DETERMINANTS OF DISCONTINUATION, FAILURE AND SWITCHING OF ORAL CONTRACEPTIVES IN BRAZIL: AN EXPLORATORY ANALYSIS

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Abstract

Contraceptive prevalence is relatively high among Brazilian women, with orals the most popular reversible method. However important differentials persist across regions and social groups in reproductive outcomes. This study examined the factors associated with discontinuation, failure and switching of orals in Brazil, aiming to increase the evidence base on contraceptive use dynamics in a context of wide socio-economic disparities. Data were drawn from the 1996 Demographic and Health Survey, notably the calendar module of reproductive events. Multilevel competing risks hazard models were used to estimate the effects on the probability of a woman making a specific transition at a given duration of use. Results showed lower risks of contraceptive failure and of switching to no method associated with certain characteristics, in particular woman's age, education and media exposure, presumably related to increased motivation for fertility control. Moreover the risk of switching from orals to condoms, of great interest in the era of HIV/AIDS, increased with level of education. Expanding access to a range of contraceptive methods, improving knowledge among health agents of contraceptive technologies and increasing medical supervision of contraceptive practise may be considered key to expanding quality reproductive health care services for all.

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Introduction

The 1960s saw the start of a sustained process of fertility decline in Latin America. In Brazil in particular, the total fertility rate (TFR) has already reached a level considered as low as that of many developed countries: 2.5 children per woman in 1996.[1] Although fertility decline in Brazil has become rather generalized, there remain important differences across sub-regions and social groups in relation to the stage and pace of this process. In particular, evidence from the Demographic and Health Surveys (DHS) suggests that fertility is appreciably higher in the country's poverty-stricken Northeast region, and that the contribution of adolescent fertility (among 15 to 19 year-olds) to the TFR is increasing over time.[2]

The widespread use of contraception has been attributed as the most important proximate determinant of Brazil's overall fertility decline. However, high levels of prevalence alone do not necessarily result in low levels of fertility. The contraceptive method mix undoubtedly plays an important role in the process of fertility decline. According to the 1996 Brazil DHS, the most commonly used method is female sterilization, a long-term and highly effective method, relied upon by 27% of women of reproductive age. The second most popular method is oral contraceptives, used by 16% of women. (Use of all other reversible methods combined stands at about 10%.) Strong regional differences in the mix are observed, notably in terms of a higher reliance on sterilization in the Northeast versus greater use of orals in the more prosperous Southeast and South regions. Orals are also the most commonly used method

among sexually experienced adolescents (27%).

Despite relatively high overall levels of modern contraceptive use, there appears to remain a large unmet need for family planning, particularly among the more vulnerable segments of society. It is estimated 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.[3] Brazil does not have an official family planning program, although in recent years some family planning-related services have been incorporated into the country's maternal and child health program. Important constraints have been disclosed in the availability of and access to family planning and reproductive health services for women, as well as severe deficiencies in quality of care.[4]

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

Contraceptive failure, discontinuation 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.[6] The impact of

contraceptive discontinuation depends on the woman's decision whether 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 a woman having an unintended pregnancy and, therefore, is likely to lead to an overall increase in the level of fertility. Switching between methods of similar effectiveness may be of lesser concern from a demographic perspective, 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 method they started using.

In Brazil, DHS data have pointed to a contraceptive discontinuation rate of 43% for the five-year period before the survey. Moreover, the twelve-month cumulative rate of abandonment, or stopping use of a method while (presumably) still in need of family planning, has been found to be higher for episodes of use of orals compared to condoms or traditional methods.[7] Discontinuation and switching patterns for orals hold particular interest given that over 50% of all episodes of contraceptive use in the period 1991-96 were for this method.

The objective of this study is to analyze the factors associated with discontinuation and switching of the most commonly used reversible method among Brazilian women, that is, oral contraceptives. As such, the paper aims at contributing to the increasing evidence base on contraceptive use dynamics, notably in a context of rapid fertility decline and wide socio-economic disparities. Special attention is drawn to analyzing the social determinants of method failure and switching, in order to identify any potential disparities in outcomes that might be associated with the quality of family planning and reproductive health care services.

