Typical-use contraceptive failure rates in 43 countries with Demographic and Health Survey data: summary of a detailed report

Chelsea B. Polis,⁎ Sarah E.K. Bradley, Akinrinola Bankole, Tsuyoshi Onda, Trevor Croft, Susheela Singh

Guttmacher Institute, 125 Maiden Lane, 7th Floor, New York, NY 10038, USA
University of California Berkeley, 2232 Piedmont Avenue, Berkeley, CA 94720-2120, USA
ICF International, 530 Gaither Road, Suite 500, Rockville, MD 20850-5971, USA

Received 18 February 2016; revised 10 March 2016; accepted 15 March 2016

Abstract

Background: While most unintended pregnancies occur because couples do not use contraception, contraceptive failure is also an important underlying cause. However, few recent studies outside of the United States have estimated contraceptive failure rates, and most such studies have been restricted to married women, to a limited number of countries and to 12-month failure rate estimates.

Methods: Using self-reported data from 43 countries with Demographic and Health Survey data, we estimated typical-use contraceptive failure rates for seven contraceptive methods at 12, 24 and 36 months of use. We provide a median estimate for each method across 43 countries overall, in seven subregions and in individual countries. We assess differences by various demographic and socioeconomic characteristics. Estimates are not corrected for potential errors in retrospective reporting contraceptive use or potential underreporting of abortion, which may vary by country and subgroups within countries.

Results: Across all included countries, reported 12-month typical-use failure rates were lowest for users of longer-acting methods such as implants (0.6 failures per 100 episodes of use), intrauterine devices (1.4) and injectables (1.7); intermediate for users of short-term resupply methods such as oral contraceptive pills (5.5) and male condoms (5.4); and highest for users of traditional methods such as withdrawal (13.4) or periodic abstinence (13.9), a group largely using calendar rhythm.

Conclusions: Our findings help us to highlight those methods, subregions and population groups that may be in need of particular attention for improvements in policies and programs to address higher contraceptive failure rates.

© 2016 The Authors. Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/).

Keywords: Contraception; Failure rates; Unintended pregnancy; International; Life tables

1. Introduction

In the developing world, 74 million unintended pregnancies occur annually, and 30% of these are due to contraceptive failure among women using traditional or modern contraceptive methods [1], including both method-related failures (i.e., failure of a method to work as expected) and user-related failures (i.e., failure stemming from incorrect or inconsistent use of a method). Unintended pregnancies can have many undesirable consequences, including unwanted childbearing, recourse to (potentially unsafe) abortion and maternal and/or newborn morbidity and mortality [2–4]. Measuring typical-use contraceptive failure rates among a cross-section of users (as opposed to failure rates from clinical studies) is critical to informing improvements in provision of contraceptive information, supplies and services, which can assist women and couples to use contraception correctly and consistently. Few recent studies outside of the United States and France have estimated contraceptive failure rates. Studies estimating contraceptive failure rates using Demographic and Health Survey (DHS) data [5–8] have generally restricted analysis to a limited number of countries or particular subgroups (e.g., married women), and most have not provided estimates of failure rates beyond 12 months of use.

⁎ Corresponding author.
E-mail address: cpolis@guttmacher.org (C.B. Polis).

http://dx.doi.org/10.1016/j.contraception.2016.03.011
0010-7824/© 2016 The Authors. Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/).
Recently, we produced a detailed report estimating typical-use contraceptive failure rates using DHS data from 43 countries with the necessary data. Using single-decrement life tables, we estimated contraceptive failure rates at 12, 24 and 36 months for seven contraceptive methods, including five modern methods [implants, intrauterine devices (IUDs), injectables, oral contraceptive pills and male condoms] and two traditional methods [withdrawal and periodic abstinence (largely comprised of users of the calendar rhythm method)]. We provided detailed contraceptive failure rate estimates by method and duration for each of 43 countries, as pooled regional estimates for each of seven subregions and as overall median estimates across 43 included countries. We also estimated contraceptive failure rates for various demographic and socioeconomic subpopulations.

