

# **Assessing regional differences in contraceptive discontinuation, failure and switching in Brazil**

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## **Abstract**

**Background:** Contraceptive prevalence is relatively high in Brazil (55% among women of reproductive age). However, reversible methods account for less than half of the mix and widespread disparities persist across regions and social groups. This raises attention to the need for monitoring family planning service-related outcomes that might be linked with quality of care. The present study examines the factors associated with method discontinuation, failure and switching among current contraceptive users, with a focus on sub-national assessment.

**Methods:** Data for the analysis are drawn from the Brazil Demographic and Health Survey, notably the calendar module of reproductive events. Multilevel discrete-time competing risks hazard models are used to estimate the random- and fixed-effects on the probability of a woman making a specific transition at a given duration of contraceptive use.

**Results:** Contraceptive continuation was found to be highest for the pill, the most popular reversible method. Probabilities of abandonment while in need of family planning and of switching to another method were highest for injections. Failure, abandonment and switching were each higher among users in the Northeast region compared to the relatively prosperous Southeast and South.

**Conclusion:** Findings point to seemingly important disparities in the availability and quality of family planning and reproductive health care services across regions of the country. Expanding access to a range of contraceptive methods, improving knowledge among health agents of contraceptive technologies and increasing medical supervision of contraceptive practice may be considered key to expanding quality reproductive health care services for all.

## Introduction

The strengthening of reproductive health and family planning services in developing countries is repeatedly highlighted as a priority area for intervention in international frameworks for reducing maternal mortality and improving maternal and child health, including the Millennium Development Goals [1]. Effective implementation of appropriate services requires an understanding of the factors affecting reproductive outcomes among women at risk and their patterns of behaviour. Delayed age at first birth among adolescents, increased birth spacing and reduced numbers of unplanned pregnancies are generally associated with safer motherhood. The use of contraceptives may be an important factor influencing such outcomes.

In Brazil, despite relatively high overall levels of contraceptive use, there appears to remain a large unmet need for family planning, particularly in the poorer areas of the country. Although the total fertility rate (TFR) has undergone a period of sustained decline and already reached a level considered as low as that of many developed countries—2.5 children per woman in 1996—evidence from the Demographic and Health Survey (DHS) suggests that if all Brazilian women who wanted to limit their fertility were protected by effective contraception, the TFR in 1996 would have stood at 1.8 children, or some one-third lower than the actual rate [2]. This proportion was about the same as that observed ten years earlier, albeit at a higher fertility level (Figure 1).

Moreover, while fertility decline has become rather generalized in Brazil, there remain important differences across sub-regions in relation to the stage and pace of this process. Differentials in availability, accessibility, and acceptability of the range of contraceptive technologies may mean that not all methods are favoured at the same time. Evidence from a

number of developing countries reveals that the mix of specific methods tends to continually evolve, as newer and more effective methods increase in popularity. For example, a dramatic rise in sterilization acceptance has been noted in many countries, especially in the Latin American and Asian regions, often at the expense of other methods [3-4]. It has been estimated, based on cross-national analyses of survey data, that at least half of contraceptors switch methods within a five-year period [5]. With regard to temporary methods alone, about a third of women from six less developed countries were found to have stopped use of their method within 12 months [6]. Such findings underlie the increasing importance of monitoring trends and determinants of method choice, as family planning and reproductive health programs must adapt to meet users' changing needs and preferences.

In Brazil, the most commonly used method is female sterilization, a long-term and highly effective method, relied upon by 27 per cent of women of reproductive age [2]. The second most popular method is oral contraceptives, used by 16 per cent of women. With use of other reversible methods standing at about 10 per cent, in all, reversible methods account for less than half of the method mix. It is likely that some combination of individual- and community-level factors eventually shaped this mix. Analyses of DHS results have revealed a number of socio-cultural variables, including media exposure and religiosity, as exercising significant influences on contraceptive method choice [7]. Research using multilevel modeling has also pointed to significant random effects at the municipal level on women's adoption of sterilization, likely reflecting influences of the service environment such as presence of hospitals [8]. Brazil does not have an official national family planning program, although in recent years some family planning-related services have been incorporated into the country's maternal and child health program. Evidence has pointed to important constraints in the availability of and access to family planning and reproductive health services, as well as severe deficiencies in quality of care [9]. In order to fully understand women's family planning choices, it is

imperative to investigate the components of contraceptive dynamics such as contraceptive discontinuation, failure and switching.