Data and methods

Data for this research are drawn from the most recent DHS in Brazil, the 1996 *Pesquisa Nacional sobre Demografia e Saúde*. The DHS is one of the largest programs collecting quantitative data on population, health and nutrition in the developing world. Surveys are carried out using standardized instruments, methods of training, data collection, and data processing.[8] The 1996 Brazilian survey collected information through personal interviews with 12,612 women ages 15-49, selected through a two-stage random sampling process designed to obtain representative results at the national and regional levels.[9]

In addition to core questions for measuring basic indicators for population and health program monitoring and evaluation, some DHS 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. A relatively less-exploited module, the calendar has become increasingly important in monitoring contraceptive dynamics and has greatly facilitated researchers' capabilities to conduct analyses of discontinuation, failure and switching in particular.[10]

The calendar collects exceptionally detailed information (i.e. month-by-month) about the timing of a number of events – including marital unions, births, contraceptive use and residential mobility – occurring in the five full calendar years preceding the survey. For each episode of contraceptive use, the type of method, the dates of starting and ending of use, and the reason for discontinuation of use are recorded. 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.[11,12]

In examining the patterns of failure, discontinuation and switching of oral contraceptives, seven categories were created for the response variable. The first is contraceptive failure, which includes any (presumably unintentional) occurrence of a pregnancy while using the method. The next five categories consider each the choice of a specific method adopted after discontinuation, including abandonment of the method while still in need of family planning: injection, sterilization, condoms, traditional methods and no method. The latter category was created among episodes of use by the end of the follow-up period. (We did not take into account transitions to IUD, diaphragm, spermicide or other folk methods because of the very small number of cases.) Lastly, episodes where women reported having discontinued use for non-method-related reasons, such as a desire to get pregnant, marital separation or infrequent sexual intercourse, were treated as right-censored, as they were not considered to have ended while in need of family planning and there was little reason to believe they would not having continued using the same contraceptive method. Note that these categories should be interpreted as approximate as self-reported reasons for contraceptive discontinuation may be somewhat unreliable.[13]

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.[14] Likewise excluded are episodes of use that began before the calendar period, as the date of initiation would not have been recorded. A small number of cases whereby a woman reported having discontinued use more than 20 times over the course of the calendar are also excluded. The final sample was composed of 6,117 episodes of use, of which 3,466 episodes were for oral contraceptives.

In order to simultaneously assess the effects of selected socio-demographic factors we used a competing risks hazards model. This was done by implementing a Cox proportional hazards model treating events other than those of immediate interest as censored. Moreover, in modeling women's episodes of contraceptive use, an individual may contribute more than one episode of use to the sample. Thus the classic statistical assumption of independence across observations may be violated. To overcome this problem, our study takes into account the multilevel structure of the dataset by including in the model a random effects estimator with gamma distribution.[15] The parameters were estimated using the *R* statistical software package (version 2.0.1).[16]

A number of episode-specific and woman-specific variables were included as potential compounding factors. These comprise key variables identified in the literature as likely to be influential on contraceptive use dynamics in Brazil and other developing countries: contraceptive intention as well as woman's age, marital status, number of living children, education, ethnicity, urban/rural residence, region of residence, and mass media exposure.[17,18,19,20,21] With regard to the effect of contraceptive intention on switching from orals to sterilization, because of the permanent nature of the latter method we assume that all episodes of use among sterilized women are for family size limiting purposes.

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%), relatively educated (62% with at least some secondary schooling), and highly exposed to modern mass media communication (89% watching television on a weekly basis). The country's most populous region is the Southeast (42%), which includes the metropolitan areas of São Paulo and Rio de Janeiro, followed by the nine states that comprise the Northeast region (28%).

