The Share of Infant Deaths Under 4 Weeks After Birth Was Almost the Same in 1899 (0.5065) and 2024 (0.5032), but in Between It Fell to 0.3896 in 1929 and Rose to 0.6877 in 1977 Before Returning — from 1950 to 1975, the Later the Period After Birth, the Faster Its Deaths Fell (4 Weeks to 1 Year: 0.0997-Fold), and from 1975 to 2000, Deaths from 1 Day to 1 Week Fell Fastest (0.1598-Fold). Deaths Under 1 Day Fell the Least from 1950 to 2024 (0.1388-Fold), and Their Share of Infant Deaths Went from 0.060 to 0.271 [M096]

Fall in the infant mortality rate = sum of the parts under 1 day, 1 day to 1 week, 1 to 4 weeks, and 4 weeks to 1 year ── What separates them is which period after birth saw its deaths fall, and when

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Abstract

Using the infant death tables of the Ministry of Health, Labour and Welfare's Vital Statistics (Tables 6.1 and 6.2: births, infant deaths, and neonatal deaths every year from 1899 to 2024; Table 6.4: infant mortality rates by survival period in 31 rounds from 1950 to 2024), this paper looked at the history of falling deaths of infants (under 1 year after birth), split by the period after birth. No new mathematical theorem and no new law are claimed.

First, **the infant mortality rate fell from 153.83 per 1,000 births in 1899 to 1.85 in 2024 (1/83.4). The share of those deaths under 4 weeks after birth (neonatal) was almost the same in 1899 (0.5065)**

and 2024 (0.5032), but in between it fell to 0.3896 in 1929 and rose to 0.6877 in 1977 before returning (Section 4).

Second, the rise and return of the share is explained by the order in which two kinds of death fell fastest. **From 1947 to 1977, the death rate from 4 weeks to 1 year fell 0.0616-fold, faster than the neonatal 0.1953-fold; from 1977 to 2024, conversely, the neonatal rate fell 0.1512-fold, faster than 4 weeks to 1 year at 0.3288-fold** (Section 4).

Third, this is the core of the paper. **Splitting 1950–2024 into four periods — under 1 day, 1 day to 1 week, 1 to 4 weeks, and 4 weeks to 1 year — from 1950 to 1975 the later the period, the faster its fall (4 weeks to 1 year 0.0997-fold, 1 to 4 weeks 0.1133-fold, 1 day to 1 week 0.2843-fold, under 1 day 0.5920-fold), and from 1975 to 2000 the fastest fall was from 1 day to 1 week (0.1598-fold)** (Section 5).

Fourth, **the death rate under 1 day fell 0.1388-fold from 1950 to 2024, the least of the four periods. The share of infant deaths under 1 day went from 0.060 in 1950 to 0.271 in 2024, and under 1 week from 0.250 to 0.383.** Of the 5826.8 fall in the total (per 100,000 births) from 1950 to 2024, 4 weeks to 1 year accounts for 0.5450 and under 1 day for 0.0533 (Section 6).

Fifth, from 2021 to 2024 the total moved from 172.4 to 184.5 per 100,000 births. Combining the two years' guides to fluctuation based on the square root of the count gives 6.94, and the difference is 1.74 times that. These tables alone give no way to distinguish this from year-to-year fluctuation (Section 7).

Sixth, what separates them is **which period after birth saw its deaths fall, and when**. The pattern "half of infant deaths occur under 4 weeks" looks like the same number in 1899 and 2024, but it is the two ends of an order of decline that switched twice in between.

Scope note: **This paper claims no new mathematical theorem and no new law** — births, infant deaths, neonatal deaths, and infant mortality rates by survival period are in public tables, and this paper only took differences between periods after birth, lined up shares and the order of decline, and split the decline by period after birth. **This paper is a structural interpretation of the shape of numbers in public aggregate data; it is not medical advice, not a diagnosis, and not a treatment recommendation. The author is not a physician. Decisions about individual health should be discussed with a physician or a medical institution. This is a preprint that has not been peer reviewed. Mindful that families who have lost a baby may read it, this paper describes only the shape of national numbers, does not touch individual events, causes of death, or reasons, and does not evaluate medical care, the system, or policy.** Stillbirths and perinatal figures are not covered. Why the deaths in each period fell in each era cannot be separated with these tables. Neonatal deaths are deaths under 1 month up to 1943 and under 28 days from 1947 (table notes), so the 1899 and 2024 shares compare two slightly different definitions. 1944–1946 are not in the tables, and 1947–1972 exclude Okinawa. 1943 is not used because only its neonatal figures include Karafuto. Prefectures are not compared. **About the data**: the Vital Statistics (Ministry of Health, Labour and Welfare) were taken from e-Stat and used under the Government of Japan Standard Terms of Use (Version 2.0); the rates by period after birth (obtained as differences), the shares, and the split in this paper were processed from them. What this paper adds: **splitting the return of the neonatal share of infant deaths to almost the same value in 1899 and 2024 by the order in which the two kinds of death fell fastest in between, and splitting the 1950–2024 fall in infant mortality into four periods after birth and lining up when each period fell**.