The complete report and accompanying tables can be found at http://www.guttmacher.org/report/contraceptive-failure-rates-in-developing-world (available after March 24, 2016). This summary provides a brief overview of the methods, analysis and key findings; readers are encouraged to access the full report for greater detail.

2. Methods

2.1. DHS surveys selected for inclusion

We used information from 43 DHS surveys, including ten countries in Eastern Africa, five in Western Africa, six in Northern Africa and Western Asia, five in Eastern Europe and Central Asia, five in Southern Asia, four in Southeastern Asia and eight in Latin America and the Caribbean (LAC). The countries cover a substantial proportion of the population in Eastern Africa, Western Africa, Southern Asia and Southeastern Asia (81%, 69%, 92% and 73%, respectively [9]; data are less representative in other subregions. We used the most recent survey (as of June 2014) in each country that included a reproductive calendar containing information on reasons for contraceptive discontinuation. Applying the reproductive calendar involves asking female survey respondents to retrospectively report on their contraceptive use for the last 5 years before the interview and reasons for discontinuation.

2.2. Analytic methods

We calculated self-reported typical-use failure rates for all users of each contraceptive method using single-decrement life tables. In this calculation, the unit of analysis is an episode of contraceptive use, which begins at the point in the reproductive calendar when a woman reports initiating use of a contraceptive method and ends when she reports discontinuing that method. A single woman could contribute multiple episodes, if she stopped and started using contraception several times over the last 5 years, or no episodes if she did not use any method during that period. Estimates are not adjusted for potential errors in retrospective reporting of contraceptive use or potential underreporting of abortion, which may vary by country and subgroups within countries [10]. The period of observation for calculating contraceptive failure rates is months 3–62 prior to the DHS survey. We used individual-level sampling weights to produce nationally representative results within each country. Failure rates are not presented for methods with less than 125 episodes of contraceptive use in month 1 of the life table. Ninety-five percent confidence intervals (95% CIs) were calculated with a jackknife approach.

We pooled data across countries (weighted equally) within the same subregion; these should be interpreted as average method-specific rates across the included countries. We estimated overall contraceptive failure rates across 43 included countries in two ways: (1) by calculating a median failure rate by method and (2) by calculating a pooled all-country estimate across all 43 countries. In describing overall failure rates, we focus largely on median values to make our estimates more easily comparable to previous analyses [5], but we assessed differences by various demographic and socioeconomic characteristics using the pooled all-country estimates. We conducted all analyses in CSPro version 4.1.002 and produced graphics using StataMP 14.

3. Results

3.1. Contraceptive prevalence and method mix among 43 countries assessed

Among the 43 countries assessed, overall contraceptive prevalence ranged from 13% in Senegal to 79% in Vietnam (Fig. 1). Contraceptive prevalence was extremely low in Western Africa (range: 13–19%) and low in Eastern Africa (14–58%). Prevalence was higher in Eastern Europe and Central Asia (28–69%) and Southern Asia (35–61%), while LAC (38–77%), Southeastern Asia (range: 49–79%) and Northern Africa and Western Asia (range: 51–72%) had the highest contraceptive prevalence. Method mix varied considerably (Fig. 2).

---

1 Where possible, women who report using fertility awareness methods (such as the Standard Days method or the TwoDay method) were classified as “Other modern method” users. In some cases, however, the category of periodic abstinence users (and their failure rates) may include some women using fertility awareness methods who were not identified as such through the survey.

2 In some countries, the most recent survey did not collect the reproductive calendar or did not include the information on reasons for discontinuation in the calendar necessary for contraceptive failure. Details are available in the full report.

3 In seven DHS surveys that included only ever-married women, the sample does not include any unmarried contraceptive users.

