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Adolescent Reproductive Behaviour in Northeast Brazil: Trends and Differentials

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Abstract

This dissertation addresses trends and differentials in reproductive behaviour among adolescent women in the Northeast region of Brazil. The issue, once relatively less explored, has been commanding increasing attention in demographic research. Recently observed fertility patterns among teenagers seemed to contradict expected norms: while fertility decline has been consistently observed in the past two decades among women in the central age groups of their reproductive years, among adolescents fertility levels have been increasing. The need for a better understanding of this phenomenon is evident, as early childbearing can be linked to higher rates of maternal and child morbidity and mortality, truncated educational opportunities, and lower future family income levels.

Our goal is to explore the relationships between the main proximate determinants of fertility and socio-demographic and cultural characteristics of adolescents in a context of rapid fertility decline. Fortunately, our ability to conduct quality analyses of this question has been vastly improved in recent years, in particular thanks to a multitude of data collected from demographic and health surveys in Brazil and the Northeast region, enabling researchers to better evaluate the impact of such factors with the aid of empirical evidence. Our investigation draws on multivariate logistic hazard regression models and is guided by a framework for evaluating factors related to both individuals and their environment believed important in shaping attitudes and influencing personal choice in matters of reproductive behaviour.

Women's education is found to be among the covariates most consistently and significantly associated with differential outcomes in fertility, sexual activity, contraceptive use and union formation. That educational attainment shapes reproductive outcomes is hardly surprising, echoing results obtained from a multitude of other studies conducted across the developing world. However the seemingly diminishing returns of women's schooling on delayed sexual activity may help explain in part observed increases in the absolute levels of sexual experience and subsequent fertility among our target population between the beginning and the end of the period of observation. Moreover the multilevel modelling techniques used in the present

analyses point to significant random effects at the cluster level. This result leads us to recommend future in-depth research in the area of community influences on individual reproductive behaviour.

Résumé

Le Brésil a connu une baisse importante de la fécondité au cours des dernières décennies. Le déclin s'est produit en parallèle avec des transformations socio-économiques profondes dans cette société : améliorations importantes des niveaux de scolarité, pénétration globale des moyens modernes de communication, urbanisation et industrialisation grandissantes. Une part importante de cette baisse est attribuable aux femmes ayant atteint le milieu de leur vie reproductive. En même temps, la contribution de la fécondité des adolescentes (15-19 ans) à l'indice synthétique de fécondité (15-44 ans) a augmenté. Cette tendance est particulièrement remarquée dans le Nordeste, une des régions les plus pauvres du pays. Selon les estimations tirées de l'Enquête démographique et de santé (EDS), la proportion annuelle des naissances issues des adolescentes *nordestinas* est passée de 12 à 20 pour cent entre 1986 et 1996 ; la proportion des adolescentes qui ont déjà eu un enfant est passée de 12 à 17 pour cent.

Cette fécondité précoce n'est pas sans risques. Les femmes qui ont leurs enfants pendant l'adolescence sont plus exposées à la mortalité et la morbidité maternelle-infantile. De plus, selon la littérature, leurs perspectives en termes d'instruction et de développement professionnel diminuent. Les facteurs qui influencent les décisions reproductives des femmes adolescentes sont peu connus. Une meilleure connaissance des déterminants de leur comportement reproductif, et ce dans le but de pouvoir mieux développer les programmes d'intervention de santé et d'éducation, semble donc évident.

Nous nous proposons d'étudier les tendances et les différentiels de la fécondité et ses déterminants proches chez les adolescentes du Nordeste, à partir des données empiriques tirées des EDS menées dans la région en 1986, 1991 et 1996. La disponibilité des données de trois enquêtes nous offre une source riche en informations quantitatives et facilite notre analyse temporelle auprès des groupes d'âge les plus jeunes. Des modèles de régression logistique multivariée sont utilisés pour évaluer la probabilité pour une femme de connaître une première maternité, un

premier rapport sexuel, une pratique contraceptive et une première union en cours d'adolescence, ainsi que pour en évaluer les déterminants. Tout en étant consciente de l'existence d'une multitude de facteurs sociaux, économiques, psychologiques, biologiques, ainsi que des influences de la famille et des pairs, dans cette thèse nous nous limiterons à quelques caractéristiques vraisemblablement clé dans le développement des politiques et des programmes d'intervention.

La scolarité d'une jeune femme représente l'un des facteurs les plus fortement et les plus uniformément associés aux différentiels du comportement reproductif. Cela concorde avec les résultats observés dans la littérature sur la recherche démographique dans les pays en développement. Notre analyse souligne l'influence d'une instruction au niveau secondaire ou plus sur le comportement reproductif des adolescentes du Nordeste : maternité tardive, délai des rapports sexuels, prévalence accrue des contraceptifs et mariage différé. Malgré qu'elle demeure présente, l'influence indépendante de la scolarité sur la probabilité d'une jeune femme d'avoir des relations sexuelles précoces semble diminuer en magnitude dans le temps. Ceci pourrait nous aider à expliquer en partie l'augmentation du niveau absolu d'expérience sexuelle observé dans notre population cible. La combinaison des taux croissants d'activité sexuelle avec un plus grand risque de conception prénuptiale parmi les femmes dans les unions informelles pourrait expliquer au moins en partie les niveaux absolus plus élevés de la fécondité adolescente.

Finalement, les régressions de type multi-niveaux dans nos analyses appliquées aux données de l'EDS montrent souvent une variance aléatoire significative au niveau grappe. Elle souligne l'existence de forces indépendantes, mais non-mesurées, sur le comportement des jeunes femmes, conditionnées par les frontières géographiques, et ce après des contrôles pour l'âge, le lieu de résidence (urbain/rural) et les autres caractéristiques socio-culturelles. Le résultat nous amène à recommander une recherche approfondie des influences communautaires sur le comportement reproductif des individus.

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I. Introduction

Over the past three decades the developed and developing worlds have been witness to important changes in fertility behaviour among their adult and adolescent populations. Accompanied by higher levels of schooling, better health care, increased urbanisation, and greater exposure to modern forms of mass communication, general fertility levels have dropped rapidly in many regions. In developing countries in particular, estimates indicate that fertility has dropped by about one-third, from an average of six lifetime children per woman in the 1960s to around four today. However wide variations in reproductive behaviour persist at the national and sub-national levels, and across social groups. While much research ad analysis has been conducted on the causes and consequences of such differential behaviour among adults, until recently adolescents have received relatively less attention. The factors that influence adolescents to behave similarly, or differently, than their older counterparts remain less understood.

Brazil is no exception to this general trend. The largest country in Latin America has experienced rapid fertility decline: the total fertility rate (TFR) dropped from 5.8 children per woman to 2.5 between 1970 and 1996 (BEMFAM, 1997). At the same time Brazilian society has been marked by profound socio-economic changes. Among the indicators to this point are rapid urbanisation and industrialisation: for example, the urban population increased from 56 percent to 76 percent over the period 1970-1991 (Baer, 1995; Ferreira and Waldvogel, 1997). Nevertheless such changes did not eliminate the sharp regional inequalities that have characterised Brazil since the colonial period (see Baer, 1995; Wood and Carvalho, 1988). Much attention has been paid in the literature to disparities between the poverty-stricken Northeast and more affluent Southeast, the two most populous regions. 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 percent) than in the Southeast (24 percent). A similar tendency can be observed in terms of rates of adult illiteracy (40 percent versus 9 percent in the Northeast and Southeast respectively) (BEMFAM, 1997). Such differences are seen to hold important implications for demographic 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 (BEMFAM, 1997).

Again, while several studies have been conducted on differential reproductive practises among women of fertile age in Brazil and its regions (see, for example, Alves, 1996; Arruda et al., 1994; Camarano, 1994; Martine, 1996; Rios-Neto et al., 1991; Silva et al., 1990), the mechanisms regulating behaviour among the youngest age groups remain relatively less explored. Preliminary descriptive analyses have pointed to divergent behaviour across adolescent and older women: while fertility decline has been consistently observed in the past two decades among women in the central age groups of their reproductive years, the rate has been substantially slower among adolescents. As such, the proportional contribution of adolescent fertility to the TFR is increasing over time. Not only is this trend particularly accentuated in the Northeast region, but it would appear that adolescent fertility is even increasing here, and this despite near universal knowledge of contraceptive methods (Arruda et al., 1987; BEMFAM, 1997).

The issue of adolescent fertility is increasingly raising concerns over potentially adverse health, social and economic consequences. Early childbearing has been linked to higher rates maternal and child morbidity and mortality, truncated educational opportunities, and lower future family income levels (see Jones et al., 1986; Menken, 1980; Senderowitz and Paxman, 1985; Voydanoff and Donnelly, 1990; Wulf and Singh, 1991). Several negative health consequences of teenage fertility both for the mother and child can be listed. Among the documented pregnancy and delivery complications before the maternal age of 20 are, for the woman, higher than average levels of toxaemia, anaemia, bleeding, cervical trauma, prolonged and difficult labour, premature delivery, and death; and for the child, higher incidence of low birth weight (which itself can lead to neurological problems, retardation, death), prematurity, stillbirth, and perinatal mortality. Worldwide, pregnancy-related deaths are the main cause of mortality among 15-19 year-old females. In addition, long-term demographic effects of adolescent fertility may include larger completed family sizes, the timing of a first birth likely associated with future fertility patterns (Grindstaff, 1990; Senderowitz and Paxman, 1985).

What may lie at the root of differential fertility outcomes among adolescent women? The object of this dissertation is to provide an analysis of trends in fertility and its main proximate determinants among women in the earliest stage of the reproductive life cycle in the context of the fertility transition in Brazil and the Northeast region. A review of the literature presents a range of theories and frameworks addressing the complex relationship between socio-economic and cultural conditions and demographic outcomes at the societal level. In the next chapter, we examine the dominant demographic theories and related empirical evidence, focusing on the interrelationships between fertility and some of the principle characteristics of transitional societies. The following three chapters respectively aim to describe trends and explain determinants of an adolescent woman having a first birth, having first intercourse and using a contraceptive during sexual initiation, and entering into a first union in Northeast Brazil. The period of adolescence is defined here as 15 to 19 years of age. Empirical analyses are performed using hazard models for individual-related retrospective events. The chosen multivariate regressions will be structured to facilitate partition of the effects of age from socio-economic and cultural determinants.

The data used in this research are drawn from the Demographic and Health Surveys (DHS), a programme producing cross-national and comparative information in the area of human reproduction throughout the developing world. Over the past three decades, the availability of national sample surveys has become increasingly important in monitoring overall trends in reproductive-related behaviour, and has greatly facilitated researchers' capabilities to conduct demographic analyses with the aid of cross-sectional and cross-cultural comparisons (see, for example, Anderson and Cleland, 1984; Rutenberg et al., 1991; Tsui, 1985). While multitudes of fertility surveys and studies of contraceptive knowledge, attitudes, and practise (KAP) have been carried out since the mid-twentieth century, before 1974 most of these surveys were limited to selected areas or communities targeted by family planning programmes. Then, with the initiation of the World Fertility Survey (WFS) programme, data collection was broadly introduced at the national level, enabling the compilation and tabulation of nationally representative information on fertility and its major documented determinants. From 1974 to the early 1980s, forty-one data sets were compiled from samples of women of childbearing age in developing countries. Its follow-up, the ongoing DHS programme, is

composed of a series of cross-national surveys (including, for the first time, Brazil), and provides the most recent source of information on fertility and family planning. More extensive than its WFS predecessor, the standard DHS questionnaire addresses fertility and family planning, maternal and child health, and other reproductive behaviour and health topics.