Contraceptive discontinuation, failure and switching are closely related. Considerable attention has been paid to contraceptive failure because, by definition, the result is an unintended pregnancy, due to either method failure, user error or provider failure [10]. The impact of contraceptive discontinuation and switching on reproductive outcomes depends to a great extent on both the woman's decision to use another method and the effectiveness of that method. Of particular interest is switching to a less effective method or to no method, which increases the chance of conception and is therefore likely to increase the overall level of fertility. Switching between methods of similar effectiveness may hold less important demographic impacts, although any switching may potentially increase the risk of an unintended pregnancy, as women are more likely to experience a method failure in the first months of use when they are not fully familiar with the new method. One study of contraceptive dynamics suggested that, overall, at least one-third of the TFR in 15 less developed countries (including Brazil) was associated with either a contraceptive failure or a contraceptive discontinuation for reasons other than a desire to get pregnant [11]. It has been argued that contraceptive continuation rates could be raised substantially by eliminating discontinuation due to non-method and method related reasons [12].

The contraceptive continuation rate has been suggested as a useful summary measure of the overall effectiveness of program services in enabling clients to sustain contraceptive use even though they may switch from one method to another [13]. In addition to fertility implications, declines in contraceptive failure rates have been associated with declines in abortion rates, although the relationship may be tempered by changes in the demand for fertility regulation

[14]. Moreover, in light of the HIV/AIDS epidemic, patterns of discontinuation and switching for condoms, the only effective barrier method against the transmission of HIV and other sexually transmitted infections, warrant special attention for improving sexual health program interventions. While the epidemic has shown signs of stabilization in Brazil in recent years, UNAIDS estimates that the majority (53 per cent) of all female AIDS cases remain the result of heterosexual transmission [15].

At the same time, Brazilian society has been marked by sharp regional inequalities that have characterised the country since the colonial period (see [16-17]). Much attention has been paid in the literature to disparities between the poverty-stricken Northeast and more affluent Southeast, the two most populous regions, together comprising about 70 per cent of the total population. For example, in terms of income levels, the proportion of workers earning less than one legal minimum wage is some 2.4 times higher in the Northeast (58 per cent) than in the Southeast (24 per cent). A similar tendency can be observed in terms of rates of adult illiteracy (40 versus 9 per cent) [2]. Such differences are seen to hold important implications for demographic and health outcomes. This can be noted through regional variations in the TFR, from a low of 2.1 in the Southeastern state of Rio de Janeiro to a high of 3.1 in the Northeast [2]. Many previous studies have examined the implications of contraceptive continuation on fertility outcomes and on family planning program performance measures at the national level or across countries; however, little research has been conducted at the sub-national level.

The objective of this paper is to analyze the factors associated with contraceptive discontinuation, failure and switching across regions of Brazil, drawing on data from the 1996 DHS. We examine the demographic and socio-cultural influences of contraceptive use dynamics across reversible methods, focusing special attention on the reported reasons for

method discontinuation. Identifying the predictors of method failure and discontinuation in a context of rapid and profound changes in reproductive behaviours could heighten attention among policymakers on regional disparities in outcomes that might be associated with the quality of reproductive health care services and eventually assist program managers in improved targeting of services.

## **Data and methods**

The DHS is one of the largest programs collecting quantitative data on reproductive health knowledge, attitudes and practices in the developing world. Surveys are carried out using standardized instruments, methods of training, data collection and data processing [18]. The most recent DHS in Brazil, the 1996 *Pesquisa Nacional sobre Demografia e Saúde*, collected information through personal interviews with 12,612 women aged 15-49, selected through a two-stage random sampling process designed to represent 95 per cent of the country's population at the national and regional levels (some rural areas in the North and Centre-West regions were excluded) [2].

