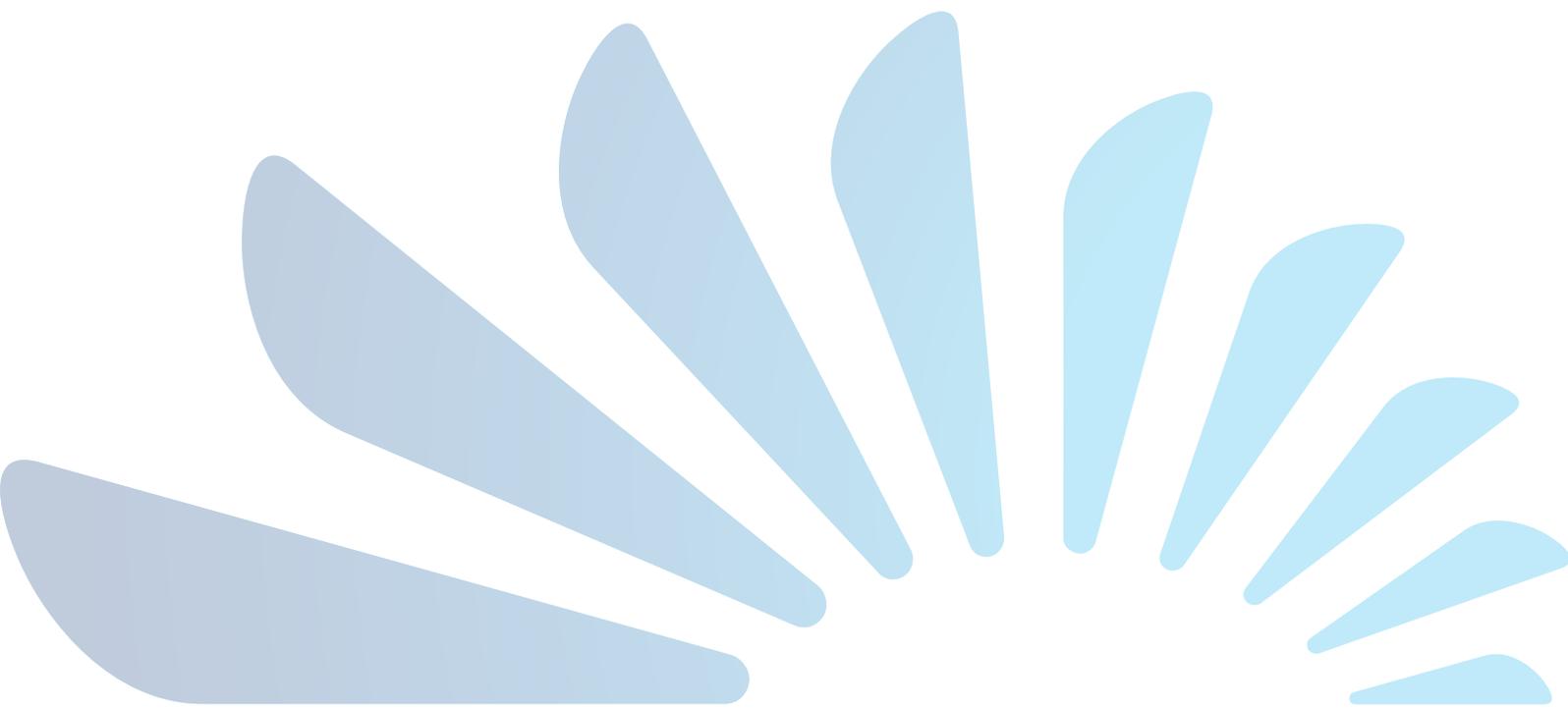


Accuracy of recollection of Last Menstrual Period (LMP)



Key Points

- Comparison of gestational age using ultrasound compared to LMP dating shows divergence between the two methods, with inaccuracies primarily in LMP dating
- Dependent on study, approximately 15% of medical records are lacking an LMP date
- Detailed study of recorded LMP found that only 32% could be classified as truly certain
- LMP records for pregnant populations are not random, with some numbers (especially 15) being a preferred date, indicating guesswork in recall of LMP
- The birth weight profile for gestational age based on LMP is also non-random, with apparent subpopulations; since a normal distribution with no subpopulations would be expected if all women record true LMP, this indicates systematic bias in recall of LMP
- When LMP was recorded twice for individual women, comparison of the two sets of records found only 71.1% had the same date
- A study of recall of LMP found only 56% of women were able to remember the exact day
- These findings indicate that there is a great deal of uncertainty in recall of LMP dates



