

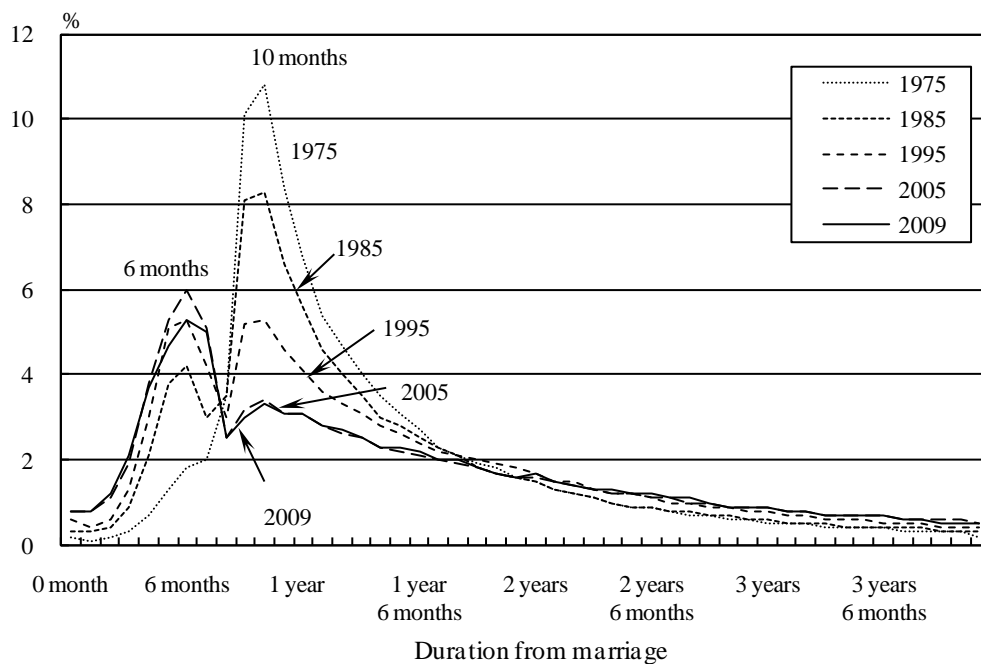
2 Manifold analysis of live birth trends

(1) Live births according to the duration from parents' marriage

The 6th month has become the peak of duration from marriage to the first live birth in 2005 and 2009.

Examination of the proportion of first live births by the duration from marriage indicates that in 1975 the rates peaked at the 10th month. However, the proportion of first live births in the 6th month increased and the proportion in the 10th month decreased in 1985. The proportions of first live births in the 10th and 6th month became almost the same in 1995, and the peak was observed in the 6th month in 2005 and 2009. (Figure 9)

Figure 1. Percent distribution of first live births, according to the duration from marriage, 1975, 1985, 1995, 2005 and 2009



Notes:

- 1) The figures are for the legitimate first live births.
- 2) The percent distribution is against the total, excluding the duration from marriage unknown.
- 3) "0 month" refers to cases where the month of birth is the same as the start of conjugal cohabitation.

(2) Trends in live births when the duration from marriage is shorter than the period of gestation

When one examines the circumstances of live births in recent years, we can see that the duration from marriage of the parents to the first live births has peaked at 6 months. From this, let us consider live births when the duration from marriage until legitimate first live birth is shorter than the period of gestation.

In this outline, we calculated the statistics based on the assumptions described below, concerning live births when the duration from marriage is shorter than the period of gestation.

<Assumptions> Approach concerning live births when the duration from marriage is shorter than the period of gestation

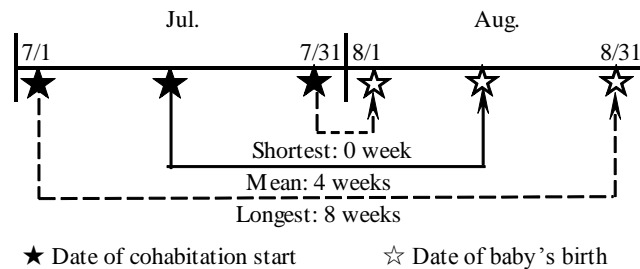
• For this report, given that:

- ① Based on how the number of weeks of gestation is counted, a female is already in the second week from pregnant at the time of ovulation when the menstrual cycle is 28 days, and,
- ② In some cases, couples register their marriage or start cohabitation after they return from their honeymoon. We elected to regard situations in which:
“The number of weeks of marriage <The number of weeks of gestation - 3 weeks (= The number of weeks of gestation >= The number of weeks of marriage + 4 weeks)” as live births when the duration from marriage is shorter than the period of gestation.