In addition to core questions for measuring basic indicators for population and health program monitoring and evaluation, some surveys include additional modules designed to obtain specialized information on specific topics, such as maternal mortality or anthropometry. The present analysis takes advantage of the "calendar" module of reproductive events. The calendar records exceptionally detailed information (i.e. month-by-month) about the timing of a number of events – including marital unions, residential mobility, births, and contraceptive use – occurring in the five full calendar years preceding the survey. A relatively less-exploited module among the DHS surveys, the calendar has

become increasingly important in monitoring contraceptive dynamics and has greatly facilitated researchers' capabilities to conduct analyses of discontinuation and switching in particular [19].

The calendar records, for each episode of use, the type of contraceptive method, the dates of starting and ending of use, and the reason for discontinuation of use. Pregnancies, live births and abortions are also documented. This retrospective method of measurement makes heavy demands on the memory of respondents but recall is aided by prior entry into the calendar of live births, ascertained earlier in the interview. In precisely timing events in relation to one another, the calendar provides a valuable framework for resolving inconsistencies in respondents' responses related to birth dates, breastfeeding durations, and segments of contraceptive use or non-use. Overall, the quality of information obtained through this method has been evaluated as superior to alternative retrospective data collection techniques for longitudinal information [20-21].

For this study, a discrete-time competing risks hazard model is used to estimate the probability of a woman making a specific transition at a given duration of use. A discrete-time competing risks model is basically a multinomial logistic model in which the observations are repeated according to the duration of use until the event occurs or is censored. This approach allows incorporation of time-varying covariates as compiled in the calendar (such as woman's age, marital status, and parity at the time of use). Our main interest is to describe the patterns and explain the independent determinants of contraceptive discontinuation, failure and switching among women at risk across the main regions of the country.

Included in the model are all sexually experienced women who initiated use of a reversible method of contraception over the period covered by the calendar. The units of analysis are the episodes of contraceptive use (i.e. continuous use from month to month). Observations in the three-month period immediately before the survey fieldwork are excluded, a conventional research practice to reduce the bias in estimation of use-failure rates, given that some women may not yet have recognized they are pregnant and as such some contraceptive failures not identified [11]. Likewise excluded are episodes of use that began before the calendar period, as the date of initiation would not have been recorded.

We consider here episodes of use of the pill, injections, condoms, and traditional methods. Uses of other modern reversible methods (such as IUD, diaphragm, or spermicides) are excluded for computational reasons, due to the small number of episodes observed in the survey, and since it was not considered pertinent to aggregate these methods into a single category as discontinuation and failure rates can vary substantially across methods. Episodes of sterilization are also excluded given that the likelihood of discontinuation for this method is essentially nil.

In examining the patterns of contraceptive use dynamics, four categories were created for the response variable: (1) failure; (2) abandonment of the method while still in need of family planning; (3) switching to another reversible method; and (4) continuing use of the method. Contraceptive failures include any (presumably unintentional) occurrence of a pregnancy while using the method. Episodes where the woman reported having discontinued use for non-method-related reasons, such as a desire to get pregnant, marital separation or infrequent sexual intercourse, were included under the fourth category as they were not considered to have ended while in need of family planning. (Note that these categories should be

interpreted as approximate as self-reported reasons for contraceptive discontinuation may be somewhat unreliable [22].)

A number of episode-specific and woman-specific variables were included in the model as potential compounding factors, including contraceptive intention and duration of use as well as woman's age, marital status, number of living children, education, ethnicity, place of residence (according to the residential history in the calendar), and mass media exposure (as assessed through television viewing habits). These covariates have been considered in previous studies as relevant to the assessment of influences on contraceptive use, method choice and/or discontinuation in Brazil and elsewhere in the developing world (see, for example [6-8,19,22-23]. Moreover, in the Brazilian context, particular attention is paid to differentials across sub-regions (Figure 2).