Many studies have looked at the discrepancy between dating pregnancy using LMP and early ultrasound. However, most studies only include women who can accurately recall LMP, and even in these studies divergence is seen between LMP and ultrasound dating¹⁻³. The LMP method is primarily responsible for the discrepancy due to the incorrect assumption that all women have a regular 28 day menstrual cycle and ovulate 14 days after the first day of their LMP. Early pregnancy bleeding, amenorrhea and recent use of hormonal contraceptives can also lead to inability to assign a correct LMP^{4,5}. Alexander⁶ found that LMP-estimated gestational age resulted in more pre-term and post-term births compared to clinical estimates, with concordance between the two methods of only 47%. A similar study⁷ also found only 47% concordance between clinical estimate and LMP. Examination of the Norway Medical Birth Registry from 1967-1994 found that misclassification of gestational age was primarily due to factors relating to menstrual bleeding⁸.

Comparison of ultrasound and LMP for predicting delivery date found that ultrasound was much more accurate⁹, with only 2.7% of deliveries post-term using ultrasound compared to 10.3% using LMP. In this study, last menstrual period was reported as "certain" in only 78.6% of women (n=13,541), with the remaining 21.4% being uncertain or unknown. Detailed examination of the accuracy of algorithms for the assignment of gestational age using LMP and ultrasound revealed both random error and a systematic tendency to overstate the duration of gestation when using LMP¹⁰. Inaccurate recall of LMP, delayed ovulation and ambiguity in differentiating menstruation from early pregnancy bleeding were again all proposed as reasons for the error.

A study of LMP and ultrasound dates using the California live-birth and prenatal screening records (n=165,908) found substantial misclassification of LMP-based gestation age¹¹. It was found that 17.2% of records had estimates with an absolute difference of >14 days. It is interesting to note that in this study 26,249 (15.8%) women were excluded because a LMP was not recorded and, although no reason was given for the missing information, it illustrates the magnitude of women unable to provide a LMP. Buekens¹² found 16% of women (n=22,404) using a common perinatal form had an unknown LMP. This is likely to underestimate the true proportion of women with an inaccurate LMP because women are often prompted to guess their LMP by health care professionals. Earlier studies found as many as 30% of women did not know their LMP¹³ and around 20% of live-birth certificates in the US had a missing or incomplete date of LMP¹⁴. Campbell reported that

44.7% of women enrolled in a study examining routine ultrasound screening for prediction of gestation age, had suspect menstrual histories¹⁵. In 52.6% of these cases, the patient was unsure of the exact date of her LMP.

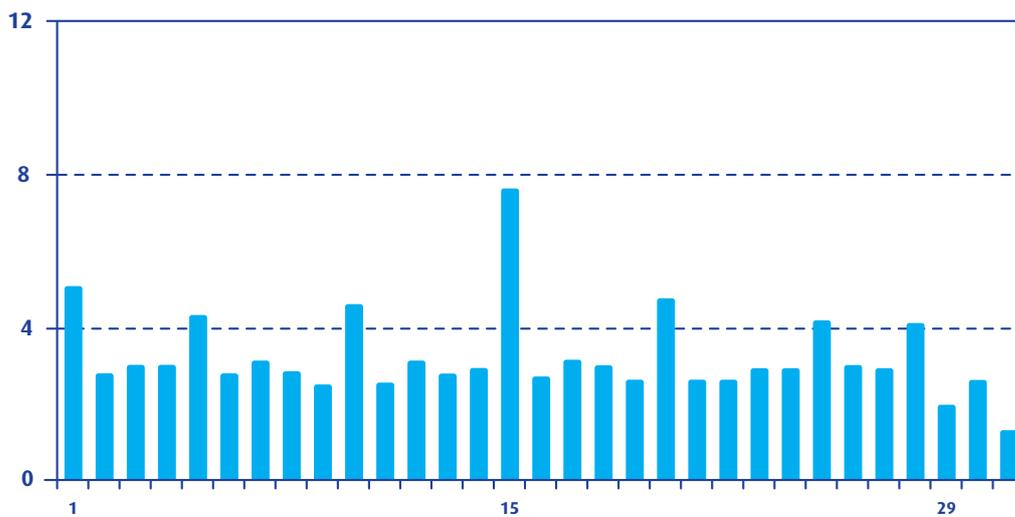
The National Center for Health Statistics live-birth database (US 2000-2002) was used to compare gestational age classifications¹⁶. Only 75% of the records had a valid LMP and clinical estimate information. Analysis of the subgroup with valid LMP dates showed that even in these cases there was discrepancy between LMP and clinical estimates, causing different rates of very pre-term, pre-term, post-term and small for gestational age births between the gestational aging methods; in fact, agreement between the two methods was only 51.4%. A more recent report on the 2002 US public use natality file also found significant missing data and disparity between LMP and clinical estimate of gestational age¹⁷. A similar proportion of cases in the UK have uncertain or unknown LMP, as demonstrated by examination of the Aberdeen maternity records where 73.2% were assessed as having certain LMP¹⁸.

