Naegele's rule

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Naegele's rule is a standard way of calculating the due date for a pregnancy. The rule estimates the expected date of delivery (EDD) by adding one year, subtracting three months, and adding seven days to the first day of a woman's last menstrual period (LMP). The result is approximately 280 days (40 weeks) from the start of the last menstrual period. Another method is by adding 9 months and 7 days to the first day of the last menstrual period.

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History

Naegele's rule is named after Franz Karl Naegele (1778–1851), the German obstetrician who devised the rule. Naegele was born July 12, 1778, in Düsseldorf, Germany. In 1806, Naegele became ordinary professor and director of the lying-in hospital in Heidelberg. His *Lehrbuch der Geburtshilfe*, published in 1830 for midwives, enjoyed a successful 14 editions.

Calculation

The rule estimates the expected date of delivery (EDD) (also called EDC, for estimated date of confinement) from the **first day** of the woman's last menstrual period (LMP) by adding one year, subtracting three months, and adding seven days to that date. The result is approximately 280 days (40 weeks) from the start of the last menstrual period.

Example:
LMP = 8 May 2009

+1 year = 8 May 2010
−3 months = 8 February 2010
+7 days = 15 February 2010

280 days past the start of the last menstrual period is found by checking the day of the week of the LMP and adjusting the calculated date to land on the same day of the week. Using the example above, 8 May 2009 is a Friday. The calculated date (15 February) is a Monday; adjusting to the closest Friday

produces 12 February, which is exactly 280 days past 8 May. The calculation method does not always result in 280 days because not all calendar months are the same length; it does not account for leap years.

Parikh's formula is a calculation method that considers cycle duration. Naegele's rule assumes an average cycle length of 28 days, which is not true for everyone. EDD is calculated using Parikh's formula by adding nine months to the start of the last menstrual period, subtracting 21 days, then adding duration of previous cycles.[1]

In modern practice, calculators, reference cards, or sliding wheel calculators are used to add 280 days to the LMP.

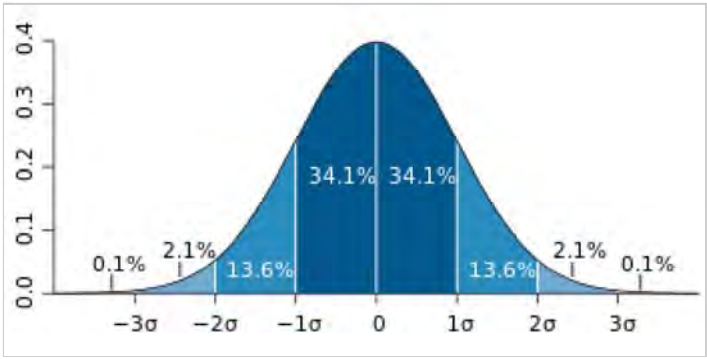
Accuracy

The date on which the last menstrual period began may not be the best date to use as the basis of a due date calculation, but it remains popular. The continued use of Naegele's rule, rather than more precise estimates such as the linear model derived in 1993 by Mittendorf, et al.,[2] attracted criticism in Super Crunchers.

Average gestation

Naegele's rule presents 280 days after start of the last menstrual period as an *estimate* for the average onset of spontaneous labor. A number of studies have been published in recent years to support continued use of this number:

- **281 days** after LMP with a standard deviation of 13 days, was the result of a population-based study of 427,581 singleton births in Sweden.[3]
- **281 days** after LMP for first-time mothers and **280 days** for all others were the medians found by a 1995 American study of 1,970 spontaneous births. Standard deviation was 7–9 days.[4][5]
- **282 days** after LMP was recommended for cases where LMP is the only known factor, in a study of 17,450 patients combining LMP and ultrasound measurement techniques.[6]
- A median of **288 days** (274 days from the date of ovulation) for first-time mothers and **283 days** (269 days from the date of ovulation) for mothers with at least one previous pregnancy was found by a 1990 study of 114 white, private-care patients with uncomplicated pregnancies and spontaneous labor. The authors suggest that excluding pregnancies involving complications (that often lead to pre-term deliveries) accounts for the longer periods.[7]



A standard deviation diagram. When applied to human gestation length, the curve's center is at 280 days (40 weeks) past LMP. The dark blue area shows births within ±13 days of the EDD.

Given that these gestation lengths are only estimates of an average, it is helpful to consider gestation time as a range of dates rather than as a single "due date". The median found by Naegele's rule is merely a guideline for the day at which half of all births occur earlier, and half of all births occur later. Births rarely occur *on* a due date, but they are clustered *around* due dates.[8]

For instance, a standard deviation of 13 days means that 90% of babies will be born within three weeks of their EDD, and 21% will be born within three days of it. Only 4% of births will occur *on* the EDD, but this is similar to most other days around the EDD; each day within a week of the EDD has a 3 to 4% probability of being the day that birth will occur. However, any given day two weeks away from the EDD has a less than 2% chance of being the day that birth will occur.

Ultrasound confirmation of gestational age

Since the 1970s, ultrasound scans have allowed measurement of the size of developing embryos directly and so allow for an estimation of gestation age. Ultrasound dating is most accurate if undertaken in the first trimester (first 12 weeks of pregnancy) with a 95% error margin of six days. Scans performed in the second trimester have an error margin of 8 days and those in the third trimester a margin of two weeks.

Most obstetric departments in Australia, Canada, the United Kingdom, and United States use a combination of LMP and ultrasound-based estimates for the EDD using either 10-day or 7-day rules, so that if LMP dates and ultrasonographic dates are in agreement within 7 (or 10) days, then the LMP dates are accepted.

References

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