Of further substantive and methodological interest, our study uses a multilevel approach. Standard regression models assume that observations are independent. However, given the hierarchically nested structure of the data being used here, multilevel modeling becomes necessary to allow for controlling for any unobserved correlation between observations within hierarchical levels. At the first level, in modeling women's episodes of contraceptive use, an individual may contribute more than one segment of use to the sample. At the second level, the DHS sampling scheme entails selection of households and individuals within enumeration clusters [24]. Individuals from the same sampling cluster are considered likely to exhibit similar demographic and behavioural characteristics (because of a variety of unmeasured and unmeasurable factors) compared to those selected from different clusters. The multilevel model is thus used to compensate for assumed intra-woman and intra-cluster dependence of observations. Moreover, a cluster can be considered a proxy for

neighbourhood or community, and reflects local service environment as well as local "culture". It has been argued that women in the same community often talk to each other and, therefore, are more likely to exhibit similar behaviours regarding contraceptive use [25].

The multilevel discrete-time competing risks model is used to assess regional disparities in contraceptive failure, abandonment and switching, conditioned for the set of fixed- and random-effects. The formulation of the model is as follows:

$$\ln\left(\frac{\lambda_{rtijk}}{\lambda_{4rtijk}}\right) = \alpha_{rt} + \beta_r' x_{ijk} + u_{rjk} + v_{rk}, \quad r = 1, 2, 3$$

where  $\lambda_{rtijk}$  is referred to as the hazard of a transition of type  $r$  at time  $t$  for the use interval  $i$  of woman  $j$  from cluster  $k$ . The baseline hazard is represented by  $\alpha_{rt}$ , a function of time.  $\beta_r$  is the vector of parameters for transition  $r$ , with  $x_{ijk}$  the associated set of covariates (the same for each of the three types of contrasts against continuation of method use). The estimators  $u_{rjk}$  and  $v_{rk}$  measure the random variations at the woman and cluster levels respectively. They are assumed to be mutually independent and normally distributed with mean zero and variances  $\sigma_{rjk}^2$  and  $\sigma_{rk}^2$  respectively.

The final sample for the study consisted of 6,027 episodes of contraceptive use. The analysis was carried out using the *MLwiN* statistical software program [26]. In order to facilitate interpretation, the results from the multilevel competing risk hazard model were applied to estimate twelve-month cumulative probabilities of contraceptive discontinuation, using the multiple classification analysis (MCA) table [27]. First, conditional probabilities of method discontinuation were calculated for each month. In order to calculate the effect of a specific covariate on the cumulative probability, the others were held at their mean.

## Results

### *Descriptive analysis*

As seen in [Table 1](#), findings from the Brazil DHS characterize a population that, in comparison with much of the developing world, is essentially urban (82 per cent), relatively educated (62 per cent with at least some secondary schooling), and highly exposed to modern mass media communication (89 per cent watching television on a weekly basis). Considering these same variables as indicators of higher development status, it may be ascertained that the Southeast and South regions are the most developed regions of the country while the Northeast is the least developed.

At the time of the survey, 55 per cent of all women of reproductive age, and 77 per cent of married women, were currently using some method of family planning. Of these, over half were relying on either female or male sterilization ([Table 2](#)). Among users of reversible methods, the majority were adopters of oral contraceptives followed by condoms. The same general pattern in terms of the method mix was observed across all regions, except with a higher reliance on sterilization in the Northeast versus relatively greater use of orals in the Southeast and especially the South.

Contraceptive discontinuation rates among the most common reversible methods by self-reported reason for discontinuation are presented for the national level in [Table 3](#). Preliminary analysis of findings from the calendar reveals an overall discontinuation rate of 43 per cent for the five-year period before the survey. The rate was lowest for users of orals and highest for users of injections. Fewer than 4 per cent of women cited a desire to become

pregnant as the reason for having ended an episode of use. Not surprisingly, failure rates were higher with respect to traditional methods (periodic abstinence and withdrawal), while concerns over side effects were more widely reported among users of modern hormonal methods (injections and orals).

