

# HUMAN FERTILITY DATABASE DOCUMENTATION: TAIWAN

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**WARNING:** Due to the adjusted exposure population estimates, there are some changes in the births estimates as well as in the fertility rates for 1976-2001. Note that these population estimates are preliminary. For more details, see section 4.3.

## 1 General information

This report documents the Taiwanese fertility data collected for the Human Fertility Database (HFD) project, including age- and birth order-specific data on births, data on births by calendar month, as well as data related to the exposure population (women by age and total number of live-born children). These data were extracted from several sources, including household registration statistics, demographic yearbooks, as well as the micro-data of population censuses produced and published by the Department of Household Registration Affairs, Ministry of the Interior (MOI), and the Directorate General of Budget, Accounting and Statistics (DGBAS) of Executive Yuan, Republic of China (Taiwan).

The Taiwanese fertility data provided for the HFD include the following:

- Live births by 5-year age groups of the mother for calendar years 1947-1975.
- Live births by single year of age of the mother and birth order for calendar years 1976-2014.
- Monthly data on births for calendar years 1906-1943 and 1965-2013.
- Age-parity distribution of the female population from the 1966 and 1980 censuses.

Detailed information about the birth data used in the HFD calculations is provided in Appendix 1.

## 1.1 Territorial coverage

The Republic of China (ROC) is popularly known as “Taiwan” according to the land over which the ROC government exercises sovereignty. Situated in the West Pacific between Japan and the Philippines, the territory encompasses the large island of Taiwan (known as Formosa) and the archipelagos of Penghu, Kinmen and Lienkiang (offshore islands next to Fukien Province in mainland China), as well as numerous islets. Altogether Taiwan covers an area of 36,191 square kilometres. About the size of the Netherlands and with a population of 23 million, Taiwan is in fact more populous than three-quarters of the world’s nations.

In the HFD data, the territory of “Taiwan Area” refers to the main island of Taiwan and Penghu islands (also called the Pescadores). The broader “Taiwan-Fukien Area” includes the Taiwan Area as well as the Fukien Province, composed of regions Kinmen and Lienkiang. Due to military reasons, the published household registration data did not cover Fukien Province for earlier years. Accordingly, the age-specific birth data in the HFD cover the Taiwan Area for 1947-2010 and the Taiwan-Fukien Area since 1992<sup>1</sup>. For the period 1992-2010 the birth data are available for both the areas, but after 2010 the data become available only for the Taiwan-Fukien Area. The monthly birth data pertaining to the Taiwan Area are available for the years 1906-1943 and 1965-2010 and for the Taiwan-Fukien Area they are available for the period since 1972. For the distribution of female population by single year of age, both the areas have been made available since 1974. In 2010, the share of residents in Kinmen and Lienkiang was below 0.5% of the Taiwan population (107 thousand vs. 23,162 thousand).

## 1.2 Data collection and availability

There were limited records on the population of Taiwan until the end of the nineteenth century. After the Sino-Japanese War, Japan captured the territory of Taiwan including the Pescadores in 1895. To effectively grasp information and compile data about the territory, the Japanese government maintained the system of household registration (*koseki* 戶籍) which required all residents to register their households with the local administration. The details of household composition and demographic changes were recorded in the system. The first census of the Taiwan population was conducted in 1905, whereas Japan did not carry out a population census on its own territory until 1920. Because the political leaders were unable to differentiate household registration from a population census and were unwilling to reserve a budget, the first and second population censuses were conducted under the name of *Provisional Taiwan Household Registration Survey* and later population censuses were literally entitled the *Survey of National Strength* (Lin, 2001). During the Japanese colonial period (1895-1945), two provisional household censuses and five population censuses were carried out (Department of Household Registration Affairs, 2011).

