population estimates are replaced by the population estimates generated using linear interpolation.

- 2) Monthly births counts covering the period 1899-1946 were added to the available time series of monthly births and thus are used in the calculation of population exposure estimates.
- 3) The HMD replaced the previously used official post-censal estimates for the years 1996-1999, 2001-2004 and 2011-2014 with the standard HMD inter-censal estimates”.

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APPENDIX 1
INPUT DATA USED FOR HFD CALCULATIONS

BIRTHS

Period	Type of data	Age range	Birth order	RefCode(s)
1947-1967	Annual number of live births by age of mother (Lexis squares)	≤14, 15,...,54, 55+, unknown	—	1-10, 41
1968-1978 ¹	Annual number of live births by age of mother and birth order (Lexis squares)	≤14, 15,...,54, 55+, unknown	1, 2,...,5+	11, 41
1979-2012	Annual number of live births by age of mother and birth order (Lexis squares)	≤14, 15,...,54, 55+, unknown	1, 2,...,5+	12-14, 33-34, 41
2013-2016	Annual number of live births by age of mother and birth order (Lexis squares)	≤14, 15,...,54, 55+, unknown	1, 2,...,10+	36-39, 41
1899-2016 ¹	Annual number of live births by month	total	total	21-29, 35-40, 41

¹ Beginning from 1973, the annual birth counts cover Japan, including Okinawa prefecture.

FEMALE POPULATION: Exposure by age and year of birth

The 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>.