A Fixed Formula to Define the Fertile Window of the Menstrual Cycle as the Basis of a Simple Method of Natural Family Planning

Marcos Arévalo,* Irit Sinai,* and Victoria Jennings*

A significant number of women worldwide use periodic abstinence as their method of family planning. Many of them use some type of calendar-based approach to determine when they should abstain from unprotected intercourse to avoid pregnancy; yet they often lack correct knowledge of when during their menstrual cycle they are most likely to become pregnant. A simple method of natural family planning (NFP) based on a fixed formula to define the fertile window could be useful to these women. This article reports the results of an analysis of the application of a fixed formula to define the fertile window. A large existing data set from a World Health Organization study of the Ovulation Method was used to estimate the theoretical probability of pregnancy using this formula. Information about the variable probability of pregnancy on different cycle days relative to ovulation also was considered in the analysis. Results suggest that a fixed formula in which days 8–19 of the menstrual cycle are considered to be the fertile window would provide the appropriate basis of a simple, effective, family planning method. CONTRACEPTION 2000;60:357–360 © 2000 Elsevier Science Inc. All rights reserved.

KEY WORDS: natural family planning, periodic abstinence, fertile phase, blanket rule

Introduction
This article presents an analysis of the theoretical probability of pregnancy that would result from the application of a fixed formula to identify the fertile window of the menstrual cycle. This formula, which defines cycle days 8–19 as the fertile window, is the basis of the proposed Standard Days method, a simple method of natural family planning (NFP). Survey data from a number of countries around the world show that a substantial number of women worldwide use periodic abstinence as their method of family planning.¹ Many of these women use calendar-based approaches to determine when they should abstain from unprotected intercourse to avoid pregnancy. However, research also indicates that a significant percentage of women who claim to use periodic abstinence lack correct knowledge of when during their menstrual cycle they are most likely to become pregnant.² Most of these women simply abstain from sexual intercourse during some part of their cycle, but without accurate information about how to determine when they are fertile. This lack of accurate knowledge can be an important factor accounting for unplanned pregnancies.

Many women—particularly those who are not using any family planning method, who use barrier methods inconsistently, or who lack reliable access to services and commodities—could clearly benefit from simple, accurate instructions to help them know when they need to abstain from unprotected intercourse if they wish to avoid pregnancy. This would increase correct use and reduce unintended pregnancies. Making instructions easy to provide to clients would also make it feasible for many programs to incorporate these methods into their services, thus meeting the needs of a broader spectrum of women, particularly those in underserved populations, as well as those who prefer to use a method with no risk of side effects and no use of drugs, devices, or surgical procedures.

One such simple method is the Standard Days method, based on a fixed formula for defining the
fertile window. This method would counsel women/couples to abstain from unprotected sexual intercourse on days 8–19 (inclusive) of their menstrual cycle to avoid pregnancy. This would eliminate the need for observations of fertility signs or for arithmetical calculations, making a natural method more accessible and practical to some populations with low educational levels or limited access to family planning services.

Because of its simplicity, the Standard Days method holds the promise of being easier for clients to learn and use and for providers to learn and teach. It would be less time-consuming and complex, less expensive, and involve less provider follow-up of clients than other natural methods, and it would potentially be more feasible for programs to provide. Furthermore, as the same formula (defining the fertile period) holds the promise of being easier for clients than other natural methods, and it would be the basis of an effective method of family planning, which the WHO study examined, identified by the Ovulation Method,6 which collected information on various aspects of the menstrual cycle, in five geographically and culturally diverse settings. The data offer information on several characteristics of approximately 7,600 menstrual cycles, including cycle length and signs of ovulation. We applied the fixed rules of the Standard Days method to these cycles.