• However, the duration from marriage is calculated as:

“Month and year of birth - Month and year when the parents began conjugally cohabiting” based on the Live Birth Form for Vital Statistics, and there is actually some range of weeks for the duration from marriage (number of months), because this is available only as the number of months.

(Example: When the duration from marriage is one month, the actual number of weeks from marriage may be from 0 weeks at the shortest to 8 weeks at the longest, or a mean of 4 weeks. (Refer to the following diagram))



• For the trial calculation of the number of live births when the duration from marriage is shorter than the period of gestation, the calculation is based on the mean number of weeks married for the duration of marriage. (Specifically, calculated in regard to the classification in the following table)

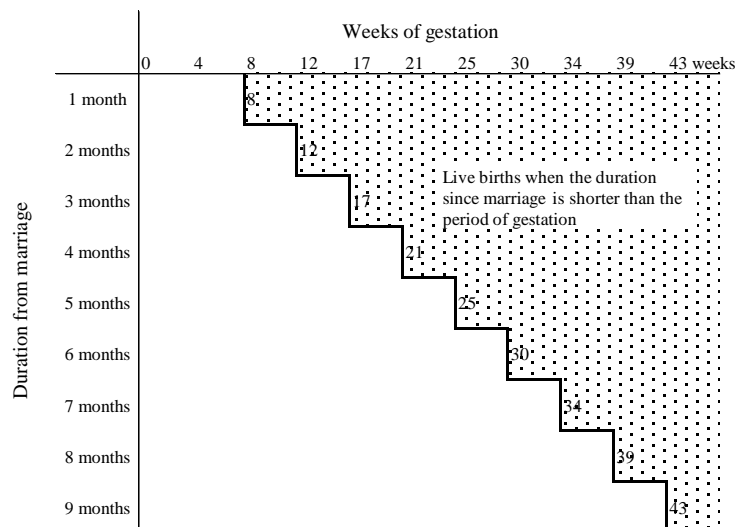
It should be noted, however, that there is a specific range on both sides of the trial calculation result, because there is some range in the actual number of weeks married as described above.

Sum of live births when the duration from marriage is shorter than the period of gestation (Assumption)

Image illustration

Duration from marriage	Weeks of gestation
1 month	8 weeks or longer
2 months	12 weeks
3 months	17 weeks
4 months	21 weeks
5 months	25 weeks
6 months	30 weeks
7 months	34 weeks
8 months	39 weeks
9 months	43 weeks

Note: Weeks of gestation are calculated using "the mean number of weeks married + 4 or more weeks"



Note: As the date when began cohabiting on the Notification of Birth, parents are supposed to enter the earlier of the date of their wedding ceremony or the date when they began conjugally cohabiting.

① Annual trends in live births when the duration from marriage is shorter than the period of gestation

The proportion of live births as a share of legitimate first live births following standardization when the duration from marriage is shorter than the period of gestation, has remained at the same level in recent years.

Looking at the number of live births when the duration from marriage is shorter than the period of gestation, and its proportion against the legitimate first live births with tentative calculation based upon the assumptions outlined above, we see that these figures had increased annually between 1995 and 2002, but then turned downwards. By examining the trends following the standardization by age group distribution of mother in 2009, the figures show the continuing trend on the rise after 2002 as well, but have remained at the same level since 2007.

Note that these rates refer to the live births when the duration from marriage is shorter than the period of gestation, against the legitimate first live births, not against the marriages. (Table 5, Figure 10)

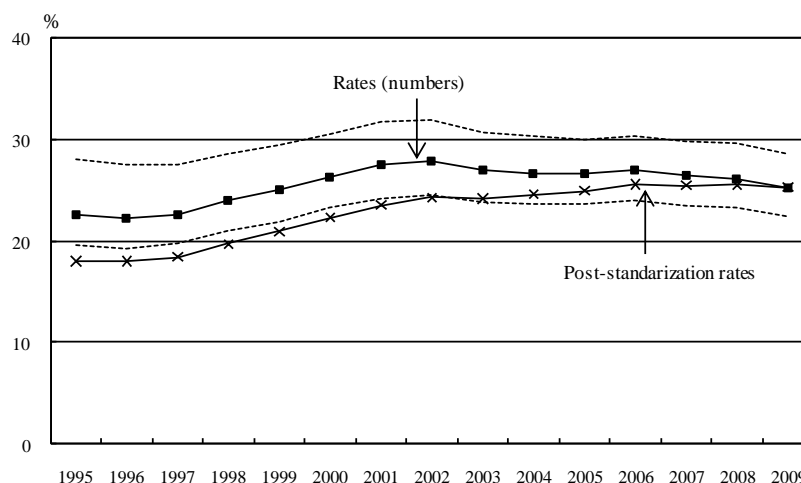
Table 1. Live births and percent distribution as a share of legitimate first live births when the duration from marriage is shorter than the period of gestation, 1995 - 2009