The bulk of the information is collected from personal interviews with a representative sample of women of reproductive age (although in certain countries coverage is limited to ever-married women). In some cases additional questionnaires are included for husbands/males and on community-level service availability. The first DHS in Brazil was conducted in 1986, with findings considered nationally representative at a 95% level (Arruda et al., 1987). Aside from providing valuable information for population policy and health planning, the survey led researchers to identify key areas for further exploration. In particular, the results seemed to suggest that priority status should be granted to the Northeast region (Arruda, 1991). A second DHS was subsequently conducted in the nine Northeastern states five years later (Ferraz et al., 1992), followed by another national survey in 1996 (BEMFAM, 1997). Unfortunately none of the three included a reliable service-availability module. While the 1991 survey included a module for husbands, and the third 1996 survey a random sub-sample of males, we have elected not to use these information sources at the present time. Needless to say, the possibilities for further analysis drawing on the experiences of men could easily be the basis for another entire dissertation.

Thus our eventual analysis pertains to trends over the period 1986-1996 in fertility behaviour among the sub-sample of adolescent women residing in the Northeast region of Brazil. Our framework is influenced by Bongaarts' (1978) seminal paper on the process of human reproduction and the mechanisms leading to fertility outcomes. The author suggests that much of the variance in fertility levels observed across societies and social groups could be accounted for by means of a few proximate determinants. These are the variables through which all basic determinants are seen to operate to regulate fertility levels. Fertility could thus be analysed in terms of the four most important factors: the proportion of women in their childbearing years who are married (encompassing both legal and consensual unions), the use and effectiveness

of means of contraception, the recourse to voluntary termination of a pregnancy, and the length of postpartum sterility.

Adapting this framework to the case of initiation of reproductive behaviour during adolescence, we can first obviously discount the importance of postpartum sterility. We also chose not to explore the issue of voluntary abortion at this junction. While the practice is believed to be widespread, information tends to be unreliable given its illegal and controversial nature, and there is a lack of other statistical sources to counter-check the validity of individual-related DHS survey data. Remaining in our field of exploration are the roles of marriage and contraceptive use in explaining fertility outcomes. Bongaarts attributes importance to the former variable assuming that marriage is the institution primarily regulating exposure to the risk of conception through sexual intercourse. However this is not necessarily the case for Brazilian adolescents, among whom premarital sexual activity appears to be both common and increasing over time (Ferraz et al., 1998). Thus we intend to conduct distinct analyses on adolescents' propensity for marriage and sexual experience.

Furthermore the need to incorporate community influences on individual-related reproductive outcomes is of both substantive and methodological importance. Our underlying hypothesis assumes that individuals do not act in a vacuum, rather their surrounding environment conditions their attitudes and behaviours. Thus it seems imperative to attempt to measure community-level factors. Multilevel modelling responds to this need. We employ a technique that allows the intercept to vary across communities, reflecting unobserved positive or negative influences on the outcome event after controlling for individual factors, also known as the random-intercepts model.[α]

Moreover multilevel modelling is most appropriate given the DHS cluster-sampling scheme. DHS samples generally use two-stage stratified designs, with sub-samples of households being randomly selected within primary sampling units or clusters. Clusters are made up of roughly 200 households in a defined geographical area, from which approximately 30 households are selected for interview (Lê and Verma, 1997).

α While the random-intercepts model theoretically allows measurement of the heterogeneity across any number of explanatory variables in addition to communities, this prospect is not explored here.

The aggregation of individual-level responses within a cluster can be considered as a proxy (albeit an imperfect one) for capturing community characteristics. In the case of Brazil, the clusters are identified from the Instituto Brasileiro de Geografia e Estatistica's *Pesquisa Nacional por Amostra de Domicilios* (national household sample survey). Standard regression analyses assume that observations are independent. However for hierarchically nested data, such as the DHS, there tends to be a certain correlation between observations within clusters. Individuals from the same cluster are expected to be more alike in terms of characteristics and behaviours than those selected from different clusters. Failure to account for this dependency could lead to biased regression outputs, hence the preference for multilevel techniques.

The use of three repeat surveys allowing observations of the same age group at different periods presents distinct advantages over traditional retrospective analyses, that must recourse to making inferences about time-trends using various cohorts from one cross-sectional database. The latter are generally prone to greater problems of recollection errors and date omissions, which tend to increase with age of the respondent. As seen in Figures 1 and 2, the DHS sample proportions of incomplete or inconsistent responses of age at sexual initiation and age at union formation respectively tend to increase noticeably by age group.

Figure 1: DHS Data Quality on Age at First Intercourse by Current Age Group of Respondent, Northeast Brazil, 1986, 1991 and 1996

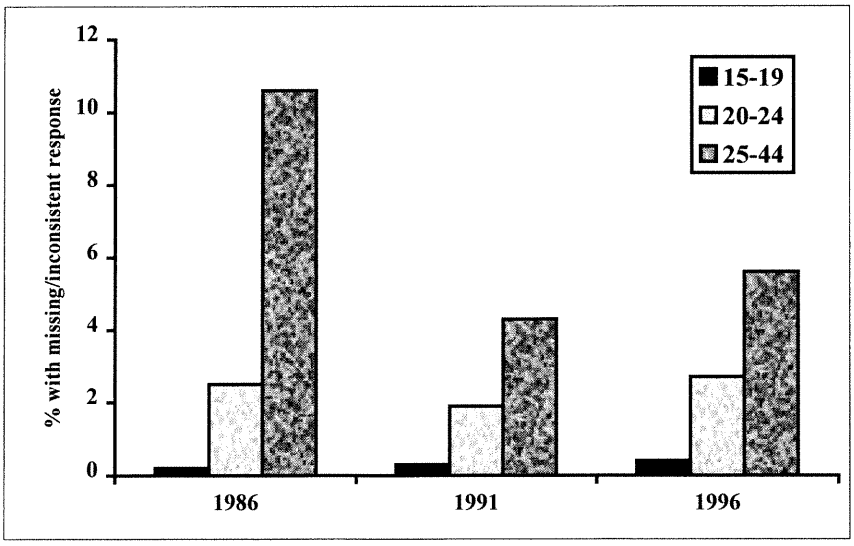
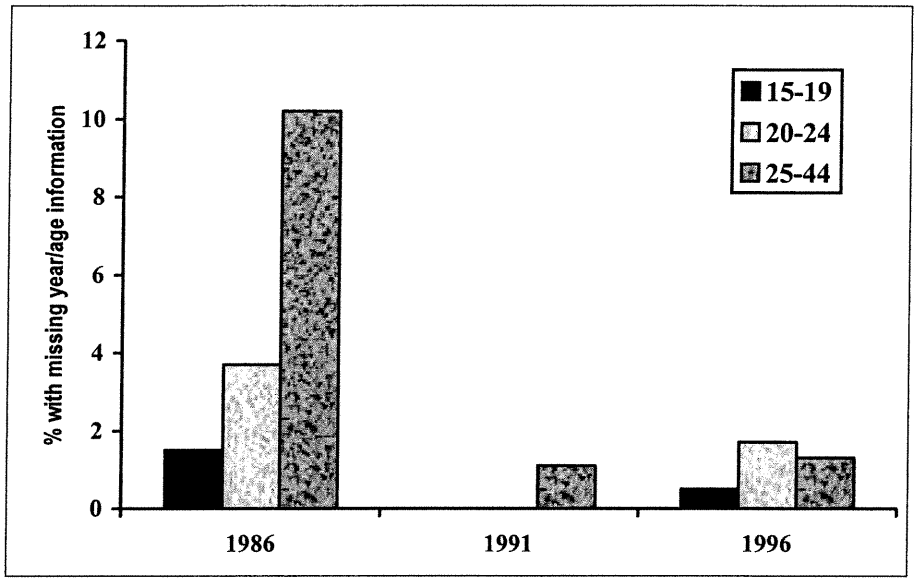


Figure 2: DHS Data Quality on Age at First Union by Current Age Group of Respondent, Northeast Brazil, 1986, 1991 and 1996



Nevertheless data quality can vary from survey to survey regardless of recall ability. Changes in questionnaire design and data processing can affect the information retrieved. Gage (1995) reports that the introduction of certain collection and coding procedures resulted in improvements in data quality between the first and second rounds of the DHS programme. A new data editing procedure to distinguish premarital sexual experience likely reduced the extent to which the timing of first intercourse could be automatically assigned to the date of marriage. The author evaluates the overall level of non-response on questions pertaining to sexual activity in the DHS as being low, seemingly indicating a willingness among women to answer such questions despite concerns among researchers that respondents might be uncomfortable with the topic. With respect to timing of fertility and union formation, collection of detailed birth histories and checks on consistency of date and age at first

union contributed to improved and now highly complete recording of the respective events, especially in Latin American countries.

Lastly, another potential factor affecting survey data quality could be training of interviewers and fieldwork implementation. Such errors are assumed to be random, however, and may be compensated by the multilevel framework presently employed (John McDonald, personal communication).

II. Explaining Reproductive Behaviour: Theory and Empirical Evidence from the Developing World

Most agree that demographic changes, their causes and consequences, are the result of the interdependent relationship between population and socio-economic and cultural conditions. In the developing world, where population growth is generally rapid, although mortality and migration levels clearly contribute to the dynamics, fertility has been cited as the variable considered to have contributed most to demographic changes in recent years (Farooq and DeGraff, 1989). Over the past three decades, accompanied by increased urbanisation, higher levels of schooling, better health care, expansion of family planning programmes and greater availability of a wide range of contraceptive methods, along with expanded social and professional opportunities for women, fertility levels have experienced a rapid decline in many regions. Estimates indicate that fertility has dropped by about one-third in developing countries, from an average of six children per woman in the 1960's to around four today. In Brazil, fertility decline has been even more rapid: from some 5,8 children per woman in 1970 to the present 2,5 children.

What may have caused the recent fertility decline in the developing world in general, and Brazil in particular? Human reproductive behaviour is the result of a complex interplay among numerous factors of demographic, economic, social, cultural, and biological nature. Thus, not surprisingly, theories and methods developed by researchers to explain and measure this phenomenon are numerous and complex. From a demographer's point of view, the bulk of research into the determinants of fertility has used either macro data, aggregated by country or by region, or micro data, collected from individuals and households. Studies of macrodeterminants tend to focus on a select number of development indicators as explanatory variables. Meanwhile, studies of microdeterminants generally follow either a sociological, economic, or psychological framework, the former two being more prominent, each dealing with the individual calculus of costs and benefits of demographic behaviour and societal constraints, and the extent to which they have general applicability across societies (Jones, 1982).