Examination of how women remembered LMP found that, of the 76% of women who could recall LMP, only 32% could actually be classified as truly certain¹⁹. Methods for remembering LMP include writing date of onset of menses in calendars, diaries or on other material, association of onset of menses with a specific event/situation or guesswork.

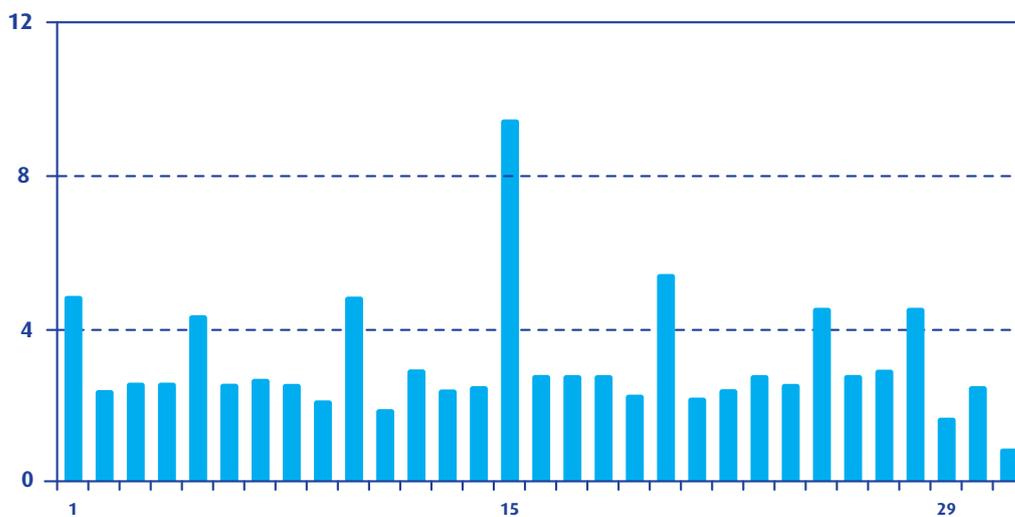
Interestingly, examination of 504,853 birth records indicated that women over-report LMP for days 1, 5, 10, 15, 20, 25 and 28 (Fig. 1). More women say their LMP was on these days than would be expected by chance and the preference for the 15th day was 2.5x more than expected²⁰. This preference for certain numbers indicates that some women appear to estimate LMP by rounding to the nearest 5. This observation was confirmed by Savitz¹⁰ who found that, in total, a 55% excess assigned to preferred dates. This suggests that more than half of women are just estimating LMP rather than using accurate recall or recording techniques. Although rounding to the nearest 5 should not add too much error to the LMP date, the over-reporting of the 1st, 15th and 28th indicates rounding to the beginning, middle and end of the month; this would incur substantially more error. More recently, Martin²¹ also found the same extent of digit preference, in the 1990-2002 US National Center for Health Statistics birth files, and concluded that "reporting of the day too often may be little more than the guess of the mother or hospital staff".

Figure 1. Number preference in the first day of the last menstrual period by onset of prenatal care, California birth certificates, 1987.

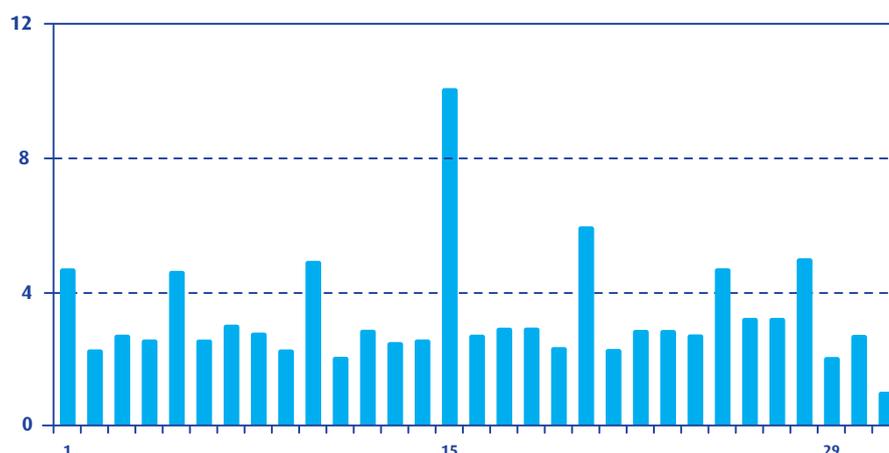
First trimester (n=335 308)