Year	Legitimate first live births (in thousands)	Live birth when the duration from marriage is shorter than the period of gestation			
		Live births (in thousands)	Percentage of legitimate first live births (%)	Post-standardization rates against the legitimate first live births (%)	
1995	557	125	22.5	18.0	
1996	563	125	22.2	18.0	
1997	559	126	22.6	18.4	
1998	571	136	23.9	19.7	
1999	565	141	25.0	20.9	
2000	569	150	26.3	22.3	
2001	559	154	27.5	23.5	
2002	555	155	27.9	24.3	
2003	531	143	26.9	24.1	
2004	522	139	26.7	24.5	
2005	497	132	26.6	24.9	
2006	507	137	26.9	25.6	
2007	503	133	26.4	25.4	
2008	500	131	26.2	25.5	
2009	494	125	25.3	25.3	

Notes:

- 1) The number of legitimate first live births refers to figures excluding the duration from marriage unknown.
- 2) The post-standardization rates represent figures standardized by the age distribution of mothers with legitimate first live births in 2009.

Figure 2. Rates of live births when the duration from marriage is shorter than the period of gestation, against the legitimate first live births, 1995 - 2009



Notes:

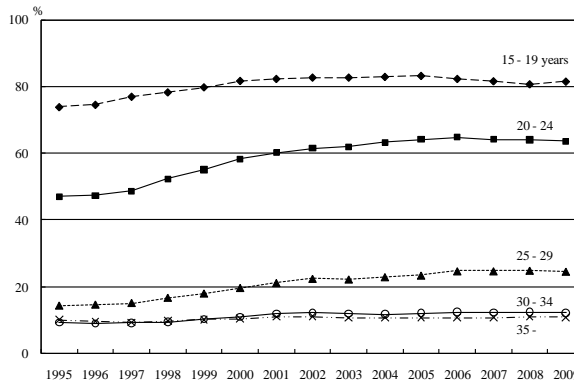
- 1) The dotted lines show the range assumed from the fact that the duration from marriage is available as only the number of the month.
- 2) Post-standardization rates represent the values standardized by the age group distribution of mothers giving legitimate first births in 2009.

② Live births when the duration from marriage is shorter than the period of gestation by age group of mother

The lower the age group of mother is, the higher becomes the proportion of live births as a share of legitimate first live births when the duration from marriage is shorter than the period of gestation.

Examining the proportion of live births as a share of legitimate first live births when the duration from marriage is shorter than the period of gestation by mother's age; in 2009 it was 80% for "ages 15 - 19", 60% for "ages 20 - 24", 20% for "ages 25 - 29", and 10% for the ages 30 and over, and growing higher as the age bracket becomes younger. The proportion is on the increase in general, and remaining the same level in recent years. (Figure 11)

Figure 3. Percentage of live births when the duration from marriage is shorter than the period of gestation, against legitimate first live births, by age group of mother, 1995 - 2009



Note: The percentages are for legitimate first live births, excluding the duration from marriage unknown.

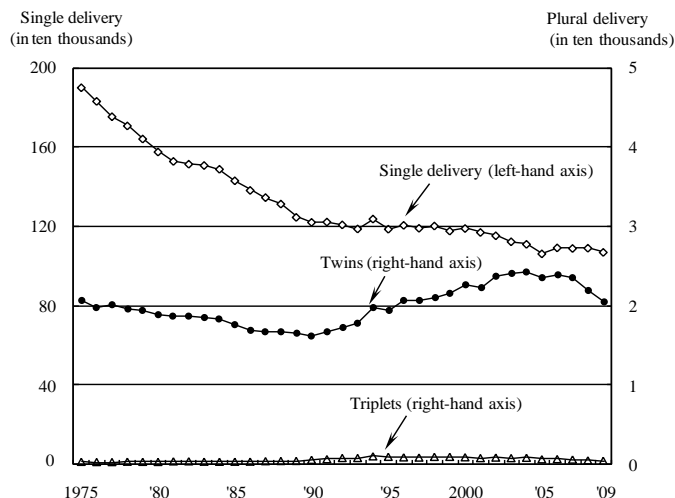
(3) Live births by plurality of births

The number of twins has been decreasing since 2005.

Turning our attention to the number of live births by plurality of birth, although nearly all births are single deliveries, trend on an increase for twins was noted until 2004, which has been decreasing since 2005.