In this chapter we present a three-part review of the literature aiming to explain and evaluate the determinants of fertility regulation in low-income countries. We first examine some of the more influential theories of fertility determinants, starting with the classic macro-level theory of the demographic transition and continuing with more recent alternate explanations. This leads to an investigation of the intermediate variables through which such determinants are seen to operate to regulate actual fertility levels (approaches based on sociological or economic variants). Secondly, we present a review of sources and analyses using micro-level empirical data for measuring reproductive-related behaviour in developing regions. Thirdly, we briefly explore the role of family planning programmes in influencing individual-level reproductive outcomes. A special focus is placed on the situation in Brazil.

2.1 Theories of Fertility Change and its Determinants

Demographic Transition Theory and Beyond

By far the most influential framework in demographic research is that of the demographic transition, developed over a half-century ago. According to demographic transition theory (see Caldwell, 1976; Coale, 1973; Farooq and DeGraff, 1988; Simmons, 1985), societies can be classified into two types: traditional, characterised by high fertility and mortality levels, and modern, where birth and death rates are low. Societies "in between" overlap, at each end, with demographic characteristics of both the traditional and modern types.

Based on early research and observation in pre-modern populations and contemporary industrial countries, the theory claims as an undeniable fact that, with sufficient modernisation,[α] fertility and mortality will change in a predictable manner. High fertility in traditional societies - so maintained through a series of props such as religious

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α Four widely recognized, empirically identifiable aspects of modernization are identified in Easterlin (1983) as follows: innovations in public health and medical care; innovations in formal schooling; urbanization; and the introduction of new goods.

doctrines, moral codes, laws, community customs, marriage habits, and family organisations - is necessary for survival because otherwise the very high mortality rate, due to the lack of technologies to overcome problems of health and nutrition, would lead to population decline and extinction. As countries develop, they begin to experience declines in mortality, probably as a result of social and economic changes affecting living conditions. A period of rapid population growth follows because of a gap in time before changes would occur in fertility behaviour. Pressures for large families are reduced as mortality levels, especially child mortality rates, decrease. Eventually the "props" are no longer be needed, or at least not at their original strength, and fertility adjustments are observed.

Proponents of demographic transition theory elaborate that fertility reductions are the behavioural outcome of changes in socio-economic process and individual decision-making. Modern urban-commercial life produces special motivational constraints on procreation. In the urban milieu, the costs of feeding and clothing a family under conditions where nearly everything must be bought drain the resources of a family. Economic development entails a decline in the economic benefits of children, both as a productive resource (compared to the traditional rural setting) and as a means of security in old age. At the same time, rising materialist aspirations and the market orientation that accompanies the expansion of capitalist production put supporting a family in competition with the acquisition of material goods. Furthermore, modernisation is seen to facilitate the development of certain attitudes, values, and abilities to allow people to better plan their lives with regard to distant future goals. These planning values are reflected with lower fertility aspirations as couples choose more frequently between the best allocation of resources, increasingly taking into account the wife's opportunities and activities outside the domestic sphere. Women's wage employment away from the home, where opportunity costs of children are highest, is considered particularly incompatible with the demands of childbearing (Rosen and Simmons, 1971; Wood and Carvalho, 1988).

As succinctly outlined by Coale (1973: 65), three general prerequisites would have to be satisfied before a fertility decline would be observed in any society:

i. fertility must be considered within the individual or family calculus of conscious choice;
ii. reduced fertility must be perceived as advantageous; and
iii. effective techniques to prevent births must be available.

With the latter point, the author is one of the few to mention the role of contraceptive technology in fertility decline -- the most important proximate determinant. This aspect is further discussed below.

There are several obvious limitations to the demographic transition theory. Coale (1973; 1986) argues that the theory merely states that fertility would inevitably decline, but fails to substantiate the circumstances under which this would begin. Nor does it indicate the degree (if any) of modernisation necessary to produce a fall. Perhaps most critical, the author cites new findings from the European Fertility Project which urge a revision of the classic theory: instances of demographic behaviour observed in pre-industrial Europe that contradict the empirical basis from which it is drawn, the most conspicuous being "precocious" reduced family size in rural France and regions of southern Hungary.

Farooq and DeGraff (1988) mention the theory's lack of attention to potential alternate responses to the pressures of rapid population growth, such as migration. The theory also ignores possible avenues for increases in fertility, such as better health and nutrition of women, reduced widowhood, and increases in income levels and shifts in income distribution. Simmons (1985) suggests that, in fact, it is not a real "theory" but merely a set of generalisations describing a process of change. According to the author, diffusion of fertility limiting knowledge and behaviour may help extend the theory. Phillips and Ross (1992) consider as a more recent variant that the demographic transition theory should also attend to the role of formal, organised family planning programmes as a fertility determinant and how these systems interface with different social settings. The latter approach is examined in greater detail in the third part of this section.

One aspect that must be addressed is whether economic modernisation is in fact a necessary criterion for fertility decline. Demographic transition theory suggests that

modernisation brings about forces dissolving the tendencies towards large families and replaces them with individualism marked by material aspirations. On the other hand, Caldwell (1976; 1978) postulates that familial obligations, characterised by the direction of intrafamilial wealth, influence family size regardless of economic growth. The author criticises transition theory for failing to consider the magnitude and direction of wealth flows and potential flows - obligations in terms of money, goods, services, or guarantees within the nuclear and extended family - nor the cultural practises and nature of family formation. Drawing on observation of African kinship systems, the author suggests that fertility would only begin to decline as the return from investment in children declines. Fertility levels should be considered as being determined by the net economic gain accruing to the family, characterised by the net wealth flows from the younger to the older generations. The traditional peasant economy is thus seen to favour high fertility because it is a familial-based economy. Declines in family size in the urban sector - by virtue of its nonfamilial productive relationships - could be attributed to a shift in the direction of wealth from the parents to the children, defined in terms of actual and anticipated benefits. As such, Caldwell's approach unites economic concepts with cultural notions that may be lacking in the more rigid theories of economic causation. It is also seen to be particularly insightful in its applicability to the situation in the rural sector. Supporting that view, Johnson (1984) cites evidence suggesting that marital fertility decline on rural farms in pre-industrial France and America could be attributed to land scarcity threatening to interrupt the intergenerational transmission of wealth.

The theory can also be extended to recognise the particular advantages of decision-makers in the relationships regulating production and reproduction. Large family size is said to be most advantageous to the most powerful member of the family, and traditional familial modes of production have long favoured the male head of household. High fertility has been seen as a means of control under patriarchal structures for optimising familial productivity and conditioning the submissive domestic role of women. Thus higher fertility may have been favoured in settings where men in decision-making roles reaped the greatest proportion of benefits, with the physical costs of childbearing and childrearing being disproportionately borne by women and generally ignored (Caldwell, 1978; Vock, 1988). Johnson (1984) proposes that gender equality could reduce the net wealth flow from women to men in various ways. Increasing

egalitarianism of the husband-wife bond could lead to a more balanced wealth exchange between the sexes. Secondly, the transmission of technical knowledge through education could help prepare women to be decision-makers in the non-familial production sector, legitimising their claim to a larger share of the produce. Furthermore, the author hypothesises that a reevaluation of the socially constructed value of women's labour should create a more adequate recognition of the net wealth they generate towards children, subsequently turning the wealth flow from children to men downward. Hence, lowering the dependency of women could help raise the dependency of children.

Indeed female status is considered an important element in many theories of fertility decline. Mason (1988) argues that in traditional societies, gender stratification of roles favour high fertility since there are few opportunities for women outside of motherhood. With social modernisation, as societies shift from a patriarchal nature to a more egalitarian one, women's exposure to the outside world and increasing autonomy in decision-making are believed to have a depressing effect on family size. According to the feminist perspective, a positive redefinition of women's status within the community should result in a decline of pressure towards large family goals as a means to control women (Goldscheider, 1982; Mason, 1988). Furthermore, gender differentials in fertility preferences may be reduced with increased husband-wife communication and cooperation, and with men increasingly taking into consideration the physical costs of childbearing borne by women.

With adequate indicators of women's empowerment being notably difficult to define and measure,[β] macro-level studies of the role of gender in demographic change often rely on the usual socio-economic aspects. It is widely stipulated that greater opportunities should emerge for women with the process of modernisation, resulting in shifting domestic practises and maternal activities. Elmendorf (1981) suggests that the availability of modern conveniences (starting with indoor running water and electricity) can help free rural women from endless hours of domestic chores and thus promote

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β Safilios-Rothschild (1982) draws an important distinction between "status" of women, that is their overall position in society, and women's "power," their ability to influence and control at the interpersonal level.

the pursuit of interests outside the home. Several authors have proposed that changes in fertility behaviour are mediated at least in part through shifts in women's education and labour force participation. Wood and Carvalho (1988) theorise that educated women should have a more positive attitude towards contraceptive use, enjoy greater personal communication with their husband, and have a greater sense of personal efficacy. Education might also lead to higher standards of childcare, creating greater emphasis on quality of children, thus tending to lower quantitative demand. Rosen and Simmons (1971) postulate that higher levels of education and higher work status could have strong effects on a woman's perceptions of herself, including her role in the household and in society at large. Furthermore, the benefits of a wife's participation in the labour force may include increased power gained through independent earnings and greater influence in family decisions. Guzman (1986) adds that working women could also have better access to health services, as well as enjoy financial security enabling the possibility of delays in age at marriage and marital disruptions, and self-sufficiency in old age, thus favouring reduced family size. Cain (1988) identifies women's reducing need for insurance through anticipated surviving adult children, particularly sons, as a potentially strong influence on family size values.

While the structural approaches to fertility decline previously discussed have generally been dominated by the second of Coale's three conditions (that is, reduced fertility must be perceived as advantageous), diffusion theory focuses mainly on the first (fertility must be within the calculus of conscious choice) and, when applied to the case of family planning programmes, on the third (availability of effective birth control techniques). For instance, Bogue (1967b) argues in favour of this social psychological approach, stating that an individual's or couple's awareness of the possibility and benefits of family planning is the necessary prerequisite upon which all other ingredients bringing about fertility decline rest.

According to diffusion theory, family planning practises can be seen as an innovation when introduced into a traditional, high fertility society. Through the process of diffusion, an ideological change could occur as reduced family size norms and values are "filtered through" society, first received and adopted by a select, innovative few, and then eventually passed on to the population at large (Johnstone, 1967). According to Bogue (1967a; 1967c), modern, mass communication networks may be seen to legitimise

family planning practises in non-regulating societies by promoting general public awareness of family planning methods and services and social acceptance of low fertility motives. The author suggests that, over time, the diffusion process may alter the balance of motives shaping fertility levels. These motives, distinguished by those favouring high fertility versus ones which favour low fertility, are believed to exist in every society. They can be categorised in areas such as health (high fertility being favoured because of high infant mortality versus low fertility to help preserve the health of the mother and assure the health of the children); personal economic welfare (larger family size for security in old age versus reduced family size leading to a decrease in everyday general expenses, permitting saving for the future); and family welfare (having more children to help around the house and continue the family name versus having fewer to help improve their lot in life); among others.