[Insert Table 1 about here]

At the time of the survey, 55% of all women of reproductive age were currently using some method of family planning. Of these, nearly half (49%) were relying on female sterilization (Figure 1). Among users of reversible methods, the majority were adopters of oral

contraceptives followed by condoms. Certain regional differences could be observed in the contraceptive method mix, notably a higher reliance on sterilization in the North and Northeast regions compared to greater use of orals in the Southeast and especially the South.

[Insert Figure 1 about here]

Twelve-month cumulative rates of contraceptive discontinuation among the most commonly used reversible methods by status after discontinuation, that is, the gross rates calculated by the Kaplan-Meier single-decrement life-table technique, are presented in Table 2. This preliminary analysis of calendar data reveals an overall discontinuation rate of 46% for the five-year period prior to the survey. The rate was lowest for users of orals and highest for users of injections. Not surprisingly, failure rates were higher with respect to traditional methods (periodic abstinence and withdrawal). Although users of oral contraceptives presented the lowest rate of failure, their rate of switching to no method was almost of same magnitude as condom users.

[Insert Table 2 about here]

Results from the competing risks hazard model

Table 3 presents the estimated coefficients from the Cox hazard model and their respective level of statistical significance for all variables assumed to be associated with contraceptive failure and switching among users of oral contraceptives. In particular, the coefficients of the categorical variables indicate the relative increase or decrease in a woman's risk of experiencing a failure or a specific type of switching compared with the risk among her counterpart in the reference category, where other events than the one of interest are competing risks. For continuous variables, the coefficients show differences in the relative risk associated

with a one-unit increase in the variable scale.

[Insert Table 3 about here]

A number of covariates present discernible associations with contraceptive failure, when all risk factors are estimated simultaneously. For one, the risk of (unintended) pregnancy while using orals is found to be significantly lower for episodes of use among women using the method for limiting versus spacing purposes. The hazard of contraceptive failure is found to have an inverse relationship with woman's age at the beginning of the episode of use. The higher the woman's age, the lower the risk of contraceptive failure. One explanation could be a probable increase in women's motivation for fertility regulation over the course of the reproductive life cycle, as age increases. A decline in fecundity could be another possible reason for lower risk of failure among older women. An inverse effect is also found with regard to educational attainment, with a hazard of 23% and 56% lower for a woman with 4 to 8 years of schooling and 9 or more years respectively, compared with her counterpart with less than 4 years of schooling. Conversely, a direct effect is observed between the number of living children and contraceptive failure. A lower risk of pregnancy while using orals among white women could be related to higher socio-economic status. Somewhat unexpectedly, the risk is significantly higher (52%) among women from urban areas. No independent association is noted in terms of the region where the woman lives, and this despite the immense social, cultural and economic regional differentials that characterize Brazil.[22]

Regarding contraceptive switching, the results show similar risks for episodes of use occurring among women living in the North and Northeast regions, the poorest two of the country,

except for switching to injectables for which the risk is much higher in the North. The lowest risk of switching from orals to sterilization is observed among women living in the South, the only region where sterilization is not the most prevalent method. (At the same time, it is important to note that only a few cases of switching to sterilization were observed. In Brazil, most sterilization operations are performed in conjunction with a caesarean delivery, meaning that contraceptive use would have first had to be discontinued altogether.)

A woman's age is found to be positively associated with the risk of switching from orals to condoms and to traditional methods. This suggests that some older women may elect to stop using the pill because of perceived potential health risks of long-term use and choose a non-hormonal method instead. The risk of switching to condoms also increases with higher levels of schooling (9 or more years), perhaps further related to heightened appreciation of this barrier method for dual prevention of pregnancy and sexually transmitted infections including HIV/AIDS. Married women are found more likely to switch from orals to sterilization and to traditional methods than their unmarried counterparts. As such, marriage could be a source of both greater motivation for family size limitation (in choosing sterilization) and lower motivation (in choosing a less effective traditional method). Place of residence appears to have an effect only on the risk of switching to a traditional method.