In 2009, the number of children born as single deliveries was 1.05 million, and the number of twins stood at 20 thousand. (Figure 12)

Figure 4. Live births by plurality of births, 1975 - 2009



Note: Single delivery refers to the number of live births, which are born from a single embryo, and which do not include fetal deaths. Plural deliveries refer to the number of live births, such as twins or triplets, which are born from multiple embryos, and which do not include fetal deaths.

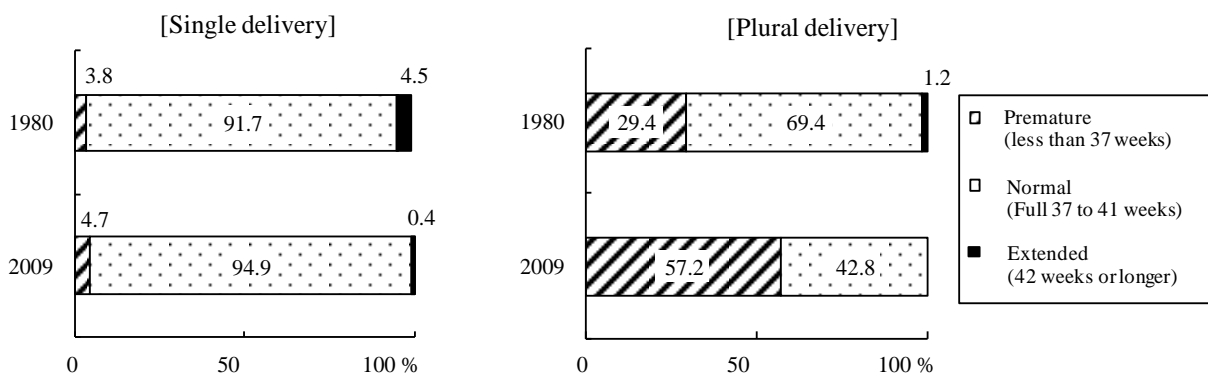
(4) Live births by period of gestation

The rate of “premature” has been increasing in the case of the period of gestation for plural deliveries.

By comparing the percent distribution of live births by period of gestation in 1980 and 2009, we note that the “normal” period of gestation accounts for more than 90% of all cases of single deliveries. Although “extended” period of gestation was recorded for 4.5% of all single deliveries in 1980, by 2009 this had fallen to 0.4%.

In the case of the period of gestation for plural deliveries, in 1980, 30% of such births were “premature” and 70% were “normal”, but in 2009, the proportion of “premature” exceeded “normal”, indicating a substantial growth. (Figure 13)

Figure 5. Percent distribution by period of gestation (premature, normal and extended), 1980 and 2009



Notes:

- 1) The percent distribution represents the figures against total, excluding the birth weight unknown.
- 2) Single delivery refers to the number of live births, which are born from single embryo, and which do not include fetal deaths. Plural delivery refers to the number of live births, such as twins or triplets, which are born from multiple embryos, and which do not include fetal deaths.

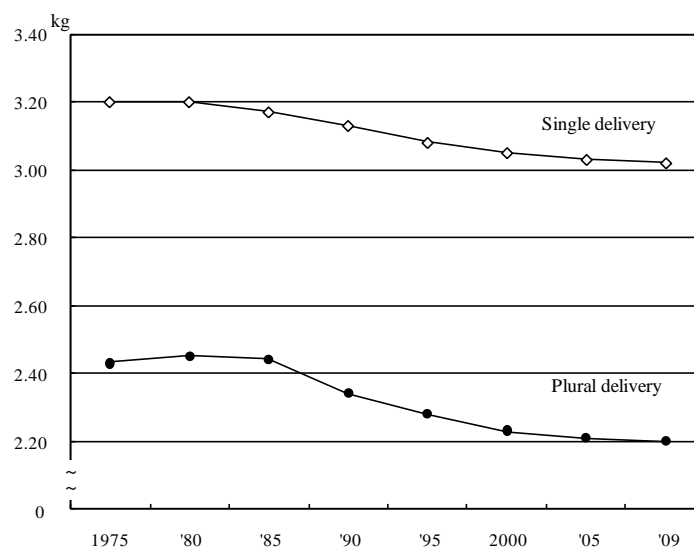
(5) Birth weight

The mean birth weight has been decreasing for both single and plural deliveries.

Examining the birth weight by plurality of births, we find that the mean birth weight for single deliveries in 1975 was 3.20 kg. Since then, the birth weight decreased year by year, declining by 0.18 kg to 3.02 kg in 2009. The trend for plural deliveries is the same, with the mean birth weight for plural deliveries decreasing by 0.23 kg from 2.43 kg in 1975 to 2.20 kg in 2009.