Moreover, the effective spread of fertility regulation practises may be influenced by the nature of society itself. Innovations may become more readily acceptable with ideological modernisation, as societies become more flexible, maintaining less of a hold on traditional customs, and with the population becoming more literate and more exposed in general to new ideas (Berelson, 1967). The process of ideological change could entail increased secularisation and value on individualism. Freedman and Freedman (1992) suggest that the primary source of diffusion of these new ideas could be the world communication and trade networks, some concerning reproductive behaviour, with others about general Western lifestyles (for example, ideas regarding health, the value of education, new consumption goods, even political power). Under actual modern conditions of world interdependence and communication, couples in the developing world may be characterised by rising aspirations, leading to perceptions that their standard of living may improve with having fewer children. Mason and Taj (1987) review that the diffusion of Western models of family and gender relations, attitudes towards personal fate, and the adoption of family planning practises could result in the manifestation of demand for fertility limitation in developing societies. A sequential five-step process of diffusion of family planning is summarised by Tsui (1985): awareness, knowledge, evaluation, trial, and finally adoption of the innovation.

As described by Katz (1967), the process is seen to be mediated by both aspects of the innovation receiver (individual predisposition, with motivation being conditioned by

cultural influences) and characteristics of the innovation itself (along with its compatibility with the values of potential adopters). The author outlines four attributes of innovations, as applied to family planning methods: communicability (with some techniques being more difficult to present than others, for example the pill requiring a strict regimen); pervasiveness (such as whether the method causes interference with the sexual act or physiological cycles, requires attendance at clinics or repeated supplies, is reversible or not); risk (a method's probable effectiveness and possible dangers, which may be subjective); and profitability (in this area seen primarily as a question of costs, either monetary or psychological, and which are relative for various degrees of protection). This element belies much of diffusion theory's attractiveness, the role of contraceptive technology generally being neglected in other theories of fertility decline.

Cleland and Wilson (1987) argue that the spread of contraceptive knowledge, norms, and technology seems to offer a better explanation for observed patterns of rapid fertility decline in today's low-income countries than previous theories of structural determinism. While little consensus has been drawn on which factors precipitate widespread fertility decline, much more is known about the speed and character of this transition once under way. The authors suggest that the diffusion of innovations theory is better able to address the way new technologies or forms of behaviour spread within a population. The influence of psychological or social elements (new knowledge, ideas, and aspirations) is believed to be able to spread rapidly, and independently of a particular country's economic circumstances. This assumption can be supported by observation within culturally homogeneous populations, such as in many East Asian and Latin American countries, where birth control and resulting fertility decline has spread to all sectors within a remarkably short period of time, thus implying that fundamental forces of change may be operate at a societal level. The authors suggest - perhaps somewhat superficially - that it is no coincidence that relatively little fertility decline has been observed in cultures of relative isolation (much of Africa), in those considered incompatible with western values (many Islamic countries), or where strong indigenous beliefs predominate (such as on the Indian subcontinent). Even proponents of diffusion theory admit, "much of the evidence is fragmentary" (Cleland and Wilson, 1987). Nonetheless, the claim is made that the theory's stronger links with culture and education, both of which are likely to determine initial acceptability of new ideas as well

as the quick spread of birth control, outweigh weak links between economic structure and fertility emphasised in other models.

Furthermore, the theory is believed to be gaining increasing acceptance, and is considered more pertinent in today's reality, given that even a few decades ago researchers could not have anticipated the pervasive strength and influence of flows of new knowledge and values from the industrialised to the developing world through international media and trade networks (itself being considered an important aspect of development) (Freedman, 1995). Nevertheless, the theory's inherent weaknesses in the area of personal motivation for family planning, coupled with its sharp western bias, the assumption that the developing world will just "blindly" follow the lead of developed countries in matters of reproduction, undermine its credibility.

In Brazil, mortality rates began to decline around the mid-twentieth century, when the country partook a rapid process of industrialisation and urbanisation supported by the military regime. The country experienced a major boom in growth in the industrial sector building characterised by a sharp rise of imported capital goods combined with the installation of technologically advanced industries and integration in the world economy (Merrick and Graham, 1979). The proportion of the population found in urban areas rose from 45 percent in 1960 to 70 percent by 1980. Over the same two decades, the percentage of the labour force engaged in agricultural activities dropped from 54 percent to less than 30 percent. Growing importance of the industrial sector was accompanied by a rise in average per capita income -- though grave inequalities persist (Wood and Carvalho, 1988). The subsequent drop in fertility rates was thus more or less consistent with transition theory. Attitudes relaxed regarding the use of birth control; the 1986 Demographic and Health Survey revealed that fewer than 2 percent of married women aged 15-44 years opposed contraception for religious reasons (Arruda et al., 1987), despite popular impressions about the significance of the role of the Catholic Church. Smaller families were favoured by new socio-economic conditions, including enhanced educational and work opportunities, particularly for women. Birth control became more readily available as the traditionally pronatalist government took steps to democratise access to family planning services through federal health agencies, while private organisations such as the *Sociedade Civil Bem-Estar Familiar no Brasil (BEMFAM)*, the Brazilian affiliate to International Planned

Parenthood Federation, provided extensive services and publicity efforts (Wood and Carvalho, 1988).

Intermediate Fertility Determinants

Attempts have been made to provide an analytic framework outlining the process of reproduction and the mechanisms leading to fertility reduction. Davis and Blake (1956) proposed the influential framework suggesting that fertility is regulated through a series of intermediate variables in conjunction with the three steps of the process: intercourse, conception, and gestation and parturition. These variables - of which there are eleven in total - are seen to each have either a negative or positive influence on fertility levels:

Intermediate Variables of Fertility

I. Factors Affecting Exposure to Intercourse

A. Those governing the formation and dissolution of unions in the reproductive period.

1. Age of entry into sexual unions.
2. Permanent celibacy.
3. Amount of reproductive period spent after or between unions (when unions are broken by death, divorce, separation or desertion).

B. Those governing the exposure to intercourse within unions.

4. Voluntary abstinence.
5. Involuntary abstinence (from impotence, illness, temporary separations).
6. Coital frequency.

II. Factors Affecting Exposure to Conception

7. Fecundity or infecundity, as affected by involuntary causes.
8. Use or non-use of contraception (by mechanical, chemical or other means).
9. Fecundity or infecundity, as affected by voluntary causes (sterilisation, subincision, etc.).

III. Factors Affecting Gestation and Successful Parturition

10. Foetal mortality from involuntary causes.
11. Foetal mortality from voluntary causes.

(Davis and Blake, 1956: 212)

The authors contend that, intentional or not, each variable is conditioned by cultural factors in every society such that the actual birth rate depends on the net balance of the values of all variables. While this framework brings much appreciated attention to biological factors of fertility, which are generally ignored in broader theories of ultimate determinants, it is unclear how, as the authors maintain, they can be affected by social

influences. The question remains as to whether variables such as sterility associated with menopause and miscarriage may be elements of choice.

Moreover, some of the eleven variables undoubtedly have a stronger immediate influence on fertility than do others. To this point, Bongaarts (1978) suggests that much of the variance in fertility levels between societies could be accounted for by means of a few proximate determinants. Fertility could thus be analysed in terms of the four most important factors: i) the proportion of women in their childbearing years who are married (encompassing both legal and consensual unions); ii) the use and effectiveness of means of contraception; iii) the recourse to voluntary interruption of a pregnancy; and iv) the length of postpartum sterility. According to the Bongaarts framework, each of the four proximate determinants can be quantitatively linked to the national fertility rate by an index of influence applied to a potential fertility in absence of the inhibiting factors.

The index of proportion married, or Cm (with Cm=1 if all women are married during the entire reproductive period and Cm=0 if none are ever married), gives the proportion by which the total fertility rate (TFR) would drop with respect to the biological maximum as a result of nonmarriage. Recent increases in the average age at first marriage have played an important role in overall fertility decline in some developing countries (Robey et al., 1992).

The value of the index of contraception, or Cc (with Cc=1 when no contraception is practised and Cc=0 when all nonsterile women in the reproductive years are protected by 100 percent effective contraception), reflects a combination of contraceptive use and the effectiveness of those means of fertility control. Contraceptive practise is recognised as the intermediate fertility variable primarily responsible for recent rapid declines in marital fertility levels in the developing world. A United Nations (1989) analysis of fertility and contraception reports that, on average, a country's total fertility rate can be expected to drop by 0,7 children per woman for each 10 percent increase in contraceptive prevalence. Furthermore,

> "the level of current contraceptive use explains, in a statistical sense, about 85% of the cross-national variation in fertility levels. No society has reached a low level of fertility without extensive resort to contraception within marriage." (United Nations, 1989: 73)

Another important factor reducing potential fertility is the practise of induced abortion. Bongaarts defines the index of induced abortion as Ca, equal to one in the absence of abortion in a given society, and declining towards zero with increasing incidence of induced abortion. Although reliable measurements of the prevalence of abortion are often lacking, it is well known than abortion is practised in many societies. It is not clear whether the influence of contraception and abortion on fertility rates will necessarily change in a similar amount or even in the same direction during a period of fertility transition. While prevalence might rise for both at the initial stages, over time there is the potential likelihood of a trade-off between abortion and contraceptive use-effectiveness (Potts and Selman, 1979; United Nations, 1989).

Finally, lactational infecundability, a variable absent from Davis and Blake's original framework, is now widely recognised as largely responsible for differential natural marital fertility levels among societies at various levels of development. Lactation has an inhibitory effect on ovulation, thus increasing the birth interval and subsequently reducing natural fertility. In the Bongaarts model, the index of lactational infecundability, Ci, equals one where no lactation is observed, and decreases towards zero as lactation lengthens indefinitely. Certain positive influences on natural fertility may come into play with the onset of modernisation in this area, however, since traditional breastfeeding practises may be disrupted - along with related cultural patterns of postpartum abstinence - thus slightly conditioning other negative influences of deliberately controlled fertility regulation behaviour (Bongaarts, 1985).

Further evolutions of the previous approach have been developed, notably the Easterlin synthesis framework incorporating economic notions of household choice of fertility regulation (1975; with Crimmins, 1985); the Freedman and Berelson (1976) model of contraceptive criteria, reflecting both the level of contraceptive technology as well as social setting; and Bulatao's (1989) factors of contraceptive method choice. At the same time, the Bongaarts model remains widely subject to empirical applications. Its attractiveness is largely derived from its minimal data requirements, a feature partly inherent to its design, partly consequence of its simplified assumptions (Casterline et al., 1984).

Applied to the Brazilian case, contraception is clearly shown to be the proximate determinant responsible in large for the country's recent decline in fertility (Silva et al., 1990; Wood and Carvalho, 1988). A continuous drop in the value of the index Cc (from 0.72 in 1970 to 0.40 in 1986) reflects a combination of increased contraceptive use and the spread of more effective means of fertility control. Another important factor reducing potential fertility has been an increase in the practise of induced abortion (the index Ca estimated to have decreased from 0.96 to 0.82 over the period 1970-1981). However these reductions may have been slightly moderated by the positive influence of changes in natural sterility. Wood and Carvalho (1988) evaluated the index Ci as having increased from 0.89 in 1970 to 0.93 in 1981. The length of postpartum infecundability is related to the duration and intensity of breastfeeding, practises that can be disrupted with the onset of modernisation.[&] In addition, related taboos of abstinence can result in a rise in fertility if abandoned (Bongaarts, 1985). Changes in fertility do not seem to have been the result of changes in marriage patterns among women of reproductive age in this society, the index Cm evaluated as having remained relatively stable (at some 0.64) over the period 1970-1986.