We tested the potential effectiveness of the Standard Days method by examining the estimated probability of pregnancy if women had followed the method’s rule—abstaining from unprotected intercourse on days 8–19 (inclusive) of the menstrual cycle. We used data from a World Health Organization (WHO) study of the Ovulation Method,6 which collected information on various aspects of the menstrual cycle, in five geographically and culturally diverse settings. The data offer information on several characteristics of approximately 7,600 menstrual cycles, including cycle length and signs of ovulation. We applied the fixed rules of the Standard Days method to these cycles.

We used three types of information to calculate the probability of pregnancy if women had followed the rules of the Standard Day method, as described below.

First, we determined, based on the fertile days identified by the Ovulation Method, the percentage of cycles in which the woman would not have become pregnant if she had had unprotected intercourse only on days considered to fall outside the fixed fertile window (1–7, and day 20 through the end of her menstrual cycle).

Second, we incorporated existing data that identify the probability that unprotected intercourse on various days relative to ovulation would result in a pregnancy, detected clinically at 6 weeks from the first day of the last menstrual period.5 This probability increases progressively from about 4% 5 days before ovulation to 29% 2 days before and 27% 1 day before ovulation, declining to 8% from intercourse occurring on the day of ovulation.5 Unprotected intercourse earlier and later in the cycle is very unlikely to result in pregnancy. We use these probabilities in our calculations.

Third, we estimated when ovulation occurred during the analyzed cycles. Women using the Ovulation Method, which the WHO study examined, identified the peak day of their menstrual cycles, which is generally accepted as a good proxy for ovulation.4 Hilgers et al7 established that some 97% of ovulations occur within 2 days before or after peak day, with the majority (38%) occurring on peak day itself.

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**Materials and Methods**

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**Notes:**

1. An older study, and preliminary results from a multi-center European study show a similar pattern.
2. This is consistent with the known life spans of gametes, which is 3–5 days for sperm and < 1 day for the egg.
3. These probabilities were calculated with a 95% confidence interval.
4. Peak day is defined as the last day on which fertile-type mucus is recognized, or the last day on which the wet or lubricative sensation is felt.
More ovulations occur before peak day than after. We applied these probabilities to the cycles in our data.

Recognizing that the fertile window begins 5 days before ovulation and extends through the day of ovulation, and that peak day can potentially occur from \#3 days before through \#3 days after ovulation, we determined that the period starting on \(P_{28}\) (8 days before peak day) and ending on \(P_{13}\) (3 days after peak day) constitutes the entire potentially-fertile window for each cycle. We therefore calculated the estimated probabilities of pregnancy on each of these days. These would be the theoretical pregnancy rates if all women in the WHO study had used the Standard Days method, by applying the fixed formula of days 8–19 to define their fertile window and abstaining from unprotected intercourse on these days.

### Results

We first examined the percentage of cycles in which days \(P_{-8}\) [8 days before peak day] through \(P_{+3}\) [3 days after peak day] are covered by the method (ie, days \(P_{-8}\) through \(P_{+3}\) occur during days 8–19 of the cycle, and are thus identified as potentially “fertile days” in which method users would abstain from unprotected intercourse). In almost all (96%–98%) cycles, days \(P_{-3}\) through peak day itself occur during days 8–19 of the cycle. This percentage gradually decreases for days further from peak day, so that some 80% of cycles are covered on day \(P_{+3}\) and 34% of cycles are covered on day \(P_{-8}\).

Next, we weighted the percentage of cycles that are not covered by the method (the reverse of these figures) by the probability that unprotected intercourse on that day relative to ovulation would result in pregnancy,\(^3\) and the probability that ovulation would occur on that day relative to peak day,\(^6,7\) to arrive at our final estimated probabilities of pregnancy if women had followed the method rules.

We recognize that most women with cycles ranging from 26 to 32 days occasionally experience a cycle outside of this range.\(^8\) We therefore calculated the probabilities of pregnancy for three overlapping subsets of cycles. First, including only cycles of women who experienced only cycles ranging 26–32 days; second, cycles of women who experienced only cycles ranging 24–34 days (allowing for occasional shorter or longer cycles by \#2 days); and third, for all cycles (ranging 12–64 days). Results are presented in Table 1. Only cycles with a clearly defined peak day are included in our analysis. Because peak day generally suggests ovulation, most anovulatory cycles were thus excluded from the analysis.