1. Notation and question

- **Infant mortality rate**: deaths of infants (under 1 year after birth) ÷ births (per 1,000 births; per 100,000 births in Table 6.4).

- **Neonatal**: under 4 weeks (28 days) after birth. **Post-neonatal**: 4 weeks to 1 year (infant deaths − neonatal deaths).
- **Neonatal share**: neonatal deaths ÷ infant deaths.
- **Four periods after birth** (total block of Table 6.4): under 1 day = "under 1 day (24 hours)"; 1 day to 1 week = "under 1 week" − "under 1 day"; 1 to 4 weeks = "under 4 weeks" − "under 1 week"; 4 weeks to 1 year = "total" − "under 4 weeks".
- **Split**: the 1950 → 2024 fall in the total = sum of the falls in the four periods. The sum equals the difference exactly.

Question: In the fall of infant deaths, which period after birth saw its deaths fall, and when?

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2. Preview and design

Written honestly: the design was decided after looking at the tables.

	Content
Tables	Vital Statistics 2024, Volume 1, Table 6.1 (births and infant deaths, 1899–2024), Table 6.2 (neonatal deaths, same years), and Table 6.4 (infant mortality by survival period, 31 rounds from 1950 to 2024)
Noticed in the preview	Table 6.2's "share of neonatal deaths among infant deaths" was about half in both 1899 and 2024. Lining up the years in between, it fell, rose, and came back
Noticed in the preview (2)	Table 6.4 has finer periods such as under 1 day and under 1 week, allowing the order of decline by period to be compared
Noticed in the preview (3)	One female value for 1975 and the 1950 sums of the periods in Table 6.4 did not match the totals (Section 3)
Comparison	The 125-year shape of the neonatal share, the order in which two kinds of death fell, rates and falls for the four periods, the 1950→2024 split, and recent movement with a guide to fluctuation

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3. Data and checks

Calculation 3.1 The 3 retrieved files were fixed by SHA-256, and the following were checked.

- Tables 6.1 and 6.2 have the same years, 123 rounds from 1899 to 2024 (1944–1946 are absent). The infant mortality rate recomputed from counts (per 1,000 births) matches the table within 0.05 in all 123.
- The neonatal mortality rate and the neonatal share do not match the table only in 1943. In 1943 only the neonatal figures include Karafuto (table note): 76,588 neonatal deaths ÷ 2,253,535 births gives 33.99, while dividing by 2,267,292 births including Karafuto gives 33.78 (table 33.8). The 122 rounds excluding 1943 are used below.
- Table 6.4 has 31 rounds from 1950 to 2024, with 11 rows in each of 3 blocks (total, male, female). Its total and under 4 weeks (per 100,000 births) match the rates of Tables 6.1 and 6.2 (per 1,000 births) within rounding in all 31.
- The difference between the sum of the periods and the total or under 4 weeks in Table 6.4 exceeds 0.5 only in 1950 (1.6 in total, male, and female) and for females in 1975. I first set 0.35 and it failed in 1950 and for the total in 1970 (0.4). In 1950 the table total is 6011.3 against a sum of 6009.7, and this paper's 4 weeks to 1 year (total − under 4 weeks) includes the 1.6. The female 1975 value for "3 to under 6 months" is 5.3; back-calculated from the total it would be 85.2 (male 105.7, total 95.8). This paper uses only the total block.

