CONTRACEPTIVE FAILURE RATES: RESULTS FROM A FRENCH POPULATION BASED SURVEY

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Introduction

Despite the widespread use of highly effective contraceptive methods it is estimated that 49% of pregnancies are unintended in the United States: there were 3.1 million in 2001 alone, the last year for which data are available.[1] Half (48%) of these pregnancies were due to contraceptive failure, while the other half occurred to the small minority (11%) of women not using any method of contraception.[1,2] A similar pattern is observed in France despite its being ranked among the first worldwide in use of reversible methods of medical contraception (in 2000, 82% of women at risk for unintended pregnancy were using the pill or the IUD).[3,] A recent population-based survey in France found that one in three pregnancies was reported as unintended, of which 65% occurred among women who were using contraceptives at the time they got pregnant.[4] These results reflect the difficulties women experience when using contraceptive methods that require adherence such as taking a pill each day or using a condom at each act of intercourse.

Most available information on contraceptive failure comes from clinical trials. Clinical trials have the advantage of collecting prospective data from women who are closely monitored, and failure rates during perfect (correct and consistent) use can be estimated; however, such trials almost surely do not reflect conditions under which contraceptive methods are actually used (or misused) in the general population. The second source of information is provided by population-based surveys that are more likely to reflect the typical conditions of use of contraceptives but may fail to provide as accurate information on use as do clinical trials. A few studies, mostly conducted in the United States using data from the National Survey of Family Growth (NSFG), have been performed using this later approach.[3,5] Contraceptive failure rates during typical use vary by user characteristics (age, parity, social background) [6,7]; this finding suggests that contraceptive failure rates may also vary by country with different contraceptive practices. In advanced industrial societies, only one Australian study, using data from the national Australian Fertility Survey, has produced contraceptive failure rate estimates based on a similar methodology [8]. However, that study focused only on contraceptive failure rates during the first use of the method.

This study provides estimates of method-specific failure rates among women in France. In addition to differentials by method used and by duration of use, the analysis explores the differences in failure rates by women's social and demographic background characteristics.

Methodology

Data

We use data from the 2000 Cocon Study, a population-based survey exploring contraceptive practices and recourse to abortion in France. A two-stage probability sampling method was used to identify a representative sample of 2,863 French speaking adult women (ages 18-44). An initial sample of 14,704 households including at least one eligible French-speaking woman between the ages of 18 and 44 years was selected at random from the telephone directory, which was first stratified by region. One eligible woman per household was then randomly selected. The response rate was 74.6%. The sampling procedure included a second phase designed to over-represent women who had an abortion or an unintended pregnancy in the five years prior to the survey. All women who met these criteria were selected (sampling proportion=100%, n=1,034), while only a fraction of the other women

were randomly selected (sampling proportion=19%, n=1,829). The sample was weighted to take into account the sampling design as well as reflect the social demographic composition (age, marital status, professional activity, and level of education) of the French population in the 1999 census. The total numbers reported in the tables are gross values, *i.e*. the number of women actually interviewed; The percentages reported are weighted percentages.

Of the 2,863 women in the sample, three women out of five (n=1,689) were randomly selected to answer the set of questions on lifetime contraceptive history in order to reduce the mean length of the questionnaire. Analyses were performed among this subgroup of women.

The telephone questionnaire which lasted an average of 40 minutes was designed to collect detailed information on the women's contraceptive and reproductive histories, from the first sexual intercourse to the date of the interview. In the pregnancy history section of the questionnaire, women were asked to specify for each of their pregnancies the outcome, the date the pregnancy ended, and whether the pregnancy was intended or unintended. An unintended pregnancy was defined as "not being planned at all" or "being planned later;" in addition, a pregnancy was classified as unintended if the woman "didn't remember if she had planned to become pregnant at that time". Depending on the pregnancy outcome, the starting date of the pregnancy was calculated as the end date of the pregnancy minus the duration of the pregnancy, where that duration was 268 days for live or still births, 42 days for ectopic pregnancies, 53 days for elective induced abortions, 65 days for spontaneous abortions, and 105 days when pregnancies were terminated for medical reasons.

Using the above reproductive history as a chronological scale to help women remember their contraceptive history, they were then asked to describe all contraceptive episodes (including the episodes when they were not using contraception) within each reproductive interval (time from first intercourse to first pregnancy, time between two consecutive pregnancies, or time from last pregnancy to the date of the interview). For each contraceptive episode, women reported the type of method used and the starting and ending date of that episode.

As probes to insure more complete reporting, the questionnaire further included questions exploring contraceptive practices at first sexual intercourse and at the time of the survey. If different from the first and last episode reported in the contraceptive history, an additional contraceptive episode was added at the beginning or end of the history. A similar probe was asked about contraceptive use at the time of the start of each unintended pregnancy. If different from the contraceptive episode described in the contraceptive history, an additional contraceptive episode was added before that pregnancy.

Using all of the above information, we were able to reconstruct a contraceptive and reproductive history for each woman. The total number of episodes for a given woman (including pregnancies) varied from 1 to 33, while the number of contraceptive episodes (including episodes with no contraception) varied from 1 to 23.

We evaluated effectiveness for eight categories of contraceptive methods as shown in Table 1. As only 44 episodes of female sterilization were identified in the sample, they were not included in the analysis. In all, 6,155 contraceptive episodes were available for analysis, ranging from 1 to 294 months of use. The mean duration of use was 38.2 months.