During the Second World War (1943-1945), population data and vital statistics were not collected. After the restoration of Taiwan to Chinese rule, the enforcement of household registration was in effect and carried out by the civil administration authority. According to the Household Registration Law, the registered population refers to all of the ROC nationals maintaining household registration in the Taiwan-Fukien Area. Nevertheless, the completion

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<sup>1</sup> In the HFD input data files, the data pertaining to the “Taiwan Area” is presented with an area code 1 and the data covering the “Taiwan-Fukien area” has an area code 2.

and accuracy of demographic data were questionable in the post-war era. The household records concerning native Taiwanese were fairly complete, but the data on Chinese immigrants were deficient, in particular the lack of data on members of the armed forces. The demographic characteristics of these non-registered soldiers were first seen in the 1956 Taiwan-Fukien Population Census. Because of the military control before 1969, the records of these people were still limited in the household registration, except for those who were newly married and had babies. It was estimated that these Chinese immigrants accounted for about 15% of Taiwan's inhabitants (Lee, 1969). The lasting demographic distinctiveness of veterans has been observed in their specific marriage and childbearing patterns (Chen, 2008) and they also affected the overall age-sex structure of the Taiwan population. In addition to the first Population Census in 1956, there were four other Taiwan-Fukien Population and Housing Censuses (1966, 1980, 1990 and 2000) and two household sampling surveys (1970 and 1975), all six of which were conducted in the second half of the twentieth century.

Population data in Taiwan are produced regularly by the Department of Household Registration Affairs within the Ministry of the Interior. The annual *static population data* are defined as those referring to a specific date (usually, to the 'standard day' on December 31); these include data on households, age-sex composition, education, marital status and population density. These year-end population data are obtained from the records of household registration system. In addition, these data are available through the population and housing censuses at 5- or 10-year intervals. Until 1990, the Ministry of the Interior was responsible for carrying out the household registration as well as population and housing censuses. Because the Household Registration Law was amended in 1997 and the Population Census Law was rescinded in 1999, the responsibility of conducting the Fifth (2000) Population and Housing Census was transferred to the Directorate General of Budget, Accounting and Statistics (DGBAS). The latest 2010 Census was carried out based on the sampling scheme of American Community Survey. About 16% of census districts were pre-selected and all Taiwanese nationals who had registered at these districts were asked to complete the census form in the period between December 26, 2010 and January 22, 2011.

In addition to *static* cross-sectional data, the Department of Household Registration Affairs also offers annual statistics of population movement (*dynamic population data*). These data comprise vital statistics such as birth, death, marriage, divorce, adoption and migration, in accordance with the records of the application forms of those vital events. The standard period of the statistics is from January 1 to December 31 in the year collected by continuous registration at the local register offices. It is worth mentioning that only "registration" statistics of vital events were provided in earlier years. Since 1973, both "registration" data and "occurrence" population dynamics data have been made available. Because the system of household registration has been playing a key role as a commonly applied basis of implementation of other policies, computerized household registration data have been online nationwide since 1997 (Department of Household Registration Affairs, 2011).

## 2 Birth count data

### 2.1 Annual birth counts by age of mother and birth order

Data on birth counts are produced and published by the Department of Household Registration Affairs based on the aggregation of birth notifications reported by parents or family members of newborns to the local authorities. Taiwanese birth count data collected for the HFD cover the period between 1947 and 2014 (for detailed information see Table 1).

Before 1965 birth counts by age of mother were grouped into eight age groups, including two separate age intervals for births outside of the reproductive age group 15-44 (i.e.  $\leq 14$ , 15-19, 20-24, ..., 40-44,  $\geq 45$ ). In the period 1965-1975 the reproductive age span of women, expanding from 15 up to 49 was divided into seven five-year age groups. However, for the period 1965-1975, births to women under the age 15 or 50 years old and over were included in the age groups 15-19 and 45-49 respectively. The birth order of births was not specified until 1975. Since 1976 detailed data by single age of mother and biological birth order have been available.

Until 1973 live births to mothers of unknown age were provided in a separate category. Since 1974, births to mothers of unknown age have been proportionately distributed among births to mothers of known age or age groups.