Episodes of use of orals are associated with lower risk of abandonment, or switching to no method, among women practising contraception for family size limiting purposes, as this would place them at greater exposure to unintended pregnancy. Likewise, the greater the number of years of schooling, the lower the risk of a woman's switching from orals to no

method. Married women are found to be less likely to stop using altogether, while older woman present a higher risk of switching to no method. Women who report watching television at least once a week are less likely to stop using altogether, possibly related to greater motivation for fertility control. Television programming in Brazil, particularly the highly popular soap operas (*telenovelas*), has been credited with playing a substantial role in promoting ideological change with respect to reproductive behaviours by portraying lifestyles that favour smaller families.[23] Finally, compared to women in the North and Northeast, those in all other regions of the country present a lower risk of switching to no method, all else being equal.

Discussion

This exploratory study examined the socio-economic and demographic influences of contraceptive discontinuation, failure and switching in a context of rapid and profound changes in fertility outcomes. Data were drawn from the nationally representative 1996 Brazil Demographic and Health Survey, notably the "calendar" module of reproductive events. The calendar presented a number of advantages in evaluating contraceptive use dynamics. The collection of detailed histories over the five years prior to interview of women's contraceptive use, marital unions, live births and residential mobility allowed transitions to be dated and a sound methodological approach for retrospective analyses to be developed. Our main interest was to describe the patterns and explain the independent determinants of discontinuation, failure and switching of oral contraceptives among women at risk across regions and social groups.

Oral contraceptives are the most important reversible method in the country, relied upon by 27% of women ages 15 to 49 and accounting for more than half of all episodes of contraceptive method use between 1991 and 1996. For one, the contraceptive continuation (or discontinuation) rate has been suggested as a useful summary measure of the effectiveness of program services in facilitating clients to sustain contraceptive use.[24] Preliminary analysis showed that the discontinuation rate was lower for episodes of pill use compared to other reversible methods (injections, condoms and traditional methods). Method failure rates were also lower among pill users. However, the rate of abandonment, that is, stopping contraceptive use altogether, was similar in magnitude as that for condoms and much higher than that for traditional methods.

Using a Cox proportional hazards model to simultaneously assess the effects of a number of covariates on the dynamics of oral contraceptive use, our analysis showed little regional differences in terms of contraceptive failure among users of oral contraceptives. This pattern was observed despite the large socio-economic differentials across regions of the country, and in contrast to the results of a previous study that found a significantly higher probability of contraceptive failure, as well as of abandonment and switching, in the Northeast region compared to the Southeast among all reversible methods combined.[25]

On the other hand, among the expected results of the study were a lower risk of failure with woman's age, level of education and white ethnic background (itself associated with higher socio-economic status), characteristics presumably related to increased motivation for fertility

control and, in turn, lower rates of user error. Likewise, the risk of contraceptive abandonment, or switching to no method, was lower among women who were better educated, from the prosperous South region, or highly exposed to the mass media. Moreover, the risk of switching from orals to condoms increased with the woman's level of education.

Brazil is a country with no official national family planning program and a contraceptive method mix skewed towards female sterilization and the pill. Oral contraceptives are widely available at relatively low cost, especially at pharmacies which is the main source for this method and often without a prescription. A lack of medical control for dispensing of the pill may be behind the higher hazard of switching from orals to non-hormonal methods particularly among older and more educated women, who may perceive negative health risks from long term use of this method. While no modern method of contraception is completely free of adverse health consequences, this aspect is especially noteworthy since beneficial effects of hormonal methods have been well documented in the literature—including decreased risks of iron deficiency anaemia, pelvic inflammatory disease, and endometrial and ovarian cancer among users of orals—but tend to be less well known and even downplayed by health officials in many countries.[26] As the Brazilian government moves forward with its family health program widening access to the health system and shifting the focus toward preventive health care, improving knowledge among health agents of contraceptive technologies and increasing medical supervision of contraceptive practise may be considered an integral part of expanding quality reproductive health care services.