With the situation that birth weight was less than 2.5 kg, although the number of cases represented 4.6% of all single deliveries in 1975, the percentage has gradually risen each year to 8.3% in 2009. In many cases of plural deliveries, the birth weight is less than 2.5 kg, representing more than half of all such births in 1975, and climbing to 73.7% in 2009. (Figure 14 and Table 6)

Figure 6. Mean birth weight by plurality of births, 1975 - 2009



Notes:

- 1) Single delivery refers to the number of live births, which are born from single embryo, and which do not include fetal deaths. Plural delivery refers to the number of live births, such as twins or triplets, which are born from multiple embryos, and which do not include fetal deaths.
- 2) Since the birth weights had been measured by 100 grams until 1990, we added 0.05 kg to the calculated means for the mean birth weights of born children.

Table 2. Live births and percent distribution distributed according to birth weight and mean birth weight, 1975 - 2009

Year	Mean birth weight (kg)	Total	Number			Percentage (%)		
			Less than 2.5 kg	Less than 1.5 kg	Less than 1.0 kg	Less than 2.5 kg	Less than 1.5 kg	Less than 1.0 kg
Single delivery								
1975	3.20	1 880 507	85 986	5 317	877	4.6	0.3	0.0
1980	3.20	1 557 694	71 830	5 089	1 290	4.6	0.3	0.1
1985	3.17	1 413 629	69 051	5 831	1 868	4.9	0.4	0.1
1990	3.13	1 204 855	67 654	5 293	1 853	5.6	0.4	0.2
1995	3.08	1 166 596	75 982	5 627	2 042	6.5	0.5	0.2
2000	3.05	1 166 926	86 522	5 803	2 169	7.4	0.5	0.2
2001	3.04	1 147 496	86 598	5 955	2 382	7.5	0.5	0.2
2002	3.04	1 129 250	86 934	6 053	2 421	7.7	0.5	0.2
2003	3.04	1 098 800	84 674	6 192	2 565	7.7	0.6	0.2
2004	3.03	1 085 564	86 671	6 218	2 546	8.0	0.6	0.2
2005	3.03	1 038 400	83 694	6 140	2 451	8.1	0.6	0.2
2006	3.02	1 068 135	86 649	6 284	2 741	8.1	0.6	0.3
2007	3.02	1 065 737	87 606	6 469	2 707	8.2	0.6	0.3
2008	3.02	1 068 797	88 140	6 353	2 600	8.2	0.6	0.2
2009	3.02	1 049 141	87 281	6 228	2 566	8.3	0.6	0.2
Plural delivery								
1975	2.43	20 933	10 981	1 004	163	52.5	4.8	0.8
1980	2.45	19 195	9 829	883	200	51.2	4.6	1.0
1985	2.44	17 948	9 123	968	286	50.8	5.4	1.6
1990	2.34	16 730	9 678	1 225	438	57.8	7.3	2.6
1995	2.28	20 468	13 130	1 686	568	64.1	8.2	2.8
2000	2.23	23 621	16 366	2 097	697	69.3	8.9	3.0
2001	2.22	23 166	16 283	2 034	692	70.3	8.8	3.0
2002	2.22	24 605	17 380	2 149	703	70.6	8.7	2.9
2003	2.22	24 810	17 646	2 198	770	71.1	8.9	3.1
2004	2.21	25 157	18 161	2 249	795	72.2	8.9	3.2
2005	2.21	24 130	17 578	2 057	664	72.8	8.5	2.8
2006	2.21	24 539	17 910	2 089	719	73.0	8.5	2.9
2007	2.21	24 081	17 558	2 056	707	72.9	8.5	2.9
2008	2.21	22 359	16 339	1 929	693	73.1	8.6	3.1
2009	2.20	20 894	15 390	1 775	584	73.7	8.5	2.8

Notes:

- 1) The percent distribution represent the figures against total, including the birth weight unknown.
- 2) Single delivery refers to the number of live births, which are born from single embryo, and which do not include fetal deaths. Plural delivery refers to the number of live births, such as twins or triplets, which are born from multiple embryos, and do not include fetal deaths.
- 3) Since the birth weights had been measured by 100 grams until 1990, we added 0.05 kg to the calculated means for the mean birth weights of born children.

(6) Structural analysis of live births, using the total fertility rates

Live births are not only affected by “total fertility rates”, but also by “female population of ages 15 - 49”, as well as by “difference in age distribution female population of ages 15 - 49”.

Two significances of the total fertility rates for a certain period

The total fertility rates for a certain period are given as the sum of the live birth rates for each year for females of ages 15 - 49 in a particular year, and are significant for the following two reasons:

- a Equivalent to the number of children one female is assumed to bear during her lifetime with the live birth rate for each age in that year. If the live birth rates for each year do not change, this would represent the actual number of children one female gives birth to. However, in a society as modern Japan where the marital and childbearing behavior varies by generation, we must turn to the total fertility rates by cohort for the actual number of children one female gives birth to.
- b Equivalent to the number of children to be born, assuming that there is one female for each age in 15 - 49 of the female population, and that they give birth at the live birth rates for respective age in the given year; Here, we can compare between years and regions of different age distributions, because we calculate live births using the standardized age distribution, based on the live birth rates for respective year, and the pre-set age distribution of female population.