### Discussion

Our results indicate that the Standard Days method, based on a fixed formula defining days 8–19 of the cycle as the fertile window, can be a highly effective family planning method for most women. It seems to be most effective for women with cycles ranging 26–32 days—the highest probability of pregnancy for these women on any given day is only about 0.007. Although only 25.7% of women experienced this range of cycle lengths throughout the study, about 78% of cycles reported in the WHO study were in the 26–32 day range.

We expect that the method would not be effective for women who consistently have cycles < 26 days or > 32 days. However, it would still be very effective

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**Table 1. Estimated probability of clinically detected pregnancy from unprotected intercourse on different days relative to peak day, for women observing the rules of the Standard Days method**

<table>
<thead>
<tr>
<th></th>
<th>Cycles of women with cycles ranging 26–32 days</th>
<th>Cycles of women with cycles ranging 24–34 days</th>
<th>All cycles</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>25.7% of women ((n = 1,377) cycles)</td>
<td>59.3% of women ((n = 4,079) cycles)</td>
<td>100.0% of women ((n = 7,592) cycles)</td>
</tr>
<tr>
<td>(P_{-8})</td>
<td>0.0004</td>
<td>0.0004</td>
<td>0.0004</td>
</tr>
<tr>
<td>(P_{-7})</td>
<td>0.0039</td>
<td>0.0045</td>
<td>0.0042</td>
</tr>
<tr>
<td>(P_{-6})</td>
<td>0.0068</td>
<td>0.0092</td>
<td>0.0088</td>
</tr>
<tr>
<td>(P_{-5})</td>
<td>0.0049</td>
<td>0.0087</td>
<td>0.0092</td>
</tr>
<tr>
<td>(P_{-4})</td>
<td>0.0043</td>
<td>0.0092</td>
<td>0.0108</td>
</tr>
<tr>
<td>(P_{-3})</td>
<td>0.0032</td>
<td>0.0058</td>
<td>0.0078</td>
</tr>
<tr>
<td>(P_{-2})</td>
<td>0.0034</td>
<td>0.0040</td>
<td>0.0071</td>
</tr>
<tr>
<td>(P_{-1})</td>
<td>0.0031</td>
<td>0.0036</td>
<td>0.0066</td>
</tr>
<tr>
<td>Peak</td>
<td>0.0029</td>
<td>0.0030</td>
<td>0.0051</td>
</tr>
<tr>
<td>(P_{+1})</td>
<td>0.0020</td>
<td>0.0021</td>
<td>0.0031</td>
</tr>
<tr>
<td>(P_{+2})</td>
<td>0.0010</td>
<td>0.0010</td>
<td>0.0014</td>
</tr>
<tr>
<td>(P_{+3})</td>
<td>0.0003</td>
<td>0.0003</td>
<td>0.0003</td>
</tr>
</tbody>
</table>

\(^P\) denotes peak day.
for women whose cycle length occasionally falls outside the range of 26–32 days by 1 or 2 days (women with cycles ranging 24–34 days). The highest probability of pregnancy for these women on any given day is only about 0.009, and most cycles in the study (94.8%) are within this range. However, even when we include in the analysis cycles of all lengths (ranging 12–64 days), the method still seems to be effective.

We conclude, therefore, that the Standard Days method can be a highly effective family planning method for most couples who choose it. It would be easier than other natural methods for clients to learn and use, for providers to teach, and for programs to offer. Therefore, it could be a good family planning option in populations with low literacy and numeracy levels.

The Institute for Reproductive Health at Georgetown University is currently undertaking a study to test the effectiveness and acceptability of the Standard Days method in several countries. We expect the results to confirm the potential effectiveness findings presented in this article.

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