ABOUT MORTALITY DATA FOR TAIWAN
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GENERAL
The area referred to here as "Taiwan" consists of the island of Taiwan (also known as Formosa) and several smaller islands and is administered by the Republic of China (ROC) based in Taipei. Uncertainties remain about the political status of this area, which is also claimed as a territory of the People's Republic of China (PRC) based in Beijing. We take no position with regard to these political issues but rather seek merely to document the demographic history of the population residing in this area.

Source of Data
Death and birth counts come from the official statistics published in Taiwan-Fukien Demographic Fact Book. This publication was originally entitled Taiwan Demographic Fact Book, but the name was changed in 1974 when it was combined with The Statistical Report on Household Registration for Taiwan-Fukien Area. The costs of publishing this fact book are shared by the Ministry of Interior, Taiwan Provincial Government, Taipei Municipal Government and Kaohsiung Municipal Government (Ministry of Interior, 1994). Population counts are based on published census counts and official population estimates. For more recent years, these data are available in computerized data files of the Statistical Yearbook of Interior (http://sowf.moi.gov.tw/stat/year/elist.htm).

Specific Episodes in Taiwan’s Demographic History
Between 1945 and 2014, the population of Taiwan increased from 6.5 million to some 23.4 million, with a 2.3 percent average annual rate of growth. In the years following World War II, there was an increase in the population of Taiwan mainly due to the influx of population from mainland China. Since then, the population has steadily increased, with low international migration rates (Selya, 2004), although at a slower rate each year. As successive censuses indicate, the average annual growth rate decreased from 3.7% during 1956-1966 to 2.1% during 1975-1980 (Census Office of the Executive Yuan, 1982). By 1992, growth fell below 1 percent. During this period, Taiwan changed structurally from a young society to an aging society. As early as 1956, the proportion of the population below age five began to shrink. The increase in the elderly population was particularly rapid after the 1960s (Selya, 2004).

One important factor to note in Taiwan demographic history is the abnormally elevated sex ratio (defined as the ratio of men to women). For older cohorts, this phenomenon results from the selective migration of males when Kuomintang (Nationalist) military and civilian supporters arrived in Taiwan after 1949. More recently, there also appears to have been an upward trend in the sex ratios of newborns (Selya, 2004). In a broader East Asian context, elevated sex ratios at birth have been attributed
to son preference and a rapid decline in fertility leading to selective abortion (Gu and Roy, 1995).

**TERRITORIAL COVERAGE**

The Human Mortality Database covers the “Taiwan Area” for 1966-1991 and the “Taiwan-Fukien Area” since 1992. The territory we refer to as the “Taiwan Area” includes the island of Taiwan and sixty-three islands in the Penghu group, known as the Pescadores. The “Taiwan-Fukien Area” includes the same territory as well as Kinmen (Quemoy) and Lienkiang (Matsu), offshore islands next to Fukien province on the mainland.

Prior to 1992, death counts are available for the Taiwan-Fukien Area, but with less age detailed information than for the Taiwan Area. For this reason, we opted to include the Fukien offshore islands only since 1992. The raw data for the HMD are restricted to the Taiwan Area before 1992 and the Taiwan-Fukien Area since then; we make adjustments for this territorial change per the *Methods Protocol*. According to the 2000 census, the area of Fukien (Kinmen-Matsu Area) had a population of 73,958 persons, which represented only 0.3% of the total population. Thus, the effect of this territorial change on mortality estimates is likely to be minor.

**DEATH COUNT DATA**

*Coverage and Completeness*

After WWII, the completeness and quality of death records fluctuated and death counts were available only by age group. In the 1970s, deaths were reported by single year of age and the reliability of the data began to improve.

The vital statistics system stopped operating during World War II. Birth registration was interrupted for the five years from 1944 to 1948 and death registration from 1944 to 1949. Moreover, there is a 16-year gap between the last pre-WWII census (1940) and the first post-WWII census (1956). Furthermore, the Census of 1956 excluded men aged 20-24 years serving in the armed forces (Census Office of the Executive Yuan, 1982). For these reasons, we have elected to present the mortality series starting in 1970 only.