The broad age group  $\leq 19$  (i.e. birth data in the period 1965-1975) cannot be satisfactorily recalculated into single years of age using the present HFD methodology (see Jasilioniene et al. 2012). In addition, prior to 1980 population estimates taken from the HMD suffer from various problems with the source data (for details see section 3.1). Therefore for the HFD calculations birth data are used starting from 1976 only.

**Table 1** Description of annual and monthly data on live births, Taiwan, 1947-2014

Period	Type of data	Age range	Age interval	Birth order <sup>4</sup>	Source
1947-1964 <sup>1</sup>	Live births by age of mother	$\leq 14$ , 20-24...40-44, 45+, unknown	5-year	-	8
1965-1973 <sup>1</sup>	Live births by age of mother	$\leq 19$ , 20-24...40-44, 45+, unknown	5-year	-	9
1951-1973 <sup>2</sup>	Live births by age of mother	$\leq 19$ , 20-24...40-44, 45+, unknown	5-year	-	10
1974-1975	Live births by age of mother	$\leq 19$ , 20-24...40-44, 45+, unknown	5-year	-	11
1975	Live births by age of mother and birth order	$\leq 19$ , 20-24...40-44, 45+, unknown	5-year	1 to 8, 9+	12
1976-2014 <sup>3</sup>	Live births by age of mother and birth order	$\leq 14$ , 15, 16,...49, 50+	1-year	1 to 8, 9+	12, 15

<sup>1</sup> Data for the period 1947-1973 are based on birth registration date.

<sup>2</sup> These data have been adjusted for underregistration by the Household Registration Office in Taiwan and further recalculated to represent births by date of occurrence.

<sup>3</sup> Beginning in 1992, birth counts cover the Taiwan-Fukien Area.

<sup>4</sup> Vital statistics in Taiwan are linked to the Household Registration System; therefore in Taiwan officially there are no births of unknown birth order. In rare cases (i.e. birth to a foreign women who is not registered in the Household Registration System) births with an unknown birth order may be classified as birth order one.

Data users should be aware that throughout the entire period 1947-2014 the vital statistics only cover the population of *Taiwanese nationality* living in Taiwan. According to the Nationality Act revised and promulgated in 2000, there are various ways a person can acquire Taiwanese citizenship, either at birth or later in life. A child is automatically granted citizenship in the following cases: (1) one of the child's parents is a citizen of Taiwan at the time of the child's birth; (2) one of the child's parents was a citizen of Taiwan but his/her death occurred after the time of the child's birth; and (3) a child was born in the territory of the Republic of China, and his/her parents can't be ascertained or both were stateless persons. In addition, a person who was not born as a citizen of Taiwan may acquire Taiwanese citizenship through a process of naturalization. Before the revision of the Nationality Act in 2000 however, a child could be recognized as a citizen of Taiwan only if the father was a Taiwanese national at the time of the child's birth. Accordingly, a child born to Taiwanese mother married to a foreign national was not included in the vital statistics before 2000. The issue is discussed in detail in section 4.2 *Data quality issues*.

### **2.3 Monthly birth count data**

The live birth counts by calendar month are available for 1906-1943 and from 1965 to the present. Data for the period 1906-1943 include monthly statistics on births to mothers of Japanese and Taiwanese nationality only<sup>2</sup>. In the period before 1972 the monthly birth count data cover only the Taiwan Area. Beginning in 1972, the official birth statistics include birth events that occurred both in the Taiwan Area and in the Fukien Province. The number of live births by month in Taiwan is collected by year and month of their registration and cannot therefore be used for the HFD calculations.

## **3 Population Count Data**

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

The annual age structure of female population of *Taiwanese nationality* is taken from the Human Mortality Database (HMD). Because there are no continuous and detailed time series on population or/and vital events prior to 1970, the HMD provides data on population exposures from 1970 onwards only (Canudas-Romo et al. 2010). In addition, population estimates prior to 1980 must be used with extra caution due to age heaping problems in death counts, as well as an unusually high ratio of males to females in the 1966 and 1980 censuses due to migration of the Nationalist Army from mainland China after 1949 (Canudas-Romo et al. 2010).