① How to decompose live birth rates

As indicated below, the number of live births in each year can be broken down to the following three elements: “female population of ages 15 - 49”, “total fertility rates for a certain period”, and “difference in age distribution of female population of ages 15 - 49”, using the total fertility rates for a certain period. These three elements are hereafter in this section referred to respectively as “female population”, “total fertility rates” and “difference in age distribution”.

Number of live births =

$$\text{Female population of ages 15 - 49} \times \frac{\text{Total fertility rates for a certain period}}{35} \times \begin{matrix} \text{Difference in age} \\ \text{distribution} \\ \text{of female population of} \\ \text{ages 15 - 49} \end{matrix}$$

Because live births can be decomposed to the three elements as above, trends in live births are not only affected by the trends in “total fertility rates”, but also the trends in “female population” and “difference in age distribution”. Since the total fertility rates are given by adding 35 live birth rates by age between 15 and 49 years old, we divide them with 35 in the formulation in order to represent the number of live births when we multiply them with the female population of ages.

“Difference in age distribution” is provided by dividing by “female population” and by “total fertility rates” / 35, and refers to the difference between the “actual age distribution of female population” and the “standardized age distribution of female population, assuming the same number for each year age”, using the live birth rates by age in the year. (See “How to decompose live birth into elements, using the total fertility rates”.)

“Difference in age distribution” is larger than 1 when the population of females of ages with higher live birth rates is larger than the population of females of ages with lower live birth rates, and is smaller than 1 when the population of the former group is smaller than the population of the latter group.

② Trends in female population

“Female population” was stable at around 30 million between 1970 and 1996, but then has been decreasing year after year until it reached 26.5 million in 2009.

③ Trends in total fertility rates

“Total fertility rates” continued to the decrease from 2.13 in 1970 to 1.26 in 2005, then took an upturn and reached 1.37 in 2009.

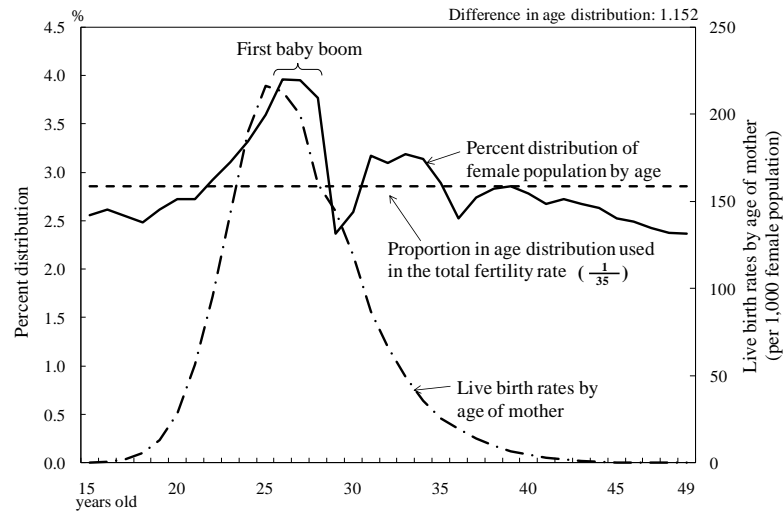
④ Trends in the difference in age distribution

If we examine the trends in “Difference in age distribution”, we find that the difference had been larger than 1 between 1970 and 1981, contributing to the increase in live births. In particular, the difference was above 1.1 between 1972 and 1978, leading to the increase by 10% over. The difference in age distribution was the largest for female population of ages 15 - 49 in 1975, in which year the first baby-boom generation was in their late 20s, contributing to the increase in live births. (Figure 15)

Between 1982 and 1997, the difference dropped below 1, contributing to the decrease in live births. In particular, the difference was below 0.9 between 1988 and 1991, leading to the decrease by 10% over. The difference in age distribution was the smallest for female population of ages 15 - 49 in 1990, in which year the first baby-boom generation was in their early 40s, and the second baby-boom generation was in their late teens, resulting in the small female population of ages 24 - 36 and contributing to the decrease in live births. (Figure 16)