4 We exclude information from the month of interview or the two preceding months because women in their first trimester may not yet recognize that they are pregnant, possibly as the result of contraceptive failure, which would lead to underestimation of failure rates.
3.2. Median method-specific contraceptive failure rates across all surveys analyzed

Median reported 12-month method-specific contraceptive failure rates across all included countries are displayed in Fig. 3. As expected, modern contraceptive methods with the least room for user error generated the lowest median failure rates and the lowest variability in these rates. The overall 12-month median failure rate for every 100 episodes of method use was 0.6 (95% CI: 0.0–2.4) for implants, 1.4 (0.0–2.4) for IUDs and 1.7 (0.6–2.9) for injectables. Oral contraceptive pills and condoms had higher failure rates: 5.5 (3.5–7.3) for oral contraceptive pills and 5.4 (2.3–8.7) for male condoms. Withdrawal and periodic abstinence had the highest failure rates: 13.4 (9.1–17.1) for withdrawal and 13.9 (9.2–19.3) for periodic abstinence. Detailed contraceptive failure rates by country are available in the full report, and failure rates at 12, 24 and 36 months are provided in Table 1. For implants, IUDs, pills and periodic abstinence, contraceptive failure generally decreased with increasing duration (i.e., the 12-month failure rate was larger than the difference between the 24- and 12-month failure rate, which itself was larger than the difference between the 36- and 24-month failure rate), while estimates for injectables, male condoms and withdrawal did...
not demonstrate this pattern. This is likely due to selection of users at increasing durations of contraceptive use: for example, women with highest levels of incorrect or inconsistent use experience failures and therefore are selected out of the population at risk over time.

3.3. Pooled subregional contraceptive failure rates

Fig. 4 displays pooled subregional 12-month method-specific failure rate estimates. Women in LAC reported the highest levels of failure across four out of seven methods (IUDs, injectables, periodic abstinence and withdrawal). Twelve-month failure rates across subregions had the following range of estimates per 100 episodes of use for each method: implants (0.2–1.3), IUDs (0.9–2.2), injectables (0.9–4.2), oral contraceptive pills (3.6–8.5), male condoms (2.2–8.7), withdrawal (7.8–17.1) and periodic abstinence (6.1–20.9). Specifics by subregion, and for longer durations of use, are provided in the full report.

3.4. Twelve-month contraceptive failure rates by demographic and socioeconomic characteristics

We assessed differences in contraceptive failure rates by age, marital status, parity, contraceptive intention, wealth, residence and education; complete results for each factor are detailed in the full Guttmacher report. Of all characteristics assessed, age was associated with the largest differences in rates (Fig. 5). For all methods except implants (for which the failure rate did not vary by age), 12-month contraceptive failure rates were significantly higher among women younger than 25 years as compared with their older counterparts. The absolute differential in 12-month contraceptive failure rates by age was >10 percentage points among users of traditional methods such as withdrawal or periodic abstinence, although the relative difference was largest for IUD users, with younger IUD users 2.8 times as likely to report a contraceptive failure as older IUD users. Declines in fecundability and increasing experience in use of particular methods that are associated with increasing age may contribute to these observed patterns in failure rates. Inclusion of unmarried women in this analysis also permitted an assessment of differences by marital status: we found that ever-married women reported similar or lower 12-month failure rates than never-married women, except among condom users, among whom this pattern was reversed (Fig. 6).

4. Discussion

Reported 12-month failure rates were lowest for users of longer-acting methods such as implants, IUDs and injectables;
intermediate for short-term resupply methods such as oral contraceptive pills and male condoms; and highest for users of traditional methods such as withdrawal or periodic abstinence (largely calendar rhythm). Implant users were 9 times less likely to report contraceptive failure than women using contraceptive pills and 23 times less likely than women using periodic abstinence.