2.2 Differential Outcomes in Reproductive Behaviour: Empirical Evidence

It has been suggested that history should record individual's characteristics - including social status, attitudes, and beliefs - as the main influence on fertility regulating behaviour, supported by the observation that there are no documented examples of contraceptive technology working independently toward fertility decline (Blake and DasGupta, 1975). Such characteristics may be socio-demographic or cultural in nature. Socio-demographic factors include those related to age, sex, socio-economic status (in particular education), place of residence (urban or rural), and experiences in fertility and

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& According the 1986 DHS, the median duration of breastfeeding in Brazil is 90 days, which is considered extremely short for a developing country.

infant mortality. Cultural influences may include reigning ideologies and religious convictions.

Age structures are often ignored in theoretical models, although empirical evidence reveals that fertility outcomes and contraceptive use vary considerably with age. Generally speaking, contraceptive use tends to peak in the middle of a woman's childbearing years, reflecting changes in fecundity and fertility desires over her reproductive life cycle. Rutenberg et al.'s (1991) comparative analysis of DHS data shows that women aged 25-34 years are more likely to use contraception than either younger (15-24 years) or older women (35-49 years). This tendency may reflect the desire of women in the middle age bracket, while still fecund, to prevent or space additional pregnancies.

One of the most consistent findings from analyses of fertility and contraceptive practise in developing countries is a strong and positive relationship between the level of women's schooling and overall contraceptive use (see Ainsworth, 1994; Martin and Juarez, 1995; Robey et al., 1992; Rutenberg et al., 1991). These results are not surprising, having been predicted by all major explanations of fertility decline. Women's education is negatively correlated with infant mortality, thus lowering demand for children. At the macro level, schooling of women is often used as an indicator of socio-economic development. The variable is also typically employed as a proxy for measuring the status of women, and is seen as a catalyst in diffusion-innovation theories.

In contrast, inconsistent results have been found with respect to many other indicators of socio-economic status. For example, Ainsworth's (1994) multivariate analysis of fourteen Sub-Saharan African countries reveals that the impact of income on family planning practises can go either way. The direction and magnitude of the so-called quantity-quality trade-off (a couple's ability to afford more children versus their desire to invest more in each) remains ambiguous. Indicators of women's employment are particularly problematic. On the one hand, DHS data indicate that working women usually have lower fertility than do non-working women. But results may differ according to the definition of "work" used from one survey to another. Varying perceptions of women's work activities (such as seen through subtle changes in

wording across surveys in both the WFS and DHS programmes) are seen to detract from international comparability of findings (Muhuri et al., 1994; Singh and Casterline, 1985).

Urbanisation is often found to have the expected impact on reproductive behaviour. In general, the level of fertility is lower, and contraceptive use is higher, in urban than in rural areas. However urban-rural differences vary from one country to another. Rutenberg et al.'s (1991) analysis of DHS data indicates that in countries where overall contraceptive prevalence is high relative to other countries in the same region (such as Brazil, Thailand, Trinidad and Tobago, and Zimbabwe), similar percentages of urban and rural women report ever using contraception. Urban-rural differences are larger where contraceptive prevalence is more moderate (for example Burundi, Uganda, and Guatemala). Furthermore, Johnson-Acsadi and Weinberger's (1980) multivariate analysis of WFS data reveals that most countries having moderate to strong family planning programmes reaching rural areas also tend to have smaller rural-urban differences in the level of contraceptive use.

Also noteworthy, citing analyses of WFS data, Cleland and Wilson (1987) discuss the failure of survey results to identify divergence in fertility patterns between individuals engaged in familial and non-familial economic sectors, in both urban and rural populations. These findings are seen to cast doubt on child-utility theories of fertility decline. The authors pronounce their growing scepticism of such theories as manifested through the absence of an observed link between fragmentation of landholding and a conscious reduction of family sizes. Similarly, a survey of rural households in Karnataka, India, draws no correlation between ever-use of contraceptives and either income or land variables, nor the perceived importance of children (Rao et al., 1986).

Other demographic factors can help predict differentials in fertility regulation and contraceptive practises. Current reproductive-related behaviour is likely to be conditioned by a couple's experiences in child mortality. Johnson-Acsadi and Weinberger (1980) ascertain from WFS data that, in general, couples who had experienced a child death were less likely to be using contraception than couples with same number of live births but no child death. However the pattern may not be

consistent. Using multivariate analyses, Njogu (1991) observes for Kenya that, while in 1977-78 contraceptive rates for couples who had experienced at least one child death were less than half the rates among those who had no such loss, by 1989 the differential had narrowed considerably, becoming insignificant. The author cites reasoning by Van de Walle and Knodel (1980) that child deaths may sometimes be caused by unintentional neglect because the births were unwanted, so that women with prior child deaths may be more highly motivated to practise contraception. Lloyd and Ivanov (1988) conclude, based on their review of the literature, that a positive relationship between contraceptive use and child survival rates only occurs in countries where fertility control is already widespread. Mechanisms conditioning the relationship between child survival and fertility are believed to depend upon the types of societal intervention, the prevalent family building strategy, and the nature and scope of family planning programmes in particular locations.

Factors related to gender and status also emerge as significant. Balakrishnan and Hou (1993), in a comparative study of the status of women in developing countries, suggest that lower fertility in relation to a nation's level of economic development (as found in countries such as Guyana, Indonesia, Thailand, China, and Sri Lanka) may be due to relatively greater rates of female participation in the educational system and labour force as well as better health care delivery. At the same time, the authors concur with Mason's (1988) view that the use of but a few aggregate statistics is an inadequate measure of the status of women, a complex and multidimensional concept. However, comparable data on other important elements such as property ownership, inheritance patterns, rights in divorce and widowhood, dowry, purdah, and occupational segregation are lacking.

While the level of husband's schooling has been found to have some independent effect on contraceptive practises, the net impact is generally less than that for the wife's education (Ainsworth, 1994; Johnson-Acsadi and Weinberger, 1980; Martin and Juarez, 1995). Men are often seen to less directly implicated in the childbearing and childrearing process. Moreover it has been suggested that men and women do not share the responsibility for family planning equally. Among currently available "male" methods (including condoms, withdrawal, and vasectomy), none have the widespread acceptability of some methods for women (such as oral contraceptives, IUD, female

sterilisation). An intensive study on the need for family planning in the Philippines by Casterline et al. (1995) points to husbands, their preferences and perceived costs of contracepting, as the most important factors in the observed discrepancy between women's expressed desires to limit or space births and an absence of contraceptive behaviour. "Machismo" has been raised as a pervasive obstacle to increased contraceptive use in much of Latin America, the only region where a low prevalence of vasectomy coexists with heavy reliance on female sterilisation (Weinberger, 1990). However alleged male obstacles to family planning may be more closely related to method acceptability and/or availability. The failure of vasectomy in particular to find acceptance may be due to lack of information, education, and accessibility (Potts and Selman, 1979; Ringheim, 1993). Ringheim (1993) reports that men seem to show willingness in surveys to use methods that are as yet hypothetical, particularly a coitus-independent yet safe and efficient method, such as a pill for men.

Differential patterns in reproductive behaviour that are not found to be statistically correlated with socio-demographic variables are often attributed to the influence of culture, much of which is somewhat ambiguous and difficult to quantify. For example, Cleland and Wilson (1987), in their comparison of various WFS findings with results of the European Fertility Project, suggest that the frequently pronounced sub-national as well as national-level differentials in fertility may be the demographic manifestation of ideological differences, given that the differentials attenuate little even after controlling for factors of an education or economic character. This type of reasoning is seen to support diffusion-innovation theory. DHS and WFS findings reveal that family planning is almost universally known in the developing world (except in parts of Africa), and is no longer a taboo topic in the mass media. Reproductive patterns are seen throughout the developing world to conform with the diffusion process, with fertility decline beginning among better educated and more urban women and gradually spreading through various groups to eventually become the norm (Robey et al., 1992). Along a similar vein, Kojima's (1993) analysis of DHS data for five African countries reveals a positive effect of education on exposure to family planning radio messages. Martine (1990) contends that, in the case of Brazil, the influence of the mass media in shaping attitudes cannot be understated: approximately 80 percent of the respondents to a survey in São Paulo considered television to be the most powerful institution in the country, ahead of legislative and judiciary branches and even the Church. Moreover,

according to Faria (1989), State investments in telecommunications led to a media generalisation through radio and television that reached practically all parts of Brazil, unifying a secular and westernised way of life.

Furthermore, the role of religion is relevant to the discussion of differential reproductive behaviour by cultural traits. Differences in fertility levels according to religious affiliation have been observed throughout the world. Christianity, Hinduism, Islam and Buddhism profess pronatalist values, encouraging high fertility (Lakshmanna, 1988). Patterns of higher fertility among Catholics and lower fertility among Jews have been found in the United States for decades, even when controlling for social class (Potts and Selman, 1979). On the other hand, Bogue (1983), citing Stycos' (1968) study of Catholic and non-Catholic women in Latin America and Bertrand et al.'s (1978) survey in rural Guatemala, suggests that degree of religiosity plays a more important role in shaping attitudes than membership in a specific church.

2.3 The Role of Family Planning Programmes

It is widely assessed that family planning programmes have contributed at least somewhat to contraceptive prevalence in much of the developing world (Lapham and Mauldin, 1985). Family planning programmes are designed to provide information, supplies, and services for voluntary fertility control via various delivery systems and with the aid of mainly modern methods of contraception. Efforts may involve both public and private channels, more often the former, but with significant and growing emphasis on the latter. Such programmes are seen to legitimise preferences for reduced family size and latent demand for fertility regulation in high fertility societies (Freedman and Berelson, 1976; Freedman and Freedman, 1992). Bulatao and Lee (1983) reason that diffusion of birth control through family planning services should help reduce some of the costs of access associated with fertility regulation, in light of the fact that such programmes are designed to provide contraceptives at minimal monetary cost to large populations. The process may also help relieve some of the health costs, as imagined risks are gradually replaced by more objective assessments.

Access to family planning programmes may be most easily measured by physical proximity (in time and distance) to services. In this respect, DHS data on service availability reveals that countries in Sub-Saharan Africa generally have the weakest service environments, while women in Asia, North Africa, and Latin America tend to have relatively ready access to family planning facilities. Ainsworth (1994) observes, in further analysis of family planning in Sub-Saharan Africa, that improved availability of services (as evaluated by distance to sources or availability of specific services) is generally associated with higher current contraceptive use. However, while the availability of specific methods can be linked with greater use in some countries (such as the pill and injections in Nigeria and Tanzania, and spermicide in Ghana), the impact may be minimal in others (no statistical difference on overall contraceptive practise being found in Zimbabwe). Moreover, while proximity may be the most readily quantifiable measure of service availability, many other features (including some highly subjective ones) could also be employed to evaluate family planning services, such as convenience of access, method choice and costs, quality of staff and services, outreach to different groups, cultural appropriateness of services, logistical support, and follow-up care (see Ainsworth, 1994; Bulatao, 1993; Freedman and Freedman, 1992). For a more general analysis, Lapham and Mauldin (1985) developed a framework for evaluating the effort of family planning programmes. Programme activities were seen to encompass policy and stage-setting activities, those related to service, and record-keeping and evaluation. Empirical applications would seem to confirm a positive correlation between national programme effort and overall contraceptive use.