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4. The 125-year shape — the neonatal share of infant deaths

Calculation 4.1 Births, death rates (per 1,000 births), and neonatal share

Year	Births	Infant mortality	Neonatal	Post-neonatal	Neonatal share
1899	1,386,981	153.83	77.92	75.91	0.5065
1920	2,025,564	165.69	68.96	96.73	0.4162
1929	2,077,026	142.12	55.37	86.74	0.3896
1950	2,337,507	60.11	27.44	32.67	0.4565
1977	1,755,100	8.93	6.14	2.79	0.6877
2000	1,190,547	3.22	1.77	1.45	0.5499
2024	686,173	1.85	0.93	0.92	0.5032

Observation 4.2: **The infant mortality rate fell from 153.83 in 1899 to 1.85 in 2024 (0.0120-fold, 1/83.4). The neonatal share differs by less than 0.01 between 1899 (0.5065) and 2024 (0.5032), but in between it was smallest at 0.3896 in 1929 and largest at 0.6877 in 1977.** The share up to 1942 (defined as under 1 month) lies between 0.3896 and 0.5144.

Observation 4.3: **From 1947 to 1977 the neonatal death rate fell 0.1953-fold and the post-neonatal 0.0616-fold, so post-neonatal fell faster. From 1977 to 2024 the neonatal fell 0.1512-fold and the post-neonatal 0.3288-fold, so neonatal fell faster.** The share rose as a result of the former and came back as a result of the latter. Of the 30 transitions from 1947 to 1977 the share rose in 23, and of the 47 from 1977 to 2024 it fell in 28, going back and forth from year to year.

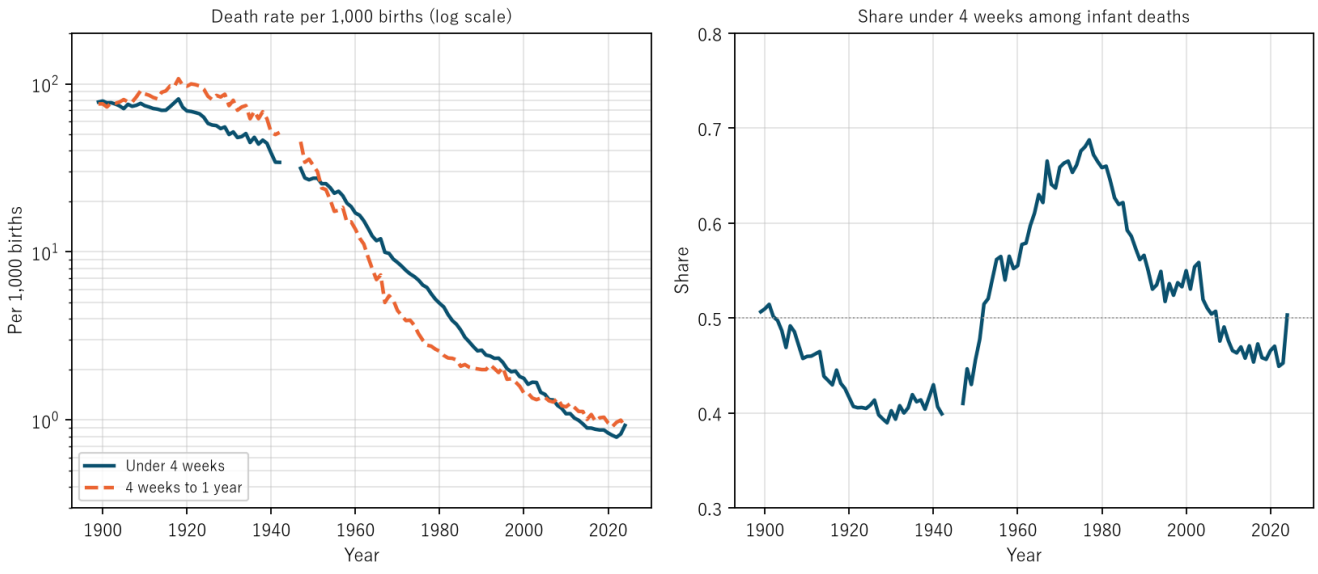


Figure 1: Left, death rates per 1,000 births (log scale); navy is under 4 weeks and the orange dashed line 4 weeks to 1 year. Right, the share of infant deaths under 4 weeks. The lines are broken for 1943–1946.