*Specific Details*

From 1952 to the 1970s, the crude death rate in Taiwan declined at an average rate of 1.35 percent per year with the exception of 1957, when an influenza epidemic increased mortality. In the 1970s and early 1980s, the crude death rate appears to have stagnated or even reversed (Selya, 2004) but even during the 1950s and 1960s, the age-specific death rates for older Taiwanese males was abnormally high compared to females. This sex gap results partly from a strong cohort effect reflecting heightened exposure and susceptibility of older men to tuberculosis (Goldman, 1980). The sex difference is also observed in life expectancy at various ages. In the 1950s, years lived between ages 0 and 40 years was 0.34 years longer for Taiwanese men than for women, whereas life expectancy at age 40 years was 0.66 years shorter for men than...
for women (Selya, 2004). Other unexpected patterns in life expectancies for women and men have also been observed in recent years (Seyla, 2004).

Infant mortality rates started declining before WWII, but HMD users should be aware that there was systematic under-registration of infant deaths, especially neonatal deaths, from the 1940s until well into the 1970s (Sullivan, 1973). Even in the 1990s, there is some evidence of under-registration of infant deaths (Chen et al., 1998). The low infant mortality rates in Taiwan even during the periods of Japanese control and retrocession to China at the end of WWII have also been attributed to the practice of a twenty-eight-day postpartum confinement, which restricted a new mother’s interaction with environments which could expose a newborn child to infectious diseases (Seyla, 2004) though it is difficult to tease out the role of such a practice from the under-registration of infant deaths.

1975 - 1978 Death Counts: For this four-year period, death counts are taken from the Department of Health statistics instead of the Ministry of Interior. The death counts in the latter publication exhibited some data quality issues (see the last section of this document for more details).

POPULATION COUNT DATA

Coverage and completeness

Data on the population of Taiwan prior to the twentieth century are limited. Enumeration of the Taiwanese population occurred irregularly (only to supply the immediate and practical needs of the local administration), and the records lacked reliability even as regards the simple enumeration of all inhabitants (Domschke and Goyer, 1986).

In the 35 years from 1905 to 1940, five population censuses and two provisional household censuses were carried out in Taiwan. The first, in 1905, was entitled “Provisional Household Census.” The collection of official demographic statistics for Taiwan was under Japanese administration. The census of 1905 covered both de facto and de jure populations, and it was the first time a modern census was conducted in the country. All the censuses administered by Japan maintained high standards of completeness, consistency and accuracy (Census Office of the Executive Yuan, 1982).

After World War II and Taiwan’s retrocession to China, the first population census of the Taiwan and Fukien Offshore Islands was realised on September 16, 1956, and the second on December 16, 1966. As noted earlier, given the 16-year gap (1940-1956) between these two censuses and the exclusion of men aged 20-24 years that were serving in the armed forces from the 1956 census, we begin the HMD mortality series in 1970.

Two micro-censuses were conducted based on a 5% sample survey on December 16 of 1970 and 1975 (Census Office of the Executive Yuan, 1982). The third and fourth censuses were conducted on December 28, 1980, and December 16, 1990. All of these censuses were conducted by the Ministry of Interior and the Directorate General of Budget, Accounting and Statistics (DGBAS) of Executive Yuan. The more recent 2000 and 2010 censuses were conducted solely by DGBAS. The 2010 census was a
Register and Sample-assisted operation. A total of 16% enumeration areas were sampled. Each household in these areas was visited and each of their members counted (National Statistics, 2016).

After WWII, most of the published census data covered the de jure (resident) population, and all census data used in the HMD are considered to be of good quality (Domschke and Goyer, 1986).

Specific Details

1956 & 1966 Census Counts: After the war and before 1970, the censuses collected data only within the Taiwan Province because of military reasons (military confrontation with Mainland China still existed in Fukien Province during that period).