### ***Results from the competing risks hazard model***

Cumulative probabilities of contraceptive failure, abandonment, and switching according to selected episode- and woman-level variables are presented in [Table 4](#). These twelve-month cumulative probabilities are derived from the estimated coefficients from the multilevel discrete-time competing risks hazard model, which can be found in [Annex](#).

As expected, the probability of failure was highest for episodes of use of traditional methods (0.23). Probabilities of abandonment (presumably while in need of family planning) and of method switching were highest for injections. In contrast, the probability of continuation was highest for the pill (0.64), the most widely used reversible method overall. Continuation was also high for condoms, albeit at a lower measure than for the pill.

After controlling for the method type and other potentially confounding factors, the probabilities of failure, abandonment and switching were each higher for episodes of use among women in the Northeast region compared to those in the Southeast and the South, a pattern that was statistically significant ( $p < 0.05$ ).

The probability of failure was essentially inversely associated with the woman's age at the start of the episode of use, as well as with her educational attainment. Abandonment was more likely among adolescents (19 years and under) as well as older users (30 years and

over) compared to users in their twenties. Abandonment was positively correlated with the number of living children at the start of the episode, and inversely associated with educational attainment. Method switching was more common among married users than their unmarried counterparts, all else being equal.

No discernible differences were found according to urban/rural residence (see [Annex Table](#)), a result consistent with analytical findings for contraceptive discontinuation from certain other countries (see, for example [28]). At the same time, significant cluster-level random variations were found with respect to contraceptive switching, pointing to additional unmeasured contextual influences that may increase or decrease the probability of a woman changing her method of choice. Such effects may be related to, for example, peer influences or proximity of service delivery points for family planning services and reproductive health care.

## **Discussion**

Over 90 per cent of governments around the world provide either direct or indirect support for contraceptive methods, including that of Brazil [29]. While Brazil does not have an official family planning program, certain related services have been incorporated into the national maternal and child health program, in recognition of the right of individuals and couples to access family planning and reproductive health information and supplies. It is being increasingly recognized that measures for the monitoring and evaluation of family planning service efforts need to go beyond their impact on fertility. In countries where contraceptive prevalence is relatively high, services aiming to reduce the number of unintended pregnancies must pay special interest to the needs of current contraceptive users.

Increased attention to quality of care has heightened attention on outcomes that might be associated with the quality of family planning services, notably contraceptive discontinuation and switching [11].

This paper examined regional patterns of contraceptive discontinuation, failure and switching for reversible methods in Brazil, drawing on data from the DHS calendar. Given both the larger size of the Brazilian survey sample (at over 12,000 women), as well as the relatively high overall contraceptive prevalence rate, the study offered a valuable opportunity for monitoring of patterns in discontinuation and switching at the sub-national level. In the analysis of discontinuation, particular attention was paid to the reasons for stopping use, differentiating method failure (i.e. presumed unintentional pregnancy) from abandonment while in need for family planning. Multilevel competing risks hazard models served to assess the random- and fixed-effects on contraceptive dynamics.

Overall, the twelve-month cumulative probability of continuation was found to be highest for oral contraceptives, the most commonly used reversible method among women of reproductive age. Somewhat encouragingly in the face of the HIV/AIDS epidemic, continuation was also high for condoms, albeit at a lower measure than for the pill. As could be expected, the probability of failure was highest with respect to traditional methods. Greater likelihoods of abandonment and switching were found for injections compared to other modern and traditional methods, echoing research results from a number of Latin American countries and reinforcing suggestions that family planning service managers examine more closely the delivery of injectables [11].

After controlling for episode- and individual-specific factors, the probabilities of contraceptive failure, abandonment and switching were each found to be significantly higher in the Northeast compared to the more developed Southeast and South, pointing to seemingly important disparities in the availability and quality of family planning and reproductive health care services across regions of the country.