Special attention should also be given to the changing proportions of marriage immigrants<sup>3</sup> in

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<sup>2</sup> In the period 1895-1945 Taiwan was under Japanese jurisdiction and followed the Japanese system for data collection and registration.

<sup>3</sup> A marriage migrant within the framework of this document is a foreigner who married a Taiwanese citizen and moved to live with his/her spouse in Taiwan.

the female population. Without citizenship, the majority of these women were not counted in the year-end static population data, but their children were actually counted in the vital statistics. For more specific details, please read section 4.2 *Data quality issues* of this document.

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

Data on the distribution of women by age and number of live-born children are available from the 1966 and 1980 censuses in Taiwan. The question about the number of live-born children was asked only to ever-married women (i.e. currently married, widowed, or divorced). In the latest 2000 and 2010 censuses data on the number of live-born children were not collected. Available data are presented in the input database but are not used in the HFD calculations.

## **4 Specific details**

### **4.1 Definitions**

#### ***Definition of a live birth***

Live birth, following the conventional WHO definition, 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, such as 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.

According to the old rule of the Household Registration Law, all live-born infants were mandatorily registered by their parents or relatives within 15 days. If newborns died at any time following birth, they were also registered and counted as deaths. Previous studies have found that reliance on parents to report vital events could result in underreporting of infant deaths, particularly those occurring during the first month of life (Chen, 1998). It was possible that parents or relatives of a victim reported neither the birth nor the death as the death event occurred within a few days after birth. To remedy this problem in birth registration practices, the applications of birth registration should be made at the local register offices within sixty days. Furthermore, the Birth Registration Database was established by the Department of Health in 1995 and reporting of births and stillbirths has been made the responsibility of the medical institutions (i.e. clinics and hospitals).

#### ***Definition of age***

The age of mother at birth of a child is calculated as an interval between birth dates of the mother and the child, taking day, month and year into consideration (i.e. age in completed years (ACY)).

#### ***Definition of birth order***

Birth order ranks the child in relation to all of the previous live-born children of the mother.

## 4.2 Data quality issues

**WARNING:** Due to the inconsistency between birth counts and exposure population, the birth data after 1985 should be used with caution.

### *Inconsistency between birth counts and exposure population*

Before the lifting of the Martial Law in 1985 the number of foreign nationals in Taiwan was small due to the unique political environment and border controls. Since the 1990s, however, the number of immigrants has surged rapidly with the influx of spouses from China and Southeast Asia.

A complete household registration is required for obtaining a ROC ID Card which is often used as proof of citizenship. In general, it takes at least 3 years for immigrants from Southeast Asian countries and 6-8 years from mainland China to attain Taiwanese citizenship. While the latest statistics show that a total of 456,814 applications have been filed for entry, residency and naturalization since 1976 (National Immigration Agency, 2011), many marriage immigrants are not registered as permanent residents and thus are not included in the population data produced by the Department of Household Registration Affairs. Women constitute more than 90% of marriage immigrants.

Detailed statistics on marriage immigration exist since 1998. The share of marriages with non-Taiwanese brides increased from 14.1% in 1998 to a maximum of 28.4% in 2003 (Table 3). To decelerate the growth of cross-border marriages and to inhibit the possibility of marriage fraud, a variety of restrictions and penalties began to be implemented and were applied to individuals and brokers involved in fake marriages starting in 2004. A decreasing proportion was observed from 21.4% in 2004 to 12.8% in 2010. Consequently, the share of babies born to non-Taiwanese mothers has been declining in recent years (Table 3).