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5. The core — when each period after birth fell

Calculation 5.1 Death rate by period after birth (per 100,000 births)

Period	1950	1975	2000	2024
Under 1 day	360.3	213.3	75.6	50.0
1 day to 1 week	1144.9	325.5	52.0	20.7
1 to 4 weeks	1238.8	140.3	49.3	22.1
4 weeks to 1 year	3267.3	325.6	144.8	91.7
Total	6011.3	1004.7	321.7	184.5

Calculation 5.2 Fall (fold)

Period	1950→1975	1975→2000	2000→2024	1950→2024
Under 1 day	0.5920	0.3544	0.6614	0.1388
1 day to 1 week	0.2843	0.1598	0.3981	0.0181
1 to 4 weeks	0.1133	0.3514	0.4483	0.0178
4 weeks to 1 year	0.0997	0.4447	0.6333	0.0281

Observation 5.3: **From 1950 to 1975, the later the period after birth, the faster it fell (in the order 4 weeks to 1 year, 1 to 4 weeks, 1 day to 1 week, under 1 day). From 1975 to 2000 the order switched: the fastest fall was 1 day to 1 week (0.1598-fold), followed by 1 to 4 weeks (0.3514-fold), under 1 day (0.3544-fold), and 4 weeks to 1 year (0.4447-fold).** Over 1950–2024 the period that fell least was under 1 day (0.1388-fold), while 1 day to 1 week and 1 to 4 weeks fell by almost the same amount, 0.0181-fold and 0.0178-fold.

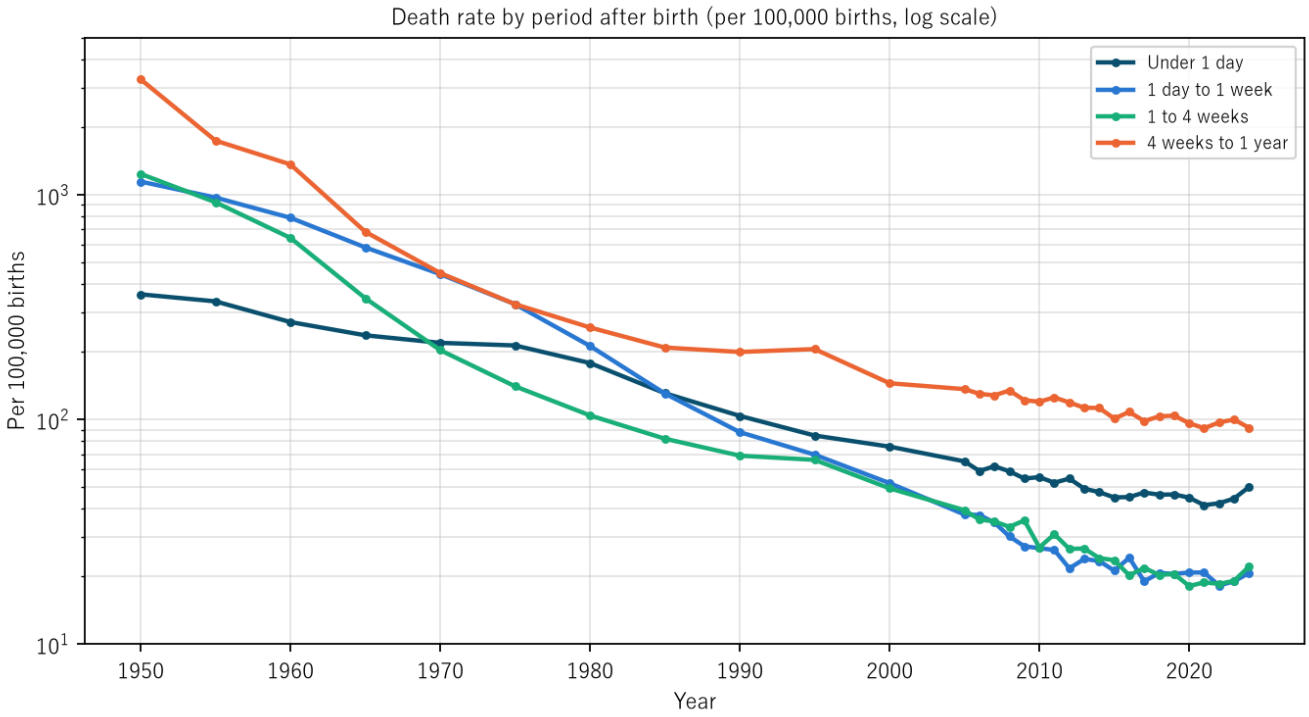


Figure 2: Death rate by period after birth (per 100,000 births, log scale). Every 5 years up to 2000 and every year from 2005.