Moreover, failure for all methods combined was highest among adolescent and less educated users, likely related to higher rates of user error. Research elsewhere on Brazil and other Latin American countries has also reported that women of lower educational attainment, a characteristic considered as proxy for socio-economic status, were less likely to adopt sterilization for contraceptive purposes [30]. Such patterns could partially be a reflection of poor outreach and follow-up of family planning services towards disadvantaged social groups.

An important venue for further research would thus be to examine, for example, effects of the proximity and quality of local service delivery points. As such, one potential future approach could be to merge independently collected data on municipal-level variables for availability and accessibility of health care resources with the DHS individual data.

Many previous studies of contraceptive discontinuation and/or switching have focused only on reports from married women (e.g. [6,11,12,22]). Often this was due to the nature of the available data, as some DHS countries limited sample coverage to ever-married women. The present analysis took advantage of available calendar data for all women of reproductive age, in a context of widespread sexual activity and contraceptive use regardless of marital status. While little appreciable effect was found of marital status on the probability of contraceptive abandonment, curiously, method switching was significantly less common among users who

were not married at the start of the episode of use compared to those who were married. Such findings point to the need for further research on contraceptive use dynamics among unmarried women, a group that has tended to be neglected in earlier investigations.

One limitation to this analysis may have been a failure to adequately address the issue of the potential endogeneity of contraceptive method choice in the discontinuation process. A recent study using multiprocess models showed that method choice was endogenous in the case of contraceptive abandonment, at least according to an application for the effect of choice of IUD and implants over the pill and injections in Indonesia [22]. The potential consequences of endogeneity on discontinuation and switching remain uncertain in the context of Brazil, where the use of reversible clinical methods is nonetheless very low, suggesting an interesting path for future study.

## **Competing interests**

The authors have no competing interests to declare.

## **Authors' contributions**

Both authors contributed to the study design. IC Leite performed the data manipulation and statistical programming. Both authors contributed to the data analysis as well as drafting of the manuscript, and have read and approved the final version.

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## Tables

**Table 1: Percentage distribution of women aged 15-49 according to selected background characteristics, by region, Brazil, 1996.**

	North	Northeast	Southeast	South	Centre-West	National
<b>Age group</b>						
15-19	23	21	19	17	17	20
20-24	18	17	14	13	16	15
25-29	15	16	15	15	18	15
30-34	14	14	16	16	15	15
35-39	13	13	14	15	14	14
40-44	11	10	12	14	11	12
45-49	6	9	10	10	9	9
<b>Marital status</b>						
Married/living together	55	58	60	66	63	60
Not in union	45	42	40	34	37	40
<b>Number of children</b>						
0	34	35	34	30	29	33
1	15	13	17	19	15	16
2	15	15	20	23	22	19
3+	36	37	29	28	34	32
<b>Ethnicity</b>						
White	18	26	49	68	42	44
Other	82	74	51	32	58	56
<b>Educational attainment</b>						
No schooling	4	10	3	3	7	5
Primary	27	39	30	31	32	33
Secondary	64	47	59	58	54	55
Higher	5	4	8	8	7	7
<b>Mass media exposure</b>						
Watches TV regularly (every week)	89	81	92	92	87	89
Does not watch TV	11	19	8	8	13	11
<b>Place of residence</b>						
Rural	3	30	11	23	16	18
Urban	97	70	89	77	84	82
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>

Source: Demographic and Health Survey (N=12,612 women, rural areas of the North and Centre-West regions excluded from sampling frame).

Note: Characteristics refer to those reported at the time of the survey.