It is difficult to distinguish the contribution of formal programmes to contraceptive use from the level that would have existed in their absence. On the one hand, the United Nations (1989) observe that the countries where contraceptive prevalence has grown rapidly do tend to have relatively strong programmes. On the other, Bulatao and Lee (1983) mention the contradictory examples of Brazil, where minimal organised effort has been made and fertility has rapidly decreased nonetheless, and of Nigeria, which has had a national family planning programmes for years but with little notable effect.

Furthermore, special field efforts in the provision of family planning information and services may include special efforts in the area of health, integrated either as part of a total health infrastructure or into maternal and child health care services. They may be

informational in nature, with stepped-up informational and educational campaigns, such as the energetic propaganda for smaller families witnessed in South Korea, Singapore, and China. They may provide incentives and/or disincentives, in money or in kind, in an antinatalist direction, such as those observed in Singapore, Taiwan, and India. Or they may involve local-agents and/or commercial interests. The outcome of such field projects, as with national programme efforts, can be varied in outcome (Freedman and Berelson, 1976).

As mentioned, in Brazil, rapid fertility decline has occurred in the absence of a nationally organised family planning programme. The Brazilian government has traditionally resisted explicit population control policies. More recently, in support of the view that individuals and couples should enjoy the right to access family planning information and supplies, certain services have been incorporated into the country's maternal and child health programme. The main source of family planning remains the private sector, with non-governmental organisations playing a prominent role, in particular BEMFAM. At the same time, certain government policies seemingly unrelated to family planning have been linked to indirectly encouraging the adoption of contraception, in particular female sterilisation and the pill. Since the late 1960s, tubal ligations became economically accessible to much of the general population under medical coverage of caesarean deliveries. Meanwhile oral contraceptives were sold across the country at bargain prices and without a prescription due to government price controls and "cloning" of pill formulas, the federal government failing to recognise international drug patents (United Nations, 1995).

2.4 Discussion

Regarding the subject of fertility decline in developing countries, our review of the literature has revealed two main categories of fertility determinants: basic and intermediate determinants. With respect to the former category, the various theories outlined - ranging from the classic demographic transition theory to the more recent theory explaining the diffusion of innovations - chronicle a process of change from high to low fertility regimes, drawing on hypotheses often inspired by observation of broad

trends having occurred at various times across different regions of the world, as associated with the general process of modernisation. Differences in approach may be considered primarily in terms of sources of alternate perceptions conditioning reproductive behaviour (such as the market place, kinship systems, reigning ideologies, or mass communication networks) and in the processes that produce mass change (modernisation being described as an evolution in socio-economic status, modes of production, gender relations, or consciousness).

In the second category, models of intermediate or proximate fertility determinants describe the mechanisms that are seen to regulate fertility outcomes. The pioneer Davis and Blake's list of intermediate variables (a sociological framework which also incorporates biological variables, the latter generally receiving little attention in demographic research) was followed by Bongaarts' selection of proximate determinants (with ready empirical applications since few indicators are deemed necessary to measure behavioural changes). Such micro models enjoy greater applicability to various socio-economic and cultural systems. On the other hand, while they may be appreciated for their qualities in measuring the mechanisms underlying processes of change in reproductive behaviour, they lack the means to explicitly describe the circumstances bringing about such change.

The emergence of considerable empirical evidence from the developing world through such cross-national and cross-sectional sources as the World Fertility Surveys (WFS) and Demographic and Health Surveys (DHS) has tremendously facilitated demographic research and analysis in the area of reproductive behaviour. Perhaps somewhat surprisingly, our review of the literature has revealed a certain lack of agreement between fertility theory and empirical results for selected variables. On the one hand, variables such as those pertaining to the status of women (especially educational attainment) do tend to exercise the expected influence on contraceptive use and fertility levels. But the statistical link with others (including child mortality, modes of production, and income) may be less consistent. Thus it would appear likely that only some elements of modernisation may be necessary to induce shifts in reproductive behaviour.

The characteristics of individuals, their attitudes and beliefs, conditioned by socio-economic circumstances, undoubtedly shape behaviour in reproductive matters. Can governments further influence such behaviour, specifically through the implementation of family planning programmes? Documented high levels of unmet need for family planning (the so-called KAP-gap, or differentials in terms of contraceptive preferences and behaviour) may appear to infer the necessity of action. While positive associations between programme effort and contraceptive prevalence have been suggested in some analyses, the existence of an independent influence of family planning programmes on national fertility levels is notoriously difficult to measure. Moreover in our case study of Brazil, although there is yet to be a national programme the country still experiences relatively low fertility rates and high contraceptive use. At the same time, other government measures unrelated to family planning are seen to have indirectly favoured widespread adoption of contraception, in particular female sterilisation and the pill.

And so, while our review of the literature in the area of reproductive behaviour has helped illustrate various aspects of this vast domain, the answers to some questions remain unclear. Which socio-economic and cultural variables associated with modernisation most condition fertility levels in the developing world and in Brazil? Which of the proximate determinants lie at the root of differential fertility outcomes across the adolescent and adult populations? Can governments independently encourage positive changes in reproductive-related behaviours, either directly via family planning programmes or indirectly through other public policies? With the goal of better understanding the determinants of fertility behaviour among adolescent women in Northeast Brazil, for our purposes the discussion in the following chapters is limited to factors which could help predict which individuals will initiate reproductive behaviour at the earliest stages, focusing on selected key characteristics likely to be relevant to policy development and programme intervention.

III. Adolescent Fertility Behaviour: Trends and Determinants in Northeastern Brazil

Neeru Gupta and Iúri da Costa Leite

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Abstract

Context: Much of the recent decline in Brazil's total fertility rate has been observed among women in the middle of their reproductive years. In contrast, the contribution of adolescent fertility (among 15-19 year-olds) to the total fertility rate is increasing over time. This trend is particularly accentuated in the country's Northeast region.
Methods: Data from three Demographic and Health Surveys conducted in Northeastern Brazil in 1986, 1991 and 1996 are used to examine trends and determinants of fertility behaviour among adolescents in the region. Discrete-time hazard models are used to estimate the probability of a woman having a first birth during adolescence, and to evaluate individual and environmental factors that may influence personal fertility choices.
Results: A young woman's level of education is the factor most strongly and consistently associated with the probability of giving birth during adolescence. In particular, an adolescent with no more than primary schooling is more than twice as likely to have had a first birth than an adolescent with at least a secondary education, even after the analysis is controlled for age, time period and other characteristics. Religious affiliation and mass media exposure did not consistently affect adolescent fertility over time in the multivariate analysis.
Conclusions: The promotion of education may be the most effective means of encouraging delayed childbearing among adolescents in Northeastern Brazil. There is a need for greater research into the impact of community facilities on teenage fertility, notably health and family planning programs, that target adolescents.

(*International Family Planning Perspectives, 1999, 25[3]: 125-130)*

Adolescent Fertility Behaviour: Trends and Determinants in Northeastern Brazil

Brazil has experienced rapid fertility decline over the last few decades, despite the lack of formal government support for family planning. The national total fertility rate (TFR) dropped from 5.8 to 2.5 lifetime births per woman between 1970 and 1996. While the pace of the fertility decline accelerated between 1978 and 1985, most of the decrease was observed among women in the middle of their reproductive years. Consequently, the proportional contribution of adolescent fertility (among women aged 15-19) to the overall fertility rate (among women aged 15-44) has been increasing over time.[1] According to estimates from the Brazil Demographic and Health Survey (DHS), the percentage of all births among adolescents increased from 12% to nearly 19% between 1986 and 1996, while the rate among women aged 25-39 dropped from 53% to 48% during the same period.

A lag in the decline of adolescent fertility compared to the decline in the TFR has been generally observed throughout Latin America. Previous research has suggested that adolescents in this region have taken less advantage of family planning services than older women.[2] The 1996 Brazil DHS reveals that 18% of female adolescents have been pregnant at least once. In the Northeast, an area of high fertility with a TFR of 3.1 lifetime births per woman, some 21% of adolescent girls have already become pregnant, despite near universal knowledge of contraceptive methods.

Adolescent fertility has steadily risen in the Northeast region over the past 10 years, both in absolute terms (17% of adolescents had ever given birth in 1996, up from 12% in 1986) and in relative contribution to the TFR (20% of all births were to teenagers in the year preceding the 1996 survey, compared with 12% 10 years earlier). The incidence of premarital childbearing among adolescents has also increased: The percentage of all first-born infants that belong to a single adolescent mother rose from 5% to 11% over the same 10-year period.

The consequences of teenage fertility are well documented and raise fundamental concerns about the health and social development of young mothers and their

children. Teenage pregnancy is generally associated with higher rates of maternal morbidity and mortality and greater risks for clandestine abortion, delivery complications and low-birth-weight infants. Young mothers who leave school early may also lose important educational opportunities.[3]

In this article, we examine trends and determinants of adolescent fertility behaviour in Northeastern Brazil. Using data from three successive Demographic and Health Surveys conducted in 1986, 1991 and 1996, we present a descriptive analysis of the key characteristics of individuals and their environment that are believed to influence personal choice in fertility regulation. We then use discrete-time hazard models in a multilevel form to estimate the probability of an adolescent ever giving birth, given the socio-economic and cultural context of the Northeast.

3.1 Background

Fertility Transition in Brazil

Rates of fertility remained relatively high and stable in Brazil throughout the first half of this century. Then, around the late 1960s, the TFR began to decline sharply. This abrupt change was observed among all social groups and in all sectors, both urban and rural, despite the absence of government policies to facilitate family planning. However, the pace and timing of the fertility decline differed among groups, and large regional variations persist. According to 1996 DHS data, the TFR ranges from a low of 2.1 lifetime births per woman in the state of Rio de Janeiro to a high of 3.1 per woman in the Northeast.* Ideal family size fluctuates less across regions, however (between 2.1 and 2.7 births per woman), and in the Northeast, reflects the national average of 2.3 births per woman.[4]

The 45.5 million inhabitants of Northeastern Brazil represent 29% of the country's population, and 46% of all rural residents. This is one of Brazil's poorest regions, exhibiting some of the lowest socio-economic indicators: The infant mortality rate is

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* The states of Maranhâo, Piauí, Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Alagoas, Sergipe and Bahia.

nearly twice the national average (74 infant deaths per 1,000 live births, compared with 39 per 1,000 nationally).[5] While the region is still marked by the highest TFR in the country, it has undergone the fastest relative fertility reduction over the past decade,[6] from 5.2 lifetime births per woman in 1986 to 3.1 per woman in 1996, a 40% drop. The distinct ethnic makeup of the Northeast includes a greater nonwhite population than the national average (74% vs. 56%). Thus, an analysis of adolescent fertility must be placed within this wider socio-economic and cultural context.

Adolescent Fertility

Adolescents generally display lower fertility rates than women in the middle of their reproductive years. This reflects the evolution of a woman's reproductive life cycle, with lower fecundity at the onset of the reproductive period and a lower risk of conception, given less-frequent sexual activity. However, in Northeastern Brazil, older women appear to take better advantage of family planning services than young women, with the result that the contribution of adolescent fertility to the TFR is increasing.