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6. Splitting the 1950→2024 fall by period after birth

Calculation 6.1 Breakdown of the total fall of 5826.8 (6011.3 → 184.5, per 100,000 births)

Period	Fall	Share of the fall
Under 1 day	310.3	0.0533
1 day to 1 week	1124.2	0.1929
1 to 4 weeks	1216.7	0.2088
4 weeks to 1 year	3175.6	0.5450

Observation 6.2: **More than half of the 1950→2024 fall (0.5450) is from 4 weeks to 1 year, and the part under 1 day is 0.0533. As a result, the share of infant deaths under 1 day went from 0.060 in**

1950 to 0.271 in 2024, and under 1 week from 0.250 to 0.383. Of the 2024 infant mortality rate of 184.5, under 1 day is 50.0, 1 day to 1 week 20.7, 1 to 4 weeks 22.1, and 4 weeks to 1 year 91.7.

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7. Recent years

Calculation 7.1 2020–2024 (per 100,000 births)

Year	Infant deaths	Births	Total	Under 1 day	Guide to fluctuation
2020	1,512	840,835	179.8	44.8	4.62
2021	1,399	811,622	172.4	41.5	4.61
2022	1,356	770,759	175.9	42.3	4.78
2023	1,326	727,288	182.3	44.4	5.01
2024	1,266	686,173	184.5	50.0	5.19

The guide to fluctuation is the square root of infant deaths ÷ births (per 100,000 births).

Observation 7.2: From 2021 to 2024 the total moved from 172.4 to 184.5 (+12.1). Combining the two years' guides gives 6.94, and the difference is 1.74 times that. As births decline, each death weighs more, and the guide grew from 4.61 to 5.19. **These tables alone give no way to distinguish this movement from year-to-year fluctuation, and no reason for it.**

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8. Limitations

1. **Why the deaths in each period after birth fell in each era cannot be separated with these tables.** Causes of death, birth weight, and length of gestation were not examined.
2. Neonatal deaths are defined as under 1 month up to 1943 and under 28 days from 1947, so the 1899 and 2024 shares are two slightly different definitions. 1944–1946 are not in the tables, and 1947–1972 exclude Okinawa.

3. Table 6.4 is every 5 years up to 2000, and the order of decline is seen at that step. The 1950 figure for 4 weeks to 1 year includes the 1.6 difference between the sum of the periods and the total.
4. The guide to fluctuation only indicates the size of chance movement in counts and is not used to judge recent movement.
5. The paper does not touch individual events, causes of death, or reasons, and does not evaluate medical care, the system, or policy.

Conclusion

The share of infant deaths under 4 weeks after birth was almost the same in 1899 (0.5065) and 2024 (0.5032). In between, from 1947 to 1977 deaths from 4 weeks to 1 year fell faster first and the share rose to 0.6877 in 1977; from 1977 to 2024 neonatal deaths fell faster and the share came back. Split into four periods after birth, from 1950 to 1975 the later periods fell faster, from 1975 to 2000 the period from 1 day to 1 week fell fastest, and deaths under 1 day fell the least.

What separates them is one thing — which period after birth saw its deaths fall, and when.

When you hear that "half of infant deaths occur under 4 weeks," **look together at which year's shape it is, and in what order the deaths of each period fell to get there.**

Data and reproduction

Data	Vital Statistics 2024, Volume 1, Tables 6.1, 6.2, and 6.4 (Ministry of Health, Labour and Welfare, e-Stat) (retrieved 26 September 2026)
Terms of use	e-Stat follows the Government of Japan Standard Terms of Use (Version 2.0). The rates by period after birth (obtained as differences), the shares, and the split in this paper were processed from it and are not numbers produced by the government
Coverage	Japan, 1899–2024 (122 rounds excluding 1943–1946), by survival period 31 rounds from 1950 to 2024, total (both sexes)
Verification	`検算/M096.py` (`--zu` also draws the figures). Every number in the text is taken from `検算/M096_output.txt`
Raw data	`data/` holds the retrieved files and `SOURCES.md` (URLs, retrieval date, SHA-256, terms of use, definitions and how the calculations were set up)
Figures	`図/M096_zu1` , `図/M096_zu2` (png, svg, English versions)

References

- Ministry of Health, Labour and Welfare. Vital Statistics 2024, final figures, Volume 1, infant deaths, Tables 6.1, 6.2, and 6.4 (in Japanese). e-Stat (accessed 26 September 2026). https://www.e-stat.go.jp/