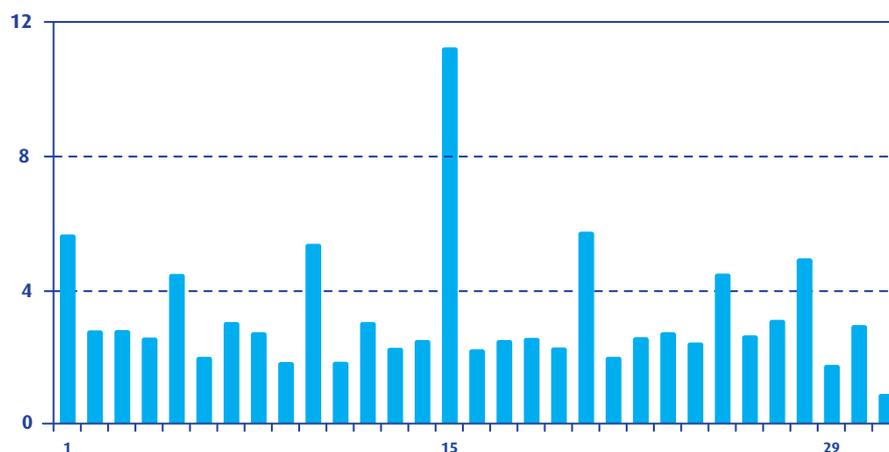
Second trimester (n=79 353)



Third trimester (n=16 623)



No prenatal care (n=6 119)



Digit preference must introduce error into gestational age calculations and has been shown to cause discrepancy in birth weight²². Indeed, the inaccuracy of use of LMP is demonstrated by the bimodal distribution of birth weight for gestational age, with additional secondary peaks. A normal distribution would be expected, so this distribution indicates that assignment of gestational age is occurring in a non-random pattern and must be influenced by human factors. Similarly, gestational age peaks were found by Gjessing⁸ and again systematic errors based on use of LMP were deemed responsible.

The advent of a new screening program (California's statewide prenatal alpha-fetoprotein screening program 2002 - XAFP) provided two separate occasions when women had to provide LMP information to medical professions. Analysis of these data found that 13% had no/incomplete LMP information. In those with complete data for both records, concordance between the two recorded dates was 71.1%, with 3.7% having a discrepancy of more than 14 days²³. This suggests that in nearly 30% of cases a different LMP is provided when requested on more than one occasion, although clerical error may be partly responsible for differences.

This figure may well be an underestimate though, because XAFP screening uptake was highest amongst the more educated, white, privately insured and older women, and missing and incomplete LMP records are generally lowest in higher socioeconomic circumstances¹⁸.

One study was designed to assess recall of LMP by normal menstruating women. Volunteers were asked to keep a menstrual history diary and, at a later date in a clinical setting, women were then prompted to recall their LMP²⁴. Over half of the women were able to recall LMP exactly (56%), and 81% were within 2 days. It should be noted that some women would have their LMP shortly before or even on their clinic visit, and when recall was more than 3 weeks women tended to overestimate the time since LMP. However, these women had modified their normal behaviour by participating in the study and it is likely that recall would be less accurate in women who had not been asked to record menstrual history. In addition, in women suspecting pregnancy, LMP would have been at least 3 weeks prior to being asked to recall date, where inaccuracy was shown to be greatest.

In conclusion, LMP appears very inaccurate for the estimation of gestational age. Inability to recollect LMP has been seen in 15-40% of women, depending on the study, and even in women who can recall LMP, number preference or guesswork deem the estimation inaccurate. When LMP is certain, this again does not accurately provide a good gestational age estimate because of the inaccurate assumption that all women have a 28 day cycle with ovulation on day 14. In addition, early pregnancy bleeding, amenorrhea and recent contraception use can cause confusion in assignment of LMP.

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