Our estimates for IUDs, injectables and oral contraceptive pills were similar to a recent large-scale analysis of contraceptive failure in DHS data by Ali et al. (Table 2) [5]. For condoms, withdrawal and periodic abstinence, our estimates were somewhat lower, although estimates from Ali et al. for each of these methods were within the range of the 95% CIs around our estimates, suggesting no statistically significant differences. Comparing our results to estimates for the United States is more complicated. Our estimates were somewhat higher than U.S. estimates for implants (0.6 vs. 0.05) and IUDs (1.4 vs. 0.8), which are derived from clinical data [11]. U.S. estimates for both of these methods fall within the 95% CIs for our estimates. On the other hand, our estimates were markedly lower than U.S. estimates for injectables (1.7 vs. 6), oral contraceptive pills (5.5 vs. 9), male condoms (5.4 vs. 18), withdrawal (13.4 vs. 22) and periodic abstinence (13.9 vs. 24), which are derived from 1995 and 2002 National Surveys of Family Growth and, notably, are corrected for abortion underreporting.

In general (and aside from estimates from West Africa, where we had particular concerns about data quality), we generally observed the lowest method-specific contraceptive failure rates, in Eastern Africa and Southern Asia. Overall contraceptive prevalence is low in Eastern Africa and moderate in Southern Asia, and contraceptive method mix differs: injectables and pills predominate in Eastern Africa, while Southern Asia has a substantial amount of female sterilization and a mix of other methods.

4.1. Limitations

We calculated failure rates based on self-reported information (such as contraceptive use and contraceptive failures),
which is subject to recall and other biases. Episodes of use of longer-term methods may be easier to recall and thus better reported than shorter-term methods [7]. In calendar data, underreporting of certain methods (particularly condoms and other short-term modern methods, as well as traditional methods) in certain countries (particularly in Western Africa but also other countries in sub-Saharan Africa and Asia) has been shown [10]. Misclassification of contraceptive failure (e.g., reporting a contraceptive failure as a deliberate discontinuation of contraception) or underreporting of contraceptive failure (e.g., to avoid reporting an unintended pregnancy that led to an abortion due to social desirability bias) would also impact contraceptive failure rates. National failure rates estimates for the United States in 2002 indicate that the effect of adjusting for underreporting of abortions varied by method type [12]. It had less of an impact on rates for oral contraceptive pills, injectables or withdrawal (producing less than a one-percentage point change in the failure rate, with inconsistent directionality) and a stronger impact on increasing failure rates for condoms (from 13.9 to 17.4) and fertility-awareness-based methods (from 23.0 to 25.3). We are unable to estimate the impact that omission, misreporting and underreporting of contraceptive use episodes; reasons for discontinuation; and abortions resulting from contraceptive failure may have on failure rates, particularly since the level of underreporting may vary across surveys. Therefore, the estimates presented should be viewed as direct reflections of women’s reports, which are potentially affected by a number of biases. Furthermore, there is need for more recent data in particular regions, such as LAC. These limitations point toward potential directions for improving data collection and analytic approaches that could enhance accurate estimation of contraceptive failure rates in DHS data. It may also be useful to assess characteristics related to contraceptive failure using multivariate analysis, which was beyond the scope of this work.

5. Conclusions

Availability of a range of contraceptive methods is an essential first step to enable women and couples to select the most effective method that they prefer to use. Provision of clear information about the risks and benefits of all available methods is also crucial in facilitating informed contraceptive choice. This analysis focused on method-specific typical-use contraceptive failure rates and demonstrated the lowest

Table 2
Comparison of 12-month failure rates in current study, a study using data from 19 DHS surveys and data from the United States

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Implant</td>
<td>0.6 (0.0–2.4)</td>
<td>na</td>
<td>0.05 (Implanon)c</td>
</tr>
<tr>
<td>IUD</td>
<td>1.4 (0.0–2.4)</td>
<td>1.1</td>
<td>0.8 (0.4–1.2) (ParaGard)d</td>
</tr>
<tr>
<td>Injectable</td>
<td>1.7 (0.6–2.9)</td>
<td>1.5</td>
<td>6 (Depo-Provera)e</td>
</tr>
<tr>
<td>Pill</td>
<td>5.5 (3.5–7.3)</td>
<td>5.6</td>
<td>9 (COC, POP)e</td>
</tr>
<tr>
<td>Male condom</td>
<td>5.4 (2.3–8.7)</td>
<td>7.6</td>
<td>18e</td>
</tr>
<tr>
<td>Withdrawal</td>
<td>13.4 (9.1–17.1)</td>
<td>15.3</td>
<td>22e</td>
</tr>
<tr>
<td>Periodic abstinence (largely calendar rhythm)</td>
<td>13.9 (9.2–19.3)</td>
<td>17.4</td>
<td>24e (largely calendar rhythm)f</td>
</tr>
</tbody>
</table>

