Commentary on the ratios

The ratios used in this report have been calculated as follows:

The tables for yearly trends for 1970, 1975 and 1980 are based on the final numbers of the National Census for Japanese population as on October 1. Therefore, the figures may differ from the values in the reports for 1970, 1975 and 1980.

Moreover, the denominator population used in the calculations is available under "Population" (Appendix to the end of Volume 1 of the Reports until 2016) in Final Data on e-Stat.

(1) Comprehensive List

$$\text{Live birth rate} = \frac{\text{Number of live births in a year}}{\text{Japanese population on October 1}} \times 1{,}000$$

$$\text{Death rate} = \frac{\text{Number of deaths in a year}}{\text{Japanese population on October 1}} \times 1{,}000$$

$$\text{Infant mortality rate} = \frac{\text{Number of infant deaths in a year}}{\text{Number of live births in a year}} \times 1{,}000$$

$$\text{Neonatal mortality rate} = \frac{\text{Number of neonatal deaths in a year}}{\text{Number of live births in a year}} \times 1{,}000$$

$$\text{Natural change rate} = \frac{\text{Number of natural changes in a year (Number of live births in a year - Number of deaths in a year)}}{\text{Japanese population on October 1}} \times 1{,}000$$

Foetal death rate (Total, spontaneous, artificial)

$$= \frac{\text{Number of foetal deaths in a year (Foetal death after 12 completed weeks of gestation) (Total, spontaneous, artificial)}}{\text{Total number of births in a year (Number of live births in a year + number of foetal deaths in a year)}} \times 1{,}000$$

$$\text{Perinatal mortality rate} = \frac{\text{Number of perinatal deaths in a year}}{\text{Number of live births in a year + Number of foetal deaths after 22 completed weeks of gestation}} \times 1{,}000$$

Foetal death rate after 22 completed weeks of gestation (Total, spontaneous, artificial)

$$= \frac{\text{Number of foetal deaths after 22 completed weeks of gestation (Total, spontaneous, artificial)}}{\text{Number of live births in a year + Number of foetal deaths after 22 completed weeks of gestation}} \times 1{,}000$$

$$\text{Early neonatal death rate} = \frac{\text{Number of early neonatal deaths in a year (Number of deaths before 1 week (7 days) of birth)}}{\text{Number of live births in a year}} \times 1{,}000$$

$$\text{Marriage rate} = \frac{\text{Number of marriages in a year}}{\text{Japanese population on October 1}} \times 1{,}000$$

$$\text{Divorce rate} = \frac{\text{Number of divorces in a year}}{\text{Japanese population on October 1}} \times 1{,}000$$

(2) Live Birth

$$\text{Sex ratio} = \frac{\text{Number of male live births in a year}}{\text{Number of female live births in a year}} \times 100$$

Live birth rate by age of mother (Age groups)

$$= \frac{\text{Number of live births by mothers of an age group}}{\text{Number of Japanese women of the age group as of October 1}} \times 1{,}000$$

$$\text{Monthly birth rate (annualized)} = \frac{\text{Number of live births in a month}}{\text{Population at the beginning of the month} \times \text{Annual conversion factor}} \times 1{,}000$$

$$\text{(Note) Annual conversion factor} = \frac{\text{Number of days in a month (30, 31, 28 or 29)}}{\text{Number of days in a year (365 or 366)}}$$

Or, the length of each month, taking the length of a year as 1.

$$\text{Total fertility rate} = \left\{ \frac{\text{Number of live births in a year by age of mother}}{\text{Female population by age as of October 1}} \right\} \text{Total of women aged 15 years to 49 years}$$

・The value for the entire country is the sum of values calculated from “the number of live births by age of mother” and “the Japanese female population”.
・The values for the prefectures are calculated from “the number of live births by five-year age group of mother” and “female population”. They are calculated, depending on the year, either by multiplying the each age-group value by five and summing up, or by adding up “the values of live births by age of mother” and “female population”.

Note that the values for the special wards and specified cities are calculated only in the National Census years.
The number of live births and female population used in the calculation for prefectures, special wards and specified cities are as follows.