Two periods – prior to the year 2000 (i.e. 1947-1999) and since 2000 – should be distinguished as far as the discrepancy between the registration of births and the inclusion of mothers in the population statistics is concerned (see Table 2). In the period before 2000, a child could receive Taiwanese nationality only through the father. Thus, a baby born to a Taiwanese mother and a foreign father would not be counted by the vital statistics, while the mother would contribute to the population statistics. Since 2000 if a newborn's father or mother was a national of the Republic of China when the baby was born, he/she would be legally recognized as a Taiwanese national. Accordingly, all births from either Taiwanese or non-Taiwanese mothers are counted in the fertility data (except for the births in which neither parent has Taiwanese citizenship), while the non-Taiwanese mothers do not contribute to the female population counts.

In sum, from the year 2000 onwards the registration of births improved. All new-born children with at least one Taiwanese parent receive Taiwanese citizenship. However, mixed marriages between Taiwanese women and non-Taiwanese men are rare<sup>4</sup>, and the share of children born in such marriages is rather negligible. Marriage between a Taiwanese man and a non-Taiwanese woman is much more common, however, and the registration system has

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<sup>4</sup> The share of marriages between Taiwanese woman and foreign man was in the range of 2-3% in the second half of 2000s (2.2% in 2006, 2.8% in 2010). See table available at <http://eng.stat.gov.tw/ct.asp?xItem=4561&ctNode=1619&mp=5>

continued to exclude these women from the population statistics even after the year 2000 (Table 2).

**Table 2** Discrepancy between the birth counts and the exposure population

	Inclusion in the official statistics	
	Before the year 2000	From 2000 onwards
<b>Taiwanese mother and foreign father</b>	Mother – IN Baby – OUT	Mother – IN Baby – IN
<b>Taiwanese father and foreign mother</b>	Mother –OUT Baby – IN	Mother –OUT Baby – IN

The nominator/denominator inconsistency had a relatively small effect on the estimated birth rates during the 1970s and 1980s. In the second half of the 1980s, and especially in the late 1990s and early 2000s the imbalance between birth counts and population exposure grew substantially. The share of births to non-Taiwanese mothers increased rapidly from about 5% in 1998 to reach its maximum of 13.7% of all live births in 2003 (see Table 3). This means that in 2003 more than 31,000 births were included in the annual birth count by the vital statistics, while their mothers were least likely to be counted into the annual female population. Detailed age- and birth order distribution of these births is not available; therefore we are not able to make appropriate adjustments to the data.

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 Taiwan, we estimated an alternative TFR with corresponding births (nominator) and population exposure (denominator).

**Table 3** Registered Number of Marriages and Births by Bride's/Mother's Origins: 1998-2010

Year	No. of Marriages	Marriages by bride's nationality (%)				No. of Births	Births by mother's nationality (%)			
		Taiwan	China	SE Asia	Other		Taiwan	China	SE Asia	Other
1998	145976	85.9	8.2	5.9		271450	94.9	5.1		
1999	173209	83.0	9.7	7.3		283661	93.9	6.1		
2000	181642	77.0	12.5	10.5		305312	92.4	7.6		
2001	170515	74.9	15.1	9.8	0.2	260354	89.3	10.7		
2002	172655	74.1	15.8	9.8	0.2	247530	87.5	12.5		
2003	171483	71.6	18.5	9.5	0.3	227070	86.3	13.4		
2004	131453	78.6	8.0	13.1	0.3	216419	86.7	5.2	8.0	0.1
2005	141140	82.1	10.0	7.6	0.3	205854	87.1	4.9	7.9	0.1
2006	142669	85.5	9.7	4.5	0.3	204459	88.3	5.1	6.5	0.1
2007	135041	84.0	10.8	4.8	0.3	204414	89.8	5.0	5.2	0.1
2008	154866	88.2	7.8	3.6	0.3	198733	90.4	5.0	4.5	0.1
2009	117099	84.4	10.8	4.4	0.4	191310	91.3	4.6	4.0	0.1
2010	138819	87.2	9.0	3.4	0.4	166886	91.3	4.9	3.7	0.1