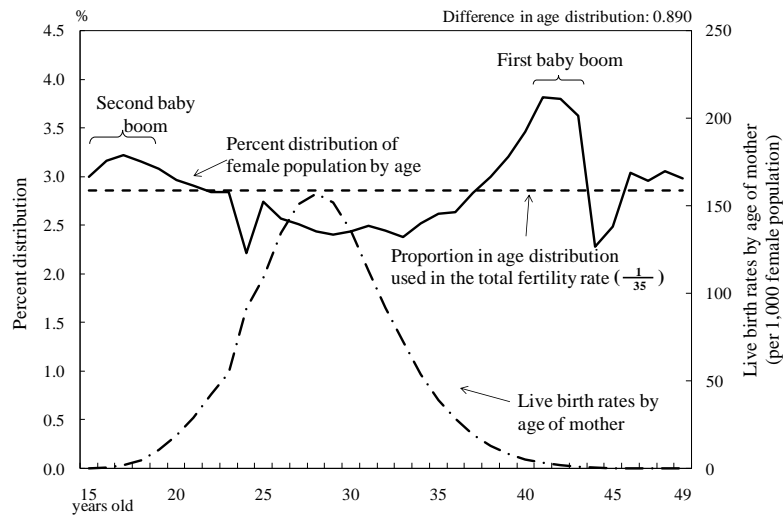
The difference exceeded 1 again since 1998, contributing to the increase in live births. Nonetheless, the largest difference in recent years was only 1.088 in 2003, which is still below the 1971 - 1978 level. Looking at age distribution of female population of ages 15 - 49 in 2003, the second baby-boom generation is around their 30s, contributing to the increase in live births. (Figure 17)

Figure 7. Percent distribution of female population by age and proportion in female age distribution used in the total fertility rate, 1975



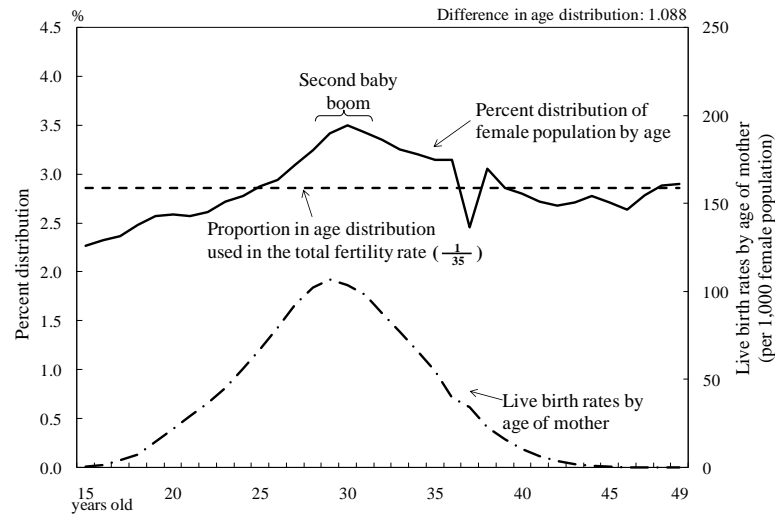
Note: The proportion of female population by age refers to percentage against the total female population of age 15 - 49.

Figure 8. Percent distribution of female population by age and proportion in female age distribution used in the total fertility rate, 1990



Note: The proportion of female population by age refers to percentage against the total female population of age 15 - 49.

Figure 9. Percent distribution of female population by age and proportion in female age distribution used in the total fertility rate, 2003



Note: The proportion of female population by age refers to percentage against the total female population of age 15 - 49.

⑤ Trends in live births by the three elements

The number of live births was increased by approximately 160 thousands between 1971 and 1973. According to the three elements of live births, trends in live births (difference rates from previous year) suggest that the “female population” increased slightly in this period and the “total fertility rates” leveled, so the above increase was caused by the rise in the “difference in age distribution”.

The number of live births was decreased by approximately 190 thousand between 1974 and 1975. Seeing that the “female population” increased slightly in this period, and the “difference in age distribution” increased, the above decrease was caused by the sharp drop in the “total fertility rates”.

The number of live births was decreased by approximately 680 thousand between 1976 and 1990. Seeing that the “female population” slightly increased in this period, the decrease above was caused by drop in the “total fertility rates” and “difference in age distribution”.

The number of live births mostly leveled off around 1.2 million between 1990 and 1996. Seeing that the “female population” decreased slightly, the drop in the “total fertility rates” was written off by the increase in the “difference in age distribution”.

The number of live births was decreased by approximately 80 thousand between 1997 and 2003. Although decrease in the “total fertility rates” was written off by the increase in the “difference in age distribution”, the “female population” dropped by some 1% every year since 1997.