**Table 2: Contraceptive method mix, by region, Brazil, 1996 DHS.**

	North	Northeast	Southeast	South	Centre-West	National
Female sterilization	65	63	45	33	66	49
Pill	15	18	30	44	22	28
Condoms	8	6	9	8	4	8
Male sterilization	0	1	5	3	2	3
Injections	6	2	2	1	1	2
Other modern	0	1	2	2	1	2
Withdrawal	2	4	4	5	2	4
Periodic abstinence	3	4	3	4	2	4
Folk methods	1	1	0	0	0	0
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>

**Table 3: Contraceptive discontinuation rates, by reason for discontinuation,  
Brazil, 1996 DHS.**

<b>Reason for discontinuation</b>	<b>Contraceptive method</b>					<b>Total</b>
	Pill	Condoms	Injections	Periodic abstinence	Withdrawal	
Method failure	4.8	5.1	4.7	17.0	15.7	5.9
To become pregnant	5.0	3.7	4.5	2.9	4.3	3.7
Side effects, health	11.8	3.6	27.4	1.5	0.6	7.7
All other reasons	23.3	47.7	27.1	35.8	41.6	26.1
<b>All reasons</b>	<b>44.8</b>	<b>60.0</b>	<b>63.7</b>	<b>57.1</b>	<b>62.2</b>	<b>43.4</b>

Source: ORC Macro, 2004.

Note: Rates based on 5 years of calendar data and represent the proportion of users discontinuing a method within 12 months after the start of use.

**Table 4: Twelve-month cumulative probabilities of contraceptive failure, abandonment and switching according to selected episode-level and woman-level variables.**

	<b>Failure</b>	<b>Abandonment</b>	<b>Switching</b>	<b>Continuation</b>
<b>Method</b>				
Pill	0.0647	0.1341	0.1607	0.6404
Condoms	0.0910	0.0750	0.3761	0.4578
Injections	0.0702	0.1694	0.3881	0.3722
Traditional methods	0.2272	0.0373	0.2962	0.4394
<b>Contraceptive intention</b>				
Spacing	0.0724	0.0912	0.2364	0.6000
Limiting	0.0979	0.1123	0.2020	0.5877
<b>Region</b>				
North	0.0661	0.1696	0.2293	0.5349
Northeast	0.0965	0.1642	0.2764	0.4628
Southeast	0.0868	0.0782	0.2129	0.6221
South	0.0721	0.0536	0.1428	0.7314
Center-West	0.0901	0.1014	0.1724	0.6360
<b>Age</b>				
≤ 19	0.1112	0.1129	0.2270	0.5489
20-24	0.1006	0.0923	0.2067	0.6004
25-29	0.0802	0.0869	0.2230	0.6100
30-34	0.0843	0.1204	0.2283	0.5694
35+	0.0449	0.1476	0.1822	0.6253
<b>Marital status</b>				
Married/living together	0.0957	0.1027	0.2273	0.5743
Other	0.0650	0.1049	0.1831	0.6471
<b>N° of living children</b>				
0	0.0928	0.1352	0.2464	0.5255
1	0.0755	0.1023	0.2235	0.5987
2	0.0847	0.0911	0.1956	0.6286
3+	0.1075	0.0782	0.1771	0.6372
<b>Ethnicity</b>				
White	0.0767	0.0951	0.2494	0.5789
Other	0.0960	0.1106	0.1902	0.6032
<b>Years of schooling</b>				
0-3	0.1022	0.1644	0.1772	0.5562
4-8	0.0951	0.1144	0.2208	0.5696
9-11	0.0742	0.0774	0.2177	0.6308
12+	0.0587	0.0549	0.2550	0.6314
<b>Mass media exposure</b>				
Watches TV regularly	0.0865	0.0985	0.2214	0.5937
Does not watch TV	0.0895	0.1820	0.1527	0.5757
<b>Global</b>	0.0869	0.1034	0.2155	0.5942

Source: 1996 Demographic and Health Survey (N = 6027 episodes of use).

Note: Episodes of use of reversible contraceptive methods that began before the five-year calendar period or of sterilization use are not included.

## Figure captions

Figure 1: Total and wanted fertility rates, Brazil Demographic and Health Surveys, 1986 and 1996.

Figure 2: Map of Brazil and its regions.