A portrait of the evolution in reproductive behaviour among our target population is presented in Table 3.1. There have been continuous increases from 1986 to 1996 in the proportion of adolescents who have ever engaged in sexual activity and who have ever used contraceptives. The percentages of adolescents who marry also increased, but at a slower pace, suggesting that marriage is not the dominant proximate determinant regulating teenage fertility.

Teenage fertility is greater both in absolute terms and in relative contribution in the Northeast than in the more highly developed Southeast region,† where contraceptive use is more widespread: Nearly 17% of female adolescents have already given birth in the Northeast, compared with 12% in the Southeast. Meanwhile, the adolescent contribution to overall fertility rose in each region over the prior decade, from 12% to 20% of all births in the year preceding the 1986 and 1996 DHS in the Northeast, and from 9% to 12% of all births in the Southeast (not shown).

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† The states of Rio de Janeiro, São Paulo, Minas Gerais and Espírito Santo.

Table 3.1: Percentage distribution of adolescent women aged 15-19, by measure of reproductive behaviour and socio-economic characteristics, according to region and year of survey, Brazil

Characteristic	Northeast			Southeast	
	1986 (N=382)	1991 (N=1,395)	1996 (N=752)	1986 (N=582)	1996 (N=1,036)
Age					
15-16	44.2	44.2	44.4	38.9	43.8
17-19	55.8	55.8	55.6	61.1	56.2
Education					
0-4	47.1	47.7	41.9	27.5	14.7
≥5	52.9	52.3	58.1	72.5	85.3
Place of residence					
Urban	62.4	64.4	69.4	81.6	88.5
Rural	37.6	35.6	30.4	18.4	11.5
Religion					
Catholic	83.6	80.0	82.7	75.1	74.7
Other/none	16.4	20.0	17.2	24.9	25.4
Race†					
White	u	20.7	24.2	u	48.2
Nonwhite	u	79.5	75.7	u	51.9
Watches TV weekly					
Yes	67.6	80.0	84.7	85.9	94.4
No	32.4	20.0	15.3	14.1	5.6
Ever gave birth					
Yes	12.3	11.0	16.6	8.8	12.3
No	87.7	89.0	83.1	91.2	87.7
Ever had intercourse					
Yes	19.9	22.4	30.4	16.1	32.0
No	80.1	77.6	69.6	83.9	68.1
Ever used contraceptives					
Yes	11.1	13.4	21.8	11.7	28.7
No	88.9	86.6	78.2	88.3	71.3
Ever in union					
Yes	14.9	16.9	19.0	11.9	14.6
No	85.1	83.1	81.0	88.1	85.4
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

† Race variable was not included in the 1986 Brazil DHS questionnaire.

Note: Data shown relate to characteristics reported at the time of survey and are weighted to reflect sampling procedures. U=unavailable.

Family Planning Practices

In Brazil, 94% of women of reproductive age living in union in 1996 used some method of family planning, and the vast majority of these women were using a modern contraceptive.‡ Evidence from the DHS suggests that contraceptive usage is widespread among adolescents, with 72% of sexually experienced adolescent girls reporting in 1996 that they had ever used contraceptives, a striking increase from the rate 10 years earlier (55%) among this age-group.

Among sexually experienced women aged 25-44, the most commonly used contraceptive methods are female sterilisation (41%) and the pill (19%). Among sexually experienced adolescents, the pill is the most prevalent method (27%), followed by the condom (10%). In the Northeast, the overall trends are similar, although the actual rates are lower (18% for the pill and 8% for the condom).

Despite these relatively high levels of contraceptive use, an unmet demand for family planning services seems to persist. Data from the 1996 DHS suggest that up to half of all births across the country are unplanned. In the Northeast, 51% of adolescents reported their last birth was unplanned. This marks a considerable increase from 40% in 1986, although birth spacing seems to be a greater issue among teenagers than family-size limitation.

While abortion is illegal except in cases of rape or when the pregnancy endangers the life of a pregnant woman, its practice is believed to be widespread, especially among young and low-income women. (Statistics are scarce and unreliable, however.) The Brazilian government has traditionally resisted developing formal population control policies, and has yet to implement a national family planning program. In recent years, though, certain family planning-related services have been incorporated into the country's maternal and child health program. In 1996, more than

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‡ Oral contraceptives, the IUD, the injectable, the implant, vaginal methods (foam, jelly or diaphragm), condoms and male or female sterilization.

two-thirds of adolescents in the Northeast who were practising contraception still relied on the private sector as their main source of family planning services.

Fertility Determinants

Which factors are most responsible for differentials in reproductive outcomes among adolescents? Aside from age distribution (which, as seen in Table 3.1, has not changed significantly in Northeastern Brazil over the decade), several explanatory variables have been identified in the literature and may be broadly classified according to either their socio-economic or cultural nature. One of the most consistent findings of analyses of fertility behaviour in developing countries, including Brazil, is a strong correlation between the level of women's education and fertility regulation.[7] Schooling of women is often viewed as an indicator of socio-economic development, and the variable is also negatively correlated with infant mortality, thus reducing overall demand for children. One longitudinal analysis of fertility patterns in Brazil identified education as a critical catalyst in the country's fertility transition.[8] In the Northeast, education has also been observed to be one of the most important fertility determinants among adult women.[9]

Among adolescents, while higher levels of education are associated with a lower probability of giving birth, the direction of causality is less clear. Adolescent girls may delay childbearing in order to complete their formal education, but teenage mothers may also be forced to leave school early upon having a child. In order to reduce the biases of selectivity, in our analysis we limited our educational categories to those with only primary schooling (0-4 years) and those who have at least some secondary schooling (five or more years). The proportion of female adolescents in the Northeast who had received at least some secondary schooling at the time of the survey has been rising, from 53% in 1986 to 58% 10 years later (Table 3.1). Nevertheless, compared with their counterparts in the Southeast, educational levels remain significantly lower in Northeastern Brazil, both in absolute terms and in the rate of increase.

Another socio-economic variable that emerges from the literature as an important influence on fertility behaviour is place of residence. Fertility levels are expected to be

lower in urban areas than in rural areas. This holds true for Brazil generally, where the TFR is 2.3 births per woman in urban areas and 3.5 per woman in rural areas. The Northeast is becoming increasingly urbanised, with the proportion of young women living in urban areas up seven percentage points between 1986 and 1996. This figure is similar to those observed in the Southeast, albeit at a lower absolute level.

On the other hand, differential patterns in reproductive behaviour that are not readily explained by socio-economic variables can often be attributed to the influence of cultural or ideational differences.[10] In Brazil, the mass media are believed to play a significant role in promoting social change with respect to attitudes about fertility and reproductive behaviours, especially given the country's linguistic homogeneity. Family planning is almost universally known, and is no longer a taboo topic in the mass media.

In a recent analysis of DHS data, access to the media was found to be the most important predictor of fertility among younger adult women (those aged 20-30 years) in the Northeast.[11] Among adolescent females, contraceptive knowledge reaches 99%, and 100% of sexually experienced teenagers are aware of at least one modern method. While there is no evidence of explicit messages that encourage women to limit childbearing, television programs, particularly Brazilian soap operas (telenovelas), disseminate images that might be interpreted to be supportive of lower fertility.[12] In Northeastern Brazil, nearly 85% of teenage girls watched television on a weekly basis in 1996, up 17 percentage points from 10 years earlier. The number of adolescent girls watching television weekly is even higher in the Southeast (94%).

Differences in fertility levels according to race and religious affiliation have been observed throughout the world. In particular, historical studies in North America suggested that Catholics have experienced relatively high fertility rates.[13] Brazilian society is predominantly Catholic, and more than 80% of young women in the Northeast are Catholic, compared to only 75% of female adolescents in the Southeast. However, the importance of the impact of religion on fertility outcomes in this group is uncertain. Previous research has also suggested that the Roman Catholic Church may have more influence on the Brazilian government's family

planning policies in relation to limiting service availability than it does in terms of discouraging fertility-limiting behaviour among its followers.[14]

Finally, the nonwhite population is larger in the Northeast than in the rest of the country: Some three-quarters of adolescents in the Northeast are nonwhite, compared with just over half in the Southeast. There is substantial socio-economic inequality between races in Brazil,[15] and race may be an important factor associated with access to reproductive health care for adolescents.[16] Our goal is to examine whether fertility differentials by race persist after socio-economic factors and other characteristics are taken into account.

3.2 Data and Methods

Data Sources

The 1986 *Pesquisa Nacional sobre Saúde Materno-Infantil e Planejamento Familiar* provided researchers with Brazil's first compilation of data on fertility and its major documented determinants.[17] For this nationally representative data set, interviews were conducted with 5,892 women aged 15-44. Among these, 1,792 resided in the Northeast -- 788 of them aged 15-24. (The results of this survey indicated a need for more investigation into ways of evaluating and improving the quality of family planning services, and also seemed to suggest that priority status should be granted to the Northeast.[18])

The *Pesquisa sobre Saúde Familiar no Nordeste Brasil* was conducted in the Northeast region alone in 1991.[19] A total of 5,695 women of childbearing age were interviewed, including 2,550 women aged 15-24.§ Finally, the *Pesquisa Nacional Sobre Demografia e Saúde*, conducted in 1996, provides the most recent information on fertility and family planning across Brazil, and particularly for the Northeast.[20] This survey included 1,861 women aged 15-24 who were living in the Northeast.

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§ The 1991 and 1996 surveys included women aged 15-49. To maintain comparability with the 1986 survey, the last five-year group has been excluded from this analysis.

Methodology

In this article, we draw on multilevel discrete time-hazard models to analyse trends and determinants of adolescent reproductive outcomes, using data from the three successive DHS surveys. Thanks to questionnaire similarities, individual-level results are generally comparable, bolstering time-trend analyses within a given age group. We focus on young women aged 15-19 at the time of each survey. We also draw on the experiences of women aged 20-24 in each survey, to examine those who have recently completed their adolescence.

Furthermore, the surveys' two-stage cluster sampling techniques, based on random subsamples of households and districts from the national statistics bureau, allow us to evaluate the independent random effects of community influences. Many previous statistical analyses have assumed that individual observations are independent. However, for samples selected in two stages, such as the DHS, there tends to be a certain correlation between observations within clusters: Individuals from the same cluster are expected to be more alike in terms of characteristics and behaviours than those selected from different clusters. As a result, the standard errors may have been underestimated. We thus employ multilevel analysis, considered more appropriate for this type of hierarchically clustered sampling.

Discrete-time hazard models (in multilevel form) estimate the probability of an adolescent having a first birth. This approach allows considerable flexibility in handling time-varying covariates (in particular, a woman's age).[21] Another advantage of discrete-time hazard models is that they allow us to fit censored observations (that is, women aged 15-19 who had not yet completed adolescence at the time of the survey), as well as those for women aged 20-24 years.

The model is essentially a logistic regression, with the dependent variable being the log odds of a woman having had a first birth at age *t* (*t*=15, 16, 17, 18 or 19).** As such, we have created a variable that indicates with repeated measures whether a

** The few births to even younger mothers were counted as having occurred to 15-year-olds.

first birth occurred at each given age of exposure. Once the event occurs, the woman is removed from the model. For example, a woman aged 20 at the time of the survey who first gave birth when she was 17 contributes to three observations: two indicating that she did not give birth at either age 15 or 16, and one indicating that the event occurred at age 17. If the observation is censored (for example, the case of an adolescent currently aged 17 who has never given birth), she contributes to two observations, indicating the event did not occur at age 15 or 16.