Table 1. Contraceptive episodes

Contraceptive method	Episodes (N)	Episodes (%)	Total exposure (months)	Mean time of use (months)	Median time of use (months)	Unintended pregnancies (N)
All episodes of reversible contraceptives	6,155	100.0	220,189	38.2	23.3	519
Pill	3,270	32.1	135,287	43.0	29.7	230
IUD	788	8.3	36,474	54.9	35.5	61
Condom	929	9.5	17,018	18.5	6.6	96
Withdrawal	280	3.1	5,949	22.8	11.3	36
Spermicides or sponges	128	1.0	2,027	13.2	5.1	25
Fertility awareness*	173	1.6	4,074	24.8	15.9	23
Pill + condom	244	2.8	9,499	40.6	30.0	7
Condom + other barrier methods**	123	1.0	4,297	40.4	18.4	17

* "Fertility awareness" = periodic abstinence (31.6%), safe period by temperature or Ogino (68.4%).
** "Condom and other barrier methods" = condom+ withdrawal (28.8%), fertility awareness methods (29.3%), spermicides (11.1%), emergency contraceptive pills (7.6%), withdrawal + fertility awareness methods (13.2%), and other combinations (10%))

We estimated the proportion of women who experienced an unintended pregnancy while using a contraceptive method by duration of use for the first 5 years of method use. For four categories of contraceptive methods (withdrawal, spermicides, fertility awareness, condom plus other barrier methods), the number of users was insufficient to calculate failure rates for five years of use. In all, we were able to identify 519 contraceptive failures, of which 468 occurred during the first 5 years of use.

Methods

We estimated probabilities of method-specific contraceptive failure, for the first five years of method use, using piecewise-constant hazards models to take into account "the woman effect" in the analysis. In these models, we first partition the time duration of method use into *n* time intervals assuming that the probability of contraceptive failure is constant within each time interval. The intervals were chosen in order to closely approximate the Kaplan-Meier estimates. Thus, we defined closely spaced boundaries (3, 6, 9, 12 months) at the beginning of use of a method (first year of use) where the risk of failure varies rapidly over time and longer time intervals (18, 24, 30, 36, 48, 54, 60 months) where the risk changes more slowly (2^{nd} year to the 5^{th} year of use). Finally, we introduced a shared frailty term (assuming a gamma distribution) at the woman level to take into account the intra-woman correlation of contraceptive episodes. These same models were then used to assess simultaneously the effects of socio-demographic characteristics described above on the probability of contraceptive failure.

In all analysis, we used weighted observations. Weights were computed in order to take the sampling design into account as well as to reflect the social and demographic composition (age, marital status, professional activity, and level of education) of the French population in the 1999 census. The total numbers reported in the tables are gross values, *i.e*. the number of contraceptive episodes reported. The probabilities of contraceptive failure are weighted.

First results

Table 2 displays probabilities of contraceptive failure by year of method use for all methods combined and for eight separate contraceptive methods. Overall, 2.9% of women experienced a contraceptive failure in the first year of contraceptive use, and 8.4 % in the first 5 years of use. The IUD had the lowest first year failure rate (1.1%), followed by the pill (2.4%), the male condom

(3.3%), fertility awareness methods (7.4%), withdrawal (10.1%), and spermicides (19.8%). Failure rates for combined contraceptive users varied from 1.3% for pill and condom users to 10.7% for women using a combination of condoms and other barrier methods.

The probabilities of contraceptive failures varied with duration of method use. The failure rate for the pill was higher in the first year of use than for longer periods of use. Conversely, the failure rate for the IUD was highest in the 2nd year of use and declined for longer durations of use. Finally, the failure rate for the condom was highest in the first two years of use.

Table 2. Percentage of women experiencing contraceptive failure, by method and duration of use.

Contraceptive method	Episodes (N)	Duration of use				
		12 months	24 months	36 months	48 months	60 months
Pill	3,270	2.4	3.6	5.0	6.1	6.7
IUD	788	1.1	4.2	4.6	5.2	6.7
Condom	929	3.3	7.5	9.2	10.2	12.1
Withdrawal	280	10.1	15.5	23.7		
Spermicides, sponges	128	19.8				
Fertility awareness	173	7.4	18.1			
Pill + condom	244	1.3	1.6	1.9	2.8	2.8
Condom + other	123	10.7	21.6			
All users of reversible contraceptives	6,155	2.9	4.4	6.5	7.6	8.4

Ongoing analysis

We will assess the effect of women's demographic, social and reproductive characteristics on the probability of contraceptive failure for the three most common contraceptive methods represented in our sample (the pill, the IUD, the condom).

The following characteristics will be examined: age of respondents at the beginning of each contraceptive episode), parity and history of unintended pregnancy at the start of each contraceptive episode, and women's level of education (measured at the time of the survey in 2000).

Discussion - Conclusion

Our probabilities of contraceptive failures are likely to be underestimated, as 40% of abortions are underreported in the Cocon survey [9]. However, compared to uncorrected failure rates (for the underreporting of abortions) among US women [10], contraceptive failure rates among French women remain remarkably lower among US women. These results suggest differences in contraceptive practices which need to be further explored.

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