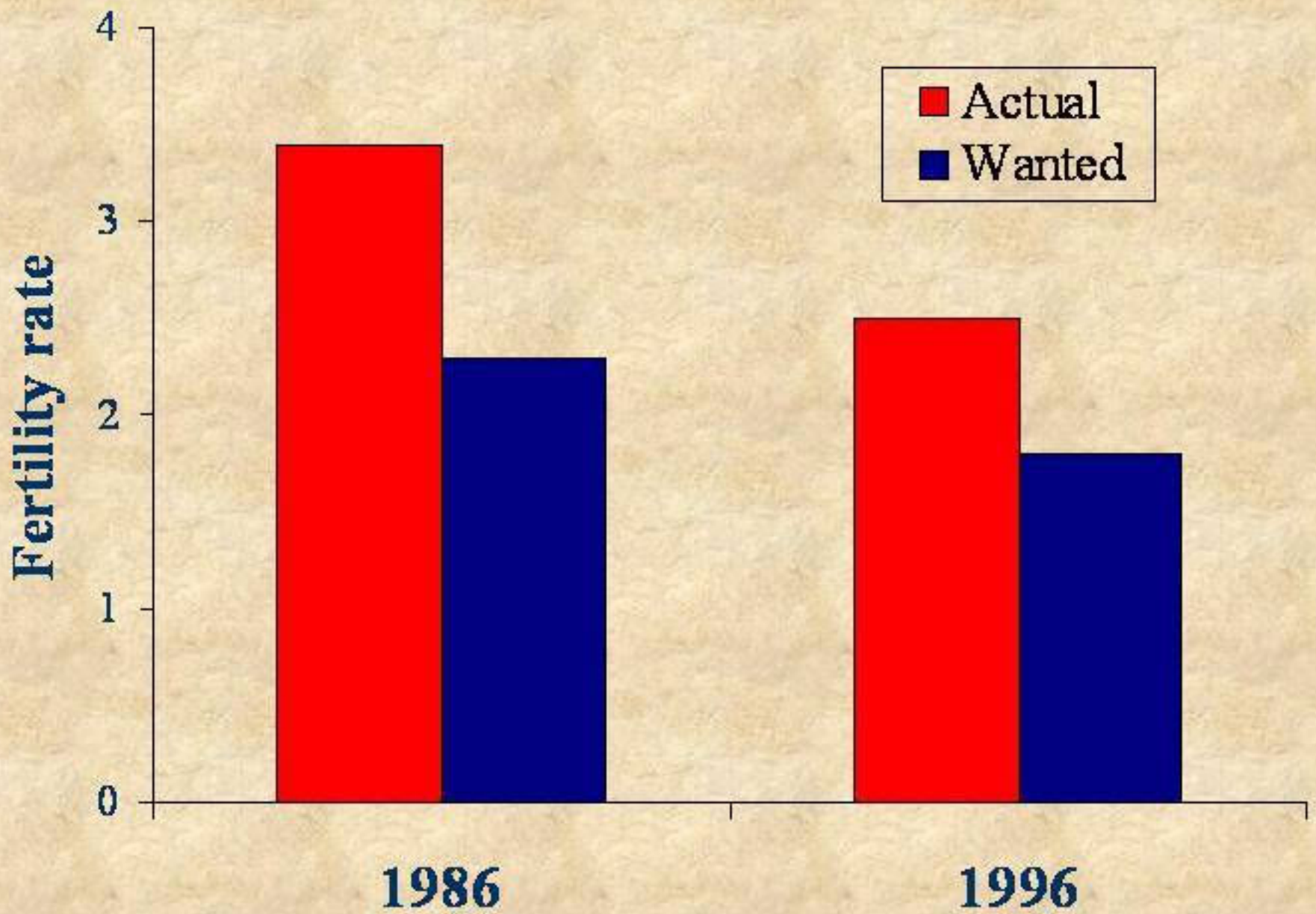


Figure 1



Figure 2

**Additional files provided with this submission:**

Additional file 1 : Annex Table.pdf : 95Kb

<http://www.reproductive-health-journal.com/imedia/1591076113845666/sup1.PDF>