Certain limitations to the present analysis should be acknowledged. In particular, lacking from

the data source was information on transitions in fertility preferences and demand for family planning. A lack of information on health system variables including services availability was also a constraint. While some additional analyses were conducted merging independently compiled information obtained from the *Instituto Brasileiro de Geografia e Estatistica* (Brazilian Institute of Geography and Statistics) on health and social development at the municipal level, notably the Human Development Index,[27] the results proved inconclusive and as such were not presented here. Given the composite nature of the HDI, taking into account variables such as life expectancy which are unlikely to change significantly over short spatial/temporal intervals, this may have been an inadequate proxy for the local development context.

It should also be noted that ideally the present analysis would have used a three-level multilevel procedure, with random effects estimators not just at the woman level but also at the sampling cluster and municipal levels. In particular, individuals selected from the same cluster or municipality are expected to show a pattern of behaviour that is more alike compared to those selected from different clusters or municipalities (due to a variety of unmeasured and unmeasurable factors). However, this model failed to converge. It is thus possible that the results will have underestimated the random effects, so should be interpreted carefully. Also failing to converge was a model incorporating a proxy variable for access to modern health care services—a cluster-level aggregate of the proportion of women having received antenatal care from a skilled health professional for their last birth in the last five years—likely related to the small number of observations per geographic aggregation.

Another 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. One 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 orals and injections in Indonesia.[28] 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.

TABLES AND FIGURES

Table 1: Percentage distribution of women ages 15-49 by selected background characteristics, Brazil, 1996.

Age group	
15-19	20
20-24	15
25-29	15
30-34	15
35-39	14
40-44	12
45-49	9
Marital status	
Married/living together	60
Not in union	40
Number of living children	
0	34
1	17
2	20
3+	29
Ethnicity	
White	42
Other	58
Educational attainment	
No schooling	5
Primary	33
Secondary	55
Higher	7
Mass media exposure	
Watches TV regularly (every week)	89
Does not watch TV	11
Place of residence	
Rural	18
Urban	82
Region	
North	5
Northeast	28
Southeast	42
South	17
Center-West	8

Source: Demographic and Health Survey (*N=12,612 women).*
Note: Characteristics refer to those reported at the time of the survey.

Table 2: Twelve-month cumulative probability of contraceptive discontinuation by method type and status after discontinuation, Brazil, 1996.

Method type	Failure	Switching	No method	Total[†]
Orals	0.067	0.167	0.222	0.400
Injections	0.084	0.334	0.281	0.571
Condoms	0.097	0.346	0.230	0.554
Traditional methods	0.251	0.332	0.082	0.548
Total	**0.106**	**0.236**	**0.205**	**0.464**

Source: Demographic and Health Survey.
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.
[†] Non-method-related reasons—including desire to get pregnant, marital separation, hysterectomy or infrequent sexual intercourse—were treated as right censored.