National Census years:
National Census years until 2010…“Number of live births by 5 year age group of mother” and “Japanese female population by 5 year age group” National Census years of 2015 and 2020…“Number of live births by age of mother” and “Japanese female population by age”
Other than National Census years:
Until 2014…“Number of live births by 5 year age group of mother” and “total female population by 5 year age group”
Since 2016…“Number of live births by 5 year age group of mother” and “Japanese female population by 5 year age group”

The total fertility rate refers to the total of live birth rates by age for women aged 15 years to 49 years. It is equivalent to the number of children a woman would bear in a lifetime at that live birth rate by age.

Moreover, number of live births at 15 years and 49 years respectively include deliveries at 14 years or less and 50 years or more of age.

(Reference)
Total fertility rate is of the following two types.

Period total fertility rate: This value focuses of the fertility situation in a certain period (one year) and is the total of live birth rates of women of each age (15-49 years old). Excluding the differences between age compositions of the female population, this value is used for year-wise, country-wise and region-wise comparisons as “the total fertility rate for that year.” The period total fertility rate is calculated using the above formula in the Vital Statistics.

Cohort total fertility rate: This value focuses on the fertility situation of a certain generation and is the cumulative total of the live birth rates from the past of women belonging to each age (15-49 years old) in the same generation (cohort). This is “the total fertility rate for that generation.”

Although “the number of children a woman would bear in a lifetime” is the cohort total fertility rate, the period total fertility rate is generally used as an equivalent because the data cannot be obtained until the generation reaches 50 years of age. Moreover, if the live birth rate for each age group is the same for all generations (cohorts) then both “total fertility rates” will give the same value.

However, late marriages and late childbirths are rising and there are differences in marriage and childbirth circumstances in each generation. When the live birth rate for each age differs by generation, it is necessary to note that the period total fertility rate, which is the total of live birth rates for each generation by age, will differ from the cohort total fertility rate.

(3)Death rate

$$\text{Death rate by sex} = \frac{\text{Number of male deaths in a year}}{\text{Number of female deaths in a year}} \times 100$$

Death rate (total, male, female) by age (age groups)

$$= \frac{\text{Number of deaths at a certain age (age group) in a year (total, male, female)}}{\text{Population of Japanese people of the age (age group as of October 1)}} \times 1{,}000$$

$$\text{Monthly death rate (annualized)} = \frac{\text{Number of deaths in a month}}{\text{Population at the beginning of the month} \times \text{Annual conversion factor}} \times 1{,}000$$

$$\text{(Note) Annual conversion factor} = \frac{\text{Number of days in a month (30, 31, 28 or 29)}}{\text{Number of days in a year (365 or 366)}}$$

Or, the length of each month, taking the length of a year as 1.

$$\text{Death rate by cause (annual)} = \frac{\text{Number of deaths in a year by cause}}{\text{Population of Japanese people as of October 1}} \times 100{,}000$$

$$\text{Age-adjusted mortality rate} = \frac{\left\{\left[\text{Sum total for each age (age group) of (Death rate of each age(age group) in a group under observation}\right] \times \left[\text{Population of the same age (age group)}\right]\right\} \text{ in the standard population group}}{\text{Total number of standard population groups}}$$

(Reference)

Since mortality rates differ by age, it is useful to use age-adjusted mortality rate for international comparisons or observations of annual trends, in order to remove differences in age structure of the population, and the following years are used for the reference population for age-adjusted mortality rates.

To note, the "mortality rate for each age (age group) of the observed population" in the calculation formula is multiplied by 1,000 (or by 100,000 for calculation by cause of death).

-1989: total population by sex in 1935 (total population in 1960 for statistics by prefecture).
1990-2019: 1985 model population (based on the Japanese population of the 1985 Population Census, corrected for extreme changes during the baby boom and other periods, and prepared in units of 1,000 people).
2020- : 2015 model population (based on the Japanese population of the 2015 Population Census, corrected for extreme changes during the baby boom and other periods, and prepared in units of 1,000 people).