Source: Annual Population Statistics. Department of Household Registration Affairs, MOI, Executive Yuan. Available online: Marriage Registration: [http://www.ris.gov.tw/version96/population\\_01\\_C\\_05.html](http://www.ris.gov.tw/version96/population_01_C_05.html). Birth Registration: [http://www.ris.gov.tw/version96/population\\_01\\_C\\_03.html](http://www.ris.gov.tw/version96/population_01_C_03.html)

As described in detail in sections 1.2 and 3.1, population counts in Taiwan are produced annually by the *Department of Household Registration Affairs within the Ministry of the Interior*. The Population Register includes only people of *Taiwanese nationality* living in Taiwan. In order to calculate a TFR that is not subject to the numerator-denominator bias, we need to estimate the distribution of births having occurred to *mothers of Taiwanese nationality only*. Vital Statistics of Taiwan does not provide birth count data by age of mother for this category. However, starting in 1998, the annual number of live births is available by mothers' nationality (see Table 3), without further breakdown by age of the mother. In the calculations below we assume that the distribution of births to a Taiwanese father and foreign mother follow the same age pattern<sup>5</sup> as in the officially published statistics, which includes children with Taiwanese nationality only.

In order to obtain *births to Taiwanese mothers* we exclude children born to a Taiwanese father and foreign mother (columns 8-10 in Table 3 above) from the annual number of births published by the Vital Statistics of Taiwan. The 'alternative' estimate 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 4.

**Table 4** Official and "alternative" estimates of the TFR using different combinations of mother's and father's nationality; Taiwan, selected years 1998-2010

	official <sup>1</sup> TFR	HFD computation (live births with Taiwanese nationality related to Taiwanese females)	Alternative TFR live births to Taiwanese mothers related to Taiwanese female population only	
			Number	% deviation <sup>2</sup>
1998	1.465	1.469	1.395	5.10
2000	1.680	1.673	1.546	7.58
2005	1.115	1.116	0.972	12.91
2010	0.895	0.887	0.805	9.79

<sup>1</sup> Published by the Department of Household Registration Affairs, ROC

<sup>2</sup> Deviation is estimated as compared to the HFD estimates of TFR

The "corrected" estimates of the TFR are well below the officially published TFR levels in Taiwan. The official TFR is structurally overestimated in the range from 5.1% in 1998 to more than 12% in 2005 (see alternative estimate based on *live births to Taiwanese women and total Taiwanese female population*). Even if it shows a modest decrease in the second half of the 2000s, this is a large bias, which clearly affects the official TFR estimates. However, the *alternative TFR estimate* presented in Table 4 does not fully reveal the real fertility dynamics

<sup>5</sup> There is evidence that foreign mothers in Taiwan are younger than Taiwanese mothers (Chen 2008). However, the Vital Statistics of Taiwan does not provide detailed age schedules of births to foreign mothers and Taiwanese fathers, therefore we assume that they follow the same age pattern as in the officially published statistics.

in Taiwan as it only covers one sub-population (i.e. Taiwanese nationals). In order to obtain the TFR for Taiwan corresponding to the total resident population (as commonly computed in most other countries) we would have to relate the total number of births by age in one calendar year to the total resident female population by age in that year. Unfortunately such data are not published at present.

### **4.3 Revision history**

There are some differences between the births estimates as well as the fertility rates for 1976-2001 published for Taiwan in this HFD data release and those released on 8 April 2013. They appear due to changes in the exposure population estimates. The population estimates have been adjusted to overcome the inconsistencies found between the population counts based on the December 2000 census and those based on the population register (available starting in 2001) and to make continuous time series. Note that these population estimates are not yet final.

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

**BIRTHS**

<b>Period</b>	<b>Type of data</b>	<b>Age range</b>	<b>Birth order</b>	<b>RefCode(s)</b>
1976-2014 <sup>1</sup>	Annual number of live births by age of mother and birth order (Lexis squares)	≤14, 15, 16,...,48, 49, 50+,	1, 2,...,8, 9+	12, 15

<sup>1</sup> Before 1992 the annual birth counts cover the Taiwan Area, and from 1992 onwards the data pertain to the Taiwan-Fukien Area.

**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>.