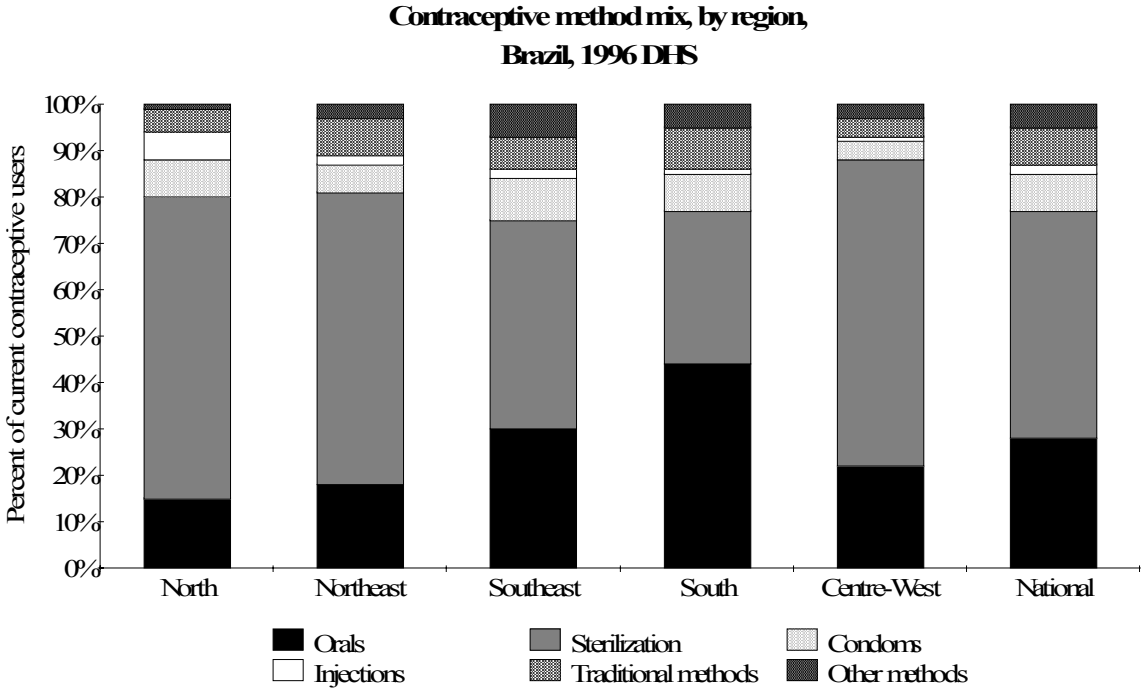
Table 3: Coefficients from the Cox proportional hazards model according to type of transition experienced for episodes of oral contraceptive use, Brazil Demographic and Health Survey, 1996.

Characteristic	Failure *(N=275)*	Injections *(N=76)*	Sterilization *(N=53)*	Condoms *(N=202)*	Traditional *(N=215)*	No method *(N=891)*
Contraceptive intention						
Spacing	0.0000	0.0000	n/a	0.0000	0.0000	0.0000
Limiting	-0.3492**	-0.1978	n/a	0.2514	-0.0830	-0.2017**
Woman's age	-0.0564**	0.0274	0.0343	0.0424**	0.0621**	0.0376**
Marital status						
Married	0.0051	-0.0822	0.8141*	-0.0721	0.4149**	-0.5444**
Not in union	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Number of living children	0.2566**	-0.1817	0.2240**	-0.2868**	-0.1388**	-0.0854**
Ethnicity						
White	-0.3809**	0.2786	-0.2936	0.0580	0.8477**	-0.0381
Other	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Years of schooling						
0-3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4-8	-0.2658*	1.1886**	0.1559	0.3233	0.4589**	-0.2127**
9+	-0.8090**	0.7503	0.2210	0.6324**	0.6530**	-0.5518**
Watches TV regularly						
Yes	-0.0309	0.7906	17.3657	0.3890	0.4577	-0.3594**
No	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Place of residence						
Rural	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Urban	0.4167**	0.1095	-0.0134	0.1467	-1.0803**	-0.0671
Region of residence						
North	-0.1372	1.1584**	-1.1668	0.2496	-0.5770	0.1654
Northeast	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Centre-West	0.0739	0.0947	-0.9745*	-0.3836	-0.8930**	-0.4850**
Southeast	0.0426	-0.3378	-0.6015*	-0.0876	-0.2758	-0.5592**
South	-0.0224	-1.2066**	-1.7763**	-1.0107**	-0.5944**	-0.7245**

* $p<0.05$; ** $p<0.10$

Notes: Episodes of use of contraceptive methods that began before the five-year calendar period are not included. Transitions to sterilization assumed to be for family size limiting purposes.

Figure 1:


Contraceptive method mix, by region,
Brazil, 1996 DHS
Percent of current contraceptive users
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
North
Northeast
Southeast
South
Centre-West
National
Orals
Injections
Sterilization
Traditional methods
Condoms
Other methods

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