I changed the standard population of the age-adjusted death rates to the model population in 2015 to enable the past comparison as follows and recalculated.

・From 2005 to 2019 (every year)

・From 1950 to 2000 (every 5 years)

Standard population -2015 model population

Age	Standard population	Age	Standard population
0year	978 000	50～54	8 451 000
1～4years	4 048 000	55～59	8 793 000
5～9	5 369 000	60～64	9 135 000
10～14	5 711 000	65～69	9 246 000
15～19	6 053 000	70～74	7 892 000
20～24	6 396 000	75～79	6 306 000
25～29	6 738 000	80～84	4 720 000
30～34	7 081 000	85～89	3 134 000
35～39	7 423 000	90～94	1 548 000
40～44	7 766 000	95years～	423 000
45～49	8 108 000	Total	125 319 000

Note:Age-adjusted mortality rates are calculated by combining age 0 and age 1～4 for the 2015 model population.

(4)Infant mortality

$$\text{Infant mortality rate by sex} = \frac{\text{Number of male infant deaths in a year}}{\text{Number of female infant deaths in a year}} \times 100$$

$$\text{Perinatal mortality rate by sex} = \frac{\text{Number of male perinatal deaths in a year}}{\text{Number of female perinatal deaths in a year}} \times 100$$

$$\text{Monthly infant mortality rate (annualized conversion rate) (before 1994)} = \frac{\text{Number of Infant deaths in that month}}{\text{Number of live births in the past one year including that month} \times \frac{\text{Number of days in the month}}{\text{Number of days in the past one year including that month}}} \times 1{,}000$$

$$\text{Monthly infant mortality rate (annualized conversion rate) (from 1995 onwards)} = \frac{\text{Number of Infant deaths in a month}}{\text{Number of live births in a year} \times \text{annual conversion factor}} \times 1{,}000$$

$$\text{(Note) Annual conversion factor} = \frac{\text{Number of days in a month (30, 31, 28 or 29)}}{\text{Number of days in a year (365 or 366)}}$$

Or, the length of each month, taking the length of a year as 1.

$$\text{Infant mortality rate by death cause or infant mortality rate by age} = \frac{\text{Number of Infant deaths in a year by death cause (or Number of Infant deaths in a year by age)}}{\text{Number of live births in a year}} \times 100{,}000$$

$$\text{Neonatal mortality rate by death cause} = \frac{\text{Number of neonatal deaths in a year by cause}}{\text{Number of live births in a year}} \times 100{,}000$$

(5) Foetal Death

$$\text{Foetal deaths by sex} = \frac{\text{Number of male foetal deaths in a year}}{\text{Number of female foetal deaths in a year}} \times 100$$

$$\text{Monthly foetal death rate (total, spontaneous, artificial)} = \frac{\text{Number of foetal deaths in a month (total, spontaneous, artificial)}}{\text{Number of births in a month (number of live births in a month + number of foetal deaths in a month)}} \times 1{,}000$$

$$\text{Monthly foetal death rate after 22 completed weeks of gestation (total, spontaneous, artificial)} = \frac{\text{Number of foetal deaths in a month after 22 completed weeks of gestation (total, spontaneous, artificial)}}{\text{Number of live births in a month + Number of foetal deaths in a month after 22 completed weeks of gestation}} \times 1{,}000$$

(6)Perinatal mortality

$$\text{Monthly perinatal mortality rate} = \frac{\text{Number of perinatal deaths in a month}}{\text{Number of live births in a month + Number of foetal deaths in a month after 22 completed weeks of gestation}} \times 1{,}000$$

(7)Maternal mortality

$$\text{Maternal mortality rate} = \frac{\text{Number of maternal deaths in a year}}{\text{Number of births in a year (number of live births in a year + number of foetal deaths in a year)}} \times 100{,}000$$

(or number of live births in a year)

$$\text{Late maternal mortality rate} = \frac{\text{Number of late maternal deaths in a year}}{\text{Number of births in a year (number of live births in a year + number of foetal deaths in a year)}} \times 100{,}000$$

Note: Please refer to “Commentary on the terms” for information on maternal deaths.