1970 & 1975 Micro-census Counts: The micro-census of 1970 complied with the United Nations’ recommendation to take a census in that year, but it was based on a 5 percent sample survey. Similarly, a 5% sample survey was conducted in 1975. The accuracy of the data in both micro-censuses is considered very high (Domschke and Goyer, 1986).

1980 Census Count: The census of 1980 was intended for 1976 but was delayed four years “in order to match the world-wide practice of taking censuses in A.D. years ending in zero to facilitate comparison and analysis of the census data” (Domschke and Goyer, 1986, p. 846-847).

REVISION HISTORY

Changes with the May 2016 revision:

The 2016 revision includes new population estimates by sex and single year age groups for the period 1974-2014, recently published by the Dept. of Household Registration Affairs, Ministry of Interior (MOI). The new population series introduces changes in population numbers compared with the previous series, with impacts on the death rates and life expectancies estimates. The largest differences are in the estimates for the 1970s and early 1980s, especially among males. Life expectancies calculated using the new population counts are higher than those in previous updates.

BIRTH COUNT DATA

Coverage and completeness

In Taiwan, infant births and infant deaths are required to be registered within 15 days by the family. Consistent with the WHO definition of a “live birth”, all live births are registered as such, irrespective of gestational age or vital status at the time of registration; if the newborn dies at any time following birth, both the live birth and the infant death are registered (Ministry of Interior, 1982). The infant vital statistics are compiled by the Department of Health of the Executive Yuan from two different sources: live birth records are collected by the Household Registration System managed by the
Ministry of the Interior, while data on infant deaths are obtained from the Vital Registration System. As shown by Chen et al. (1998), there seems to be underreporting of infant deaths, particularly those occurring during the first 28 days of life (i.e., neonatal deaths). Given that the registration of births and infant deaths in Taiwan is the responsibility of the parents, both series could suffer from underreporting. Even though this under-reporting would have to be systematically and evenly distributed temporally and spatially to be undetected (Selya, 2004), the reader should be aware that international comparisons could be affected by this drawback of the data.

**DATA QUALITY ISSUES**

The data prior to 1980 should be used with extra caution due to age heaping problems.

- For this early period, we would advise using the life tables by 5-year (or 10-year) age groups, which smooth out the age heaping, rather than using the life tables by single years of age.

- From 1975 to 1978, the raw death counts published by the Ministry of Interior exhibit patterns of age-misreporting around age 65 (see Figure 1). By 1979, the age heaping had largely disappeared. Data coming from the Department of Health did not demonstrate such problems. Therefore, we have used the data from the latter source for the HMD.

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**Figure 1. Raw Death Counts by Age, Females and Males, 1975 and 1980**

- There is less evidence of age heaping in the census counts (see Figure 2). The 1956 census is the first of its type after WWII; the deficit of males at ages 20-24 years is related to the exclusion of young men in the armed forces (Census Office of the Executive Yuan, 1982). The 1966 and 1980 censuses show an unusually high ratio of males to females that reflects the migration of the Nationalist army into Taiwan from mainland China after 1949.
Figure 2. Raw Census Counts by Age, Taiwanese Females and Males, 1956, 1966 and 1980.
There have also been problems with the quality of the population estimates at age 80 and over.

- Mortality data at ages above 65 appear to be less accurate for the years before the 1970s. A comparison of trends in remaining life expectancy at ages 65 and 80 suggests that $e_{65}$ and $e_{80}$ were much greater for Taiwan than for Sweden during the 1950s. In Taiwan, these values decline dramatically over time such that after 1970 old age life expectancy was substantially lower for Taiwan than for Sweden. This pattern is particularly evident for females (see Figure 3). Such an implausible trend can result from an improvement in data quality over time: estimates of old age life expectancy may be artificially inflated during historical periods (e.g., due to age exaggeration). This implausibility explains why the HMD series start in 1970.