a Number of failures per 100 episodes of use.
b Median confidence intervals (CIs) are calculated as a median of all CIs.
c No clinical study has reported an Implanon failure, but pregnancies during its use have been reported; thus, typical-use (and perfect-use) failure rates for this implant were arbitrarily set at 0.05; 95% CIs were not provided [11].
d Estimate derived from 1979 study of 3536 women using the TCu 380 A IUD [14]; 95% CI calculated from 1-year gross cumulative pregnancy rate per 100 women accepting the TCu 380 A IUD (0.8) and the associated standard error (0.2) provided in Table 8 of the study by Sivin and Stern [14].
e Weighted averages of estimates derived from the 1995 and 2002 National Surveys of Family Growth, corrected for abortion underreporting; 95% CIs were not provided [11].
f The overwhelming majority of women using fertility awareness-based methods (FABMs) in the NSFG are believed to be using calendar rhythm, although this could also include women using newer FABM methods such as Standard Days, TwoDay, Ovulation or Symptothermal. Notes: CI=confidence interval (when available). na=not available (method was not assessed). COC=combined oral contraceptive pill. POP=progestin-only pill.
failure rates among longer-acting methods. Improving access to a range of contraceptive options, including long-acting methods, may help to reduce contraceptive failure and unintended pregnancy, particularly in subregions where access to these methods is currently limited, or among groups with high failure rates for user-dependent methods (e.g., young women). Especially in areas with high HIV prevalence, counseling and services should consider the need for HIV prevention strategies in conjunction with contraceptive services. Provision of adequate information, counseling services and follow-up care may help to improve correctness and consistency of use and to facilitate switching to preferred methods and may also help to reduce discontinuation due to contraceptive failure for all methods. While our analysis did not assess contraceptive discontinuation for reasons other than contraceptive failure, discontinuation for reasons such as health concerns or side effects has been found to be high [5,13] and should also be addressed through counseling and services to facilitate switching methods. It may be particularly helpful to ensure that individuals initiating a contraceptive method are well-supported to establish effective patterns of use at early stages of use, which would have the benefit of reducing the probability of method failures over the long term.

Our results help us to highlight methods, subregions and population groups that may be in need of particular attention for decreasing contraceptive failure rates. For example, in subregions like Northern Africa and Western Asia, failure rates are generally higher than elsewhere, contraceptive prevalence is moderate to high and method mix is comprised of a substantial amount of traditional method use. Similarly, younger women reported higher failure rates than their older counterparts and are therefore in greater need of improved services and information. Increased availability and better quality of counseling and services that meets their need for confidentiality and nonjudgmental care may assist young women in successfully using their chosen contraceptive method.

This analysis provides a comprehensive assessment of failure rates across a large range of countries, according to duration of method use (12, 24 and 36 months), using largely recently collected data and, where possible, including both married and unmarried women. Pooling data permitted estimation of rates for subregions and population subgroups. This information can be leveraged to better assist women and couples to avoid unintended pregnancies and to have the number of children they desire at the time(s) that they feel ready and able to do so.

Acknowledgements

We are grateful to Jacqueline E. Darroch, Kathryn Kost, James Trussell, Sian Curtis, John Cleland, Tom Pullum and Michelle Weinberger for reviewing the full report; to Alyssa Browne for research assistance; and to Glen Heller for analytic assistance. The research on which this article is based was funded by UK aid from the UK Government. The views expressed are those of the authors and do not necessarily reflect the UK government’s official policies.

References