The number of live births was decreased by approximately 50 thousands from 2004 to 2009. Although the “total fertility rates” increased in this period, the “female population” continued to drop, while the “difference in age distribution” turned downward for the first time in 28 years since 1976. (Table 7)

Table 3. Structural analysis of live births, using the total fertility rate for a certain period, 1970 - 2009

Year	Number				Difference rates from previous year (%)			
	Live births (1)×(2)/35×(3)	Female population of ages 15 - 49 (in thousands) (1)	Total fertility rates (TFR) (2)	Difference in age distribution (3)	Live births	Female population of ages 15 - 49	Total fertility rates (TFR)	Difference in age distribution
1970	1 934 239	29 400	2.13	1.079
1971	2 000 973	29 589	2.16	1.097	3.5	0.6	1.1	1.7
1972	2 038 682	29 700	2.14	1.122	Δ 1.9	0.4	0.7	2.2
1973	2 091 983	30 035	2.14	1.139	Δ 2.6	1.1	0.1	1.6
1974	2 029 989	30 128	2.05	1.151	Δ 3.0	0.3	4.3	1.1
1975	1 901 440	30 251	1.91	1.152	Δ 6.3	0.4	6.8	0.1
1976	1 832 617	30 271	1.85	1.144	Δ 3.6	0.1	3.0	0.7
1977	1 755 100	30 289	1.80	1.126	Δ 4.2	0.1	2.8	1.6
1978	1 708 643	30 319	1.79	1.101	Δ 2.6	0.1	0.5	2.2
1979	1 642 580	30 351	1.77	1.071	Δ 3.9	0.1	1.2	2.8
1980	1 576 889	30 438	1.75	1.038	Δ 4.0	0.3	1.3	3.0
1981	1 529 455	30 333	1.74	1.013	Δ 3.0	0.3	0.3	2.4
1982	1 515 392	30 404	1.77	0.986	Δ 0.9	0.2	1.6	2.7
1983	1 508 687	30 463	1.80	0.963	Δ 0.4	0.2	1.7	2.3
1984	1 489 780	30 549	1.81	0.942	Δ 1.3	0.3	0.6	2.1
1985	1 431 577	30 644	1.76	0.927	Δ 3.9	0.3	2.6	1.6
1986	1 382 946	30 726	1.72	0.914	Δ 3.4	0.3	2.3	1.4
1987	1 346 658	30 834	1.69	0.904	Δ 2.6	0.4	1.9	1.1
1988	1 314 006	30 983	1.66	0.896	Δ 2.4	0.5	2.0	0.9
1989	1 246 802	31 177	1.57	0.890	Δ 5.1	0.6	5.1	0.6
1990	1 221 585	31 154	1.54	0.890	Δ 2.0	0.1	1.9	0.1
1991	1 223 245	31 094	1.53	0.897	Δ 0.1	0.2	0.5	0.9
1992	1 208 989	30 974	1.50	0.910	Δ 1.2	0.4	2.1	1.4
1993	1 188 282	30 865	1.46	0.924	1.7	0.4	2.9	1.6
1994	1 238 328	30 681	1.50	0.942	Δ 4.2	0.6	2.9	1.9
1995	1 187 064	30 614	1.42	0.954	Δ 4.1	0.2	5.2	1.3
1996	1 206 555	30 651	1.43	0.967	Δ 1.6	0.1	0.2	1.3
1997	1 191 665	30 249	1.39	0.993	Δ 1.2	1.3	2.6	2.8
1998	1 203 147	29 809	1.38	1.021	Δ 1.0	1.5	0.3	2.8
1999	1 177 669	29 330	1.34	1.047	2.1	1.6	3.0	2.6
2000	1 190 547	28 821	1.36	1.064	Δ 1.1	1.7	1.3	1.6
2001	1 170 662	28 513	1.33	1.077	Δ 1.7	1.1	1.9	1.3
2002	1 153 855	28 240	1.32	1.085	Δ 1.4	1.0	1.1	0.7
2003	1 123 610	27 998	1.29	1.088	Δ 2.6	0.9	2.1	0.4
2004	1 110 721	27 773	1.29	1.086	Δ 1.1	0.8	0.1	0.2
2005	1 062 530	27 385	1.26	1.078	Δ 4.3	1.4	2.2	0.8
2006	1 092 674	27 165	1.32	1.069	Δ 2.8	0.8	4.5	0.8
2007	1 089 818	26 982	1.34	1.057	Δ 0.3	0.7	1.5	1.1
2008	1 091 156	26 757	1.37	1.044	Δ 0.1	0.8	2.2	1.2
2009	1 070 035	26 531	1.37	1.032	1.9	0.8	0.1	1.2

Note:

The following equation represents the approximate value of the difference rates from previous year, if the value is small enough. (%):
 Number of live births = "Female population" + "Total fertility rates (TFR)" + "Difference in age distribution"