Figure 3. Female remaining life expectancy at age 80 for Sweden and Taiwan (1950-2000)

- Data quality problem among the elderly is a well know issue in many populations and it seems to exist in Taiwan too. According to Yue (2005), mortality estimates for old ages in Taiwan become less reliable as the age increases. In fact, mortality data at ages above 80 years appear to be less accurate for recent years, especially for males. A comparison of trends in remaining life expectancy at age 80 suggests that $e_{80}$ for males was greater for Taiwan than for Sweden after 2000 (Figure 4). Starting in the mid 2000s, life expectancy at ages 95 and 100 ($e_{95}$ and $e_{100}$) was greater for males than for females, an unexpected pattern which could also indicate data quality problems (Figure 5). One of the reasons of these issues is the quality of the information provided by this population in the
censuses. Furthermore, keeping the elderly data updated has become even more difficult since the people aged 65 and over are entitled to receive a monthly living expense (citizen's annuity) starting in 2001 (Yue, 2005). There are several cases in which the records of the elderly show a person alive, after being dead for years. Historical migration and the mobility of the elderly can also play an important role: “about 3 million people migrated to Taiwan due to the political unrest in 1949, and a lot of these people still alive moved back (or travel back and forth) to mainland China since 1990, when the relationship between Taiwan and China became less tight. It is very difficult to locate these people who move or travel to China, at least for now, since China is the major thread to Taiwan”. Yue (2005, p. 13).

Figure 4. Female remaining life expectancy at age 80 for Sweden and Taiwan (1970-2014)
Figure 5. Female remaining life expectancy at ages 85, 90, 95 and 100 for Taiwan (1970-2014)
• There are inconsistencies between the number of births and the population estimates under age 1, which result in implicit negative net migration at age 0. These discrepancies are likely due to differences in definition regarding the population of reference (i.e. for instance whether immigrants are included or not (Yu-Hua and Kostova, 2016).

REVISION NOTES

Changes with the December 2017 revision:

Life tables: All life tables have been recalculated using a modified methods protocol. The revised protocol (Version 6) includes two changes: 1) a more precise way to calculate a0, the mean age at death for children dying during the first year of life and 2) the use of birth-by-month data (where and when available) to more accurately estimate population exposures. These changes have been implemented simultaneously for ALL HMD series/countries. For more details about these changes, see the revised Methods Protocol (at http://v6.mortality.org/Public/Docs/MethodsProtocol.pdf), particularly section 7.1 on Period life tables and section 6 and Appendix E, on death rates. The life tables calculated under the prior methods (Version 5) remain available at v5.mortality.org but will not be further updated in the future.

ACKNOWLEDGEMENTS

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REFERENCES


APPENDIX:

DESCRIPTION OF DATA USED FOR LEXIS DATABASE

DEATHS

<table>
<thead>
<tr>
<th>Period</th>
<th>Type of Data</th>
<th>Age grouping</th>
<th>Comments</th>
<th>RefCode(s)†</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>Annual number of deaths, by sex and age group (5x1), with open-ended age interval 80+</td>
<td>0, 1-4, 5-9, ..., 75-79, 80+</td>
<td>Data for Taiwan Area</td>
<td>6</td>
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<tr>
<td>1971</td>
<td>Annual number of deaths, by sex and age group (5x1 and some single ages), with open-ended age interval 80+</td>
<td>0, 1, 2, 3, 4, 5-9, ...75-79, 80+</td>
<td>Data for Taiwan Area</td>
<td>6</td>
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<tr>
<td>1972-1973</td>
<td>Annual number of deaths, by sex and age group (5x1), with open-ended age interval 85+</td>
<td>0, 1, 2, 3, 4, 5-9, ..., 80-84, 85+</td>
<td>Data for Taiwan Area</td>
<td>7</td>
</tr>
<tr>
<td>1974-1974</td>
<td>Annual number of deaths, by sex and age group (5x1, Lexis triangle at age 0, and some single ages), with open-ended age interval 85+</td>
<td>0, 1, 2, 3, 4, 5-9, ..., 80-84, 85+</td>
<td>Data for Taiwan Area</td>
<td>8</td>
</tr>
<tr>
<td>1975-1978</td>
<td>Annual number of deaths, by sex and single year of age (1x1, and Lexis triangle at age 0), with open-ended age interval 95+</td>
<td>0, 1, , ...93, 94, 95+</td>
<td>Data for Taiwan Area</td>
<td>22</td>
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<tr>
<td>1979-1991</td>
<td>Annual number of deaths, by sex and single year of age (1x1, and Lexis triangle at age 0), with open-ended age interval 95+</td>
<td>0, 1, , ...93, 94, 95+</td>
<td>Data for Taiwan Area</td>
<td>9</td>
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<tr>
<td>1992-1997</td>
<td>Annual number of deaths, by sex and single year of age (1x1, and Lexis triangle at age 0), with open-ended age interval 95+</td>
<td>0, 1, , ...93, 94, 95+</td>
<td>Data for Taiwan-Fukien Area</td>
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<tr>
<td>1998-2014</td>
<td>Annual number of deaths, by sex, single year of age, (1x1, and Lexis triangle at age 0), with open-ended age interval 100+</td>
<td>0, 1, , ...98, 99, 100+</td>
<td>Data for Taiwan-Fukien Area</td>
<td>10, 24</td>
</tr>
</tbody>
</table>

† The reference code is used in the raw data files (Input Database) to link data with sources.
### POPULATION

<table>
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<th>Age grouping</th>
<th>Comments</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>Micro-census counts (de jure population) as of December 16th, by sex and single year of age</td>
<td>0, 1, 2, ..., 84, 85+</td>
<td>Data for Taiwan Area</td>
<td>13</td>
</tr>
<tr>
<td>1974</td>
<td>Population estimates as of December 31st, by sex and age to 85+</td>
<td>0, 1, 2, ..., 84, 85+</td>
<td>Data for Taiwan Area</td>
<td>34</td>
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<tr>
<td>1975-1991</td>
<td>Population estimates as of December 31st, by sex and age to 90+</td>
<td>0, 1, 2, ..., 89, 90+</td>
<td>Data for Taiwan-Fukien Area</td>
<td>34</td>
</tr>
<tr>
<td>1992-2014</td>
<td>Population estimates as of December 31st, by sex and age to 100+</td>
<td>0, 1, 2, ..., 99, 100+</td>
<td>Data for Taiwan-Fukien Area</td>
<td>34</td>
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</tbody>
</table>

† The reference code is used in the raw data files (Input Database) to link data with sources.

### BIRTHS

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<th>Type of Data</th>
<th>Comments</th>
<th>RefCode(s)†</th>
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<td>1906-1943</td>
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<td>Data for Taiwan Area (Missing Years: 1944-1948)</td>
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<td>Annual live birth counts</td>
<td>Data for Taiwan Area</td>
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<td>1974-1992</td>
<td>Annual live birth counts</td>
<td>Data for Taiwan Area</td>
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<tr>
<td>1992-2000</td>
<td>Annual live birth counts</td>
<td>Data for Taiwan-Fukien Area</td>
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<tr>
<td>2001-2004</td>
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<td>2005-2010</td>
<td>Annual live birth counts</td>
<td>Data for Taiwan-Fukien Area</td>
<td>21</td>
</tr>
<tr>
<td>2011-2014</td>
<td>Annual live birth counts</td>
<td>Data for Taiwan-Fukien Area</td>
<td>25</td>
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</table>

† The reference code is used in the raw data files (Input Database) to link data with sources.

### BIRTHS BY MONTH

**Type of data:** Annual live birth counts by month

**Period covered:** 1906 to 2014

**RefCodes:** 26, 27, 28, 29, 30, 31, 32, 33