We then estimate the effect of a specific covariate while controlling for a series of other factors that are assumed to influence the response variable.†† We have included a number of demographic and cultural variables in our model that are likely to influence adolescent fertility behaviour: age, place of residence, education, religion, mass media exposure and, where available, race. We estimated parameters using the software package *MLn*, which allows four different procedures for nonlinear multilevel modeling.[22] Our analysis uses the second-order predictive quasi-likelihood (PQL) procedure, which produces more reliable estimates for this type of modeling.[23] Our results are expressed in terms of cumulative probabilities.‡‡

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†† Our multivariate model may be written as: $\log(h_{tij}/1-h_{tij})=\alpha_t+x'_{ij}ß+\mu_j$ with $h_{tij}=P\{y_{tij}=1 \mid y_{kij}=0, k<t\}$. We can define y_{tij} to be the binary response at age t (t=15-19, in completed years) of woman i having a first birth in cluster j, where y_{tij} is equal to one if the woman has her first child at age t, and is equal to zero otherwise. We can thus let h_{tij} be the conditional probability that y_{tij} is equal to one (given that it did not equal one at any previous time). In standard notation, α_t is a function of age (a time-varying variable), x_{ij} the covariates vector and ß its corresponding parameters vector. The remaining term in the equation, μ_j, expresses the variation across clusters (itself independent of the baseline hazard across individuals).

‡‡ The expected cumulative probability of a woman i in a cluster j having a first birth at age t can be estimated as follows: $h_{tij}=\exp(\alpha_t+x'_{ij}ß+\mu_j)/(1+\exp(\alpha_t+x'_{ij}ß+\mu_j))$. The cluster-level random parameter is assumed to be normally distributed, with mean zero and variance σ^2. Based on these results, we can estimate the probability that the event does not occur before time t. This probability is represented by: $\hat{S}_{tij}=_{k=1}\prod^{t-1}(1-h_{tij})$. We can now calculate the cumulative probability that the event occurs, defined as follows: $\hat{Y}_{tij}=1-\hat{S}_{tij}$. In order to calculate the effect of a specific covariate on the cumulative probability, the others are held at their mean.

3.3 Results

Bivariate Analysis

As expected, there are acute differentials by educational status in the probability of having a first birth during adolescence, a trend that has continued over time (Table 3.2). For young women aged 15-19, the probability of a birth among the less-educated is consistently at least twice that of their more educated counterparts. This also holds true with respect to women aged 20-24 at the time of the survey. In addition, urban teenagers are less likely to have ever given birth than are rural adolescents. Although the direction of the differential is consistent over time, its magnitude does not appear to be as important as that of educational attainment.

Mass media exposure, as measured through television-viewing habits, also appears to effect adolescent fertility. Young women who watch television often are consistently less likely than those who do not to have had a first birth before age 20. Nonwhite adolescents typically demonstrate higher fertility than whites. There is no consistent trend by religious affiliation: Differentials between Catholic adolescents and non-Catholic teenagers vary in direction and magnitude over 10 years.

Results from the Multivariate Models

The multivariate multilevel discrete-time hazard models make it possible to distinguish between structural effects (effects pertaining to the age composition of the population), individuals' formative characteristics (factors of a socio-economic or cultural nature) and community effects (cluster-level variances) (Table 3.3).

We applied the model separately to the data sets for 1986, 1991 and 1996 (Model 1). Our results show that education is most strongly associated with delayed childbearing among adolescents in Northeastern Brazil. It is the only descriptive variable (other than a woman's age) that consistently exercises a negative independent influence on the probability of having a first birth during adolescence, and is statistically significant ($p<.01$) for all three periods.

Table 3.2: Percentage of adolescent and young adult women having had a first birth before age 20, by selected characteristics and current age-group, according to survey year, Northeastern Brazil

Characteristic	1986	1991	1996
ADOLESCENT (15-19)			
Education			
0-4	18.9	14.9	26.1
≥5	5.9	7.4	10.1
Place of residence			
Urban	10.5	10.5	15.2
Rural	15.3	11.9	20.9
Religion			
Catholic	11.6	10.3	17.7
Other/none	15.9	13.9	13.2
Race			
White	u	10.4	15.4
Nonwhite	u	11.1	17.2
Watches TV weekly			
Yes	8.5	9.4	14.9
No	20.2	17.2	27.0
YOUNG ADULT (20-24)			
Education			
0-4	54.0	47.1	46.7
≥5	24.8	21.9	24.7
Place of residence			
Urban	34.7	28.7	30.1
Rural	46.8	43.0	41.2
Religion			
Catholic	36.0	32.7	33.5
Other/none	60.6	35.2	32.1
Race			
White	u	28.6	28.9
Nonwhite	u	34.6	34.9
Watches TV weekly			
Yes	33.5	30.5	32.3
No	49.2	41.8	40.5

Note: Data shown relate to characteristics reported at the time of survey and are weighted to reflect sampling procedures.
u=unavailable.

When we examine cumulative probabilities for individual-level determinants ever found to exercise a statistically significant effect on adolescent fertility (Table 3.4), we find that the magnitude of the impact of educational status has remained relatively stable over time. An adolescent with only primary schooling at the time of the survey is more than twice as likely to have had a first birth as is one with a secondary or higher education, even after the effects of time period, age or other economic and cultural characteristics are taken into account.

Differentials by religious affiliation seem to have become attenuated over time: After controlling for other characteristics, we find that in 1991 and 1996, the difference between Catholics and non-Catholics, which had been important in 1986, was no longer statistically significant. A similar pattern is observed with regard to mass media exposure. While the difference was significant (at $p<.05$) in 1986 and 1991 and in the expected direction (lower fertility among adolescents who watch television regularly), by 1996 there were no major differentials by media exposure.

The cumulative effect of place of residence is not significant across all three periods. Similarly, race does not seem to exercise an independent effect in the two DHS surveys that measured this characteristic (1991 and 1996). It seems that other economic and demographic factors, particularly education, largely capture any observed fertility differentials between urban and rural or between white and nonwhite adolescents in Northeastern Brazil (results not shown).

The results of these hazard models seem to be generally robust in explaining fertility differentials over time. For comparison, we created an additional model with pooled information from all three DHS data sets (Table 3.3, Model 2). In terms of the relative impact of our explanatory variables (excluding race) on the probability that an adolescent would have a first birth, this model revealed tendencies similar to those of the previous models based on individual survey data. Again, an examination of cumulative probabilities (Table 3.4) indicates that education was the only variable to consistently affect rates of adolescent fertility, and at a magnitude similar to those previously calculated.

Table 3.3: Estimated coefficients from multilevel discrete-time hazard models showing the risk of having a first birth at ages 15-19, Northeast Brazil

Variables	Model 1			Model 2
	1986	1991	1996	Pooled data
Intercept	-0.63	-1.35	-1.81	-0.66** (1986) -1.35** (1991) -1.82** (1996)
Age				
15	-1.51**	-1.19**	-0.57**	-0.57**
16	-1.58**	-1.19**	-0.57**	-0.57**
17	-0.89**	-0.38**	-0.12	-0.12
18	-0.67**	-0.06**	-0.14	0.14
19	ref	ref	ref	ref
Education				
0-4	ref	ref	ref	ref
≥5	-1.18**	-1.00**	-1.01**	-1.03**
Religion				
Other/none	ref	ref	ref	ref
Catholic	0.57**	-0.19	0.02	0.02
Watches TV weekly				
No	ref	ref	ref	ref
Yes	-0.08*	-0.33**	-0.17	0.02
Religion-period interaction				
Catholic-1986	na	na	na	-0.59**
Catholic-1991	na	na	na	-0.21
Watches TV-period interaction				
Yes-1986	na	na	na	-0.17
Yes-1991	na	na	na	-0.34*
Random parameter				
Cluster-level	0.15	0.23**	0.11	0.14 (1986) 0.23* (1991) 0.11 (1996)

Source: Demographic and Health Surveys, women aged 15-24.
*p<.05. **p<.01. *Note:* na=not applicable.

The overall effects of religion and mass media exposure were not consistently significant over time. Interactions between time and religion (Table 3.3) seem to confirm the waning influence of religious affiliation between 1986 and 1996. The relative effect of mass media exposure now appears to be fluctuating, as we observe differentials in the significance of its influence over time (i.e., it was significantly different from 1996 only in 1991). In-depth ethnographic studies currently being conducted in Brazil on the impact of television on reproductive behaviour (and specifically among adolescents) may help shed some light on this trend.[24] No independent effect of place of residence is observed across time (results not shown).

Table 3.4: Cumulative probability of having a first birth at age 15-19, by year of survey, according to selected characteristics, Northeast Brazil

Characteristic	1986	1991	1996
MODEL 1			
Education			
0-4 years	0.48	0.40	0.48
≥5 years	0.20	0.18	0.22
Religion			
Catholic	0.29	0.24	0.30
Other/none	0.44	0.28	0.29
Watches TV weekly			
Yes	0.30	0.24	0.30
No	0.32	0.31	0.29
MODEL 2			
Education			
0-4 years	0.41	0.41	0.41
≥5 years	0.18	0.18	0.18
Religion			
Catholic	0.26	0.26	0.27
Other/none	0.41	0.31	0.26
Watches TV weekly			
Yes	0.36	0.24	0.27
No	0.41	0.31	0.26

Source: Demographic and Health Surveys, women aged 15-24.

Moreover, we observed significant random effects at the cluster level for the two most recent surveys ($p<.05$ in 1991 and $p<.10$ in 1996), which point to the likelihood of unexplained community influences on fertility behaviour. This suggests the existence of additional factors (unobserved or unobservable) conditioned by geographic boundaries that may affect the likelihood that an adolescent will give birth.

3.4 Discussion

Education is the covariate that has been most strongly and consistently associated with delayed childbearing among adolescents in Northeastern Brazil between 1986 and 1996. Fertility differentials by other socio-economic and cultural traits either are nonsignificant (such as place of residence and race), or are fluctuating and dissipating over time (such as mass media exposure and religion).

At the same time, the independent random variance observed in our multilevel framework at the cluster level in more recent years suggests that unobserved contextual variables might influence individual fertility behaviour. Such evidence points to the need for more research into the impact of community facilities: The possibilities include the availability and accessibility of family planning services targeting teenagers. Unfortunately, there is a void of systematic studies into the role of the health sector in Brazil's fertility transition.[25] We recommend that contextual variables be examined in greater depth in future research drawing on independently collected community-level data.

It has been argued that postponement of first birth and marriage appears to be the most viable means for continuing fertility decline in Brazil and Latin America.[26] As sexual activity increasingly begins at younger ages, improved contraceptive accessibility and higher levels of method use would also be a prerequisite for delayed childbearing.

Finally, there is a need for further research into patterns of union formation, both formal and informal, among adolescents and the impact of union on childbearing (keeping in mind the difficulties in tracing a causal relationship). Teenagers may opt for early marriage precisely because of a pregnancy: According to 1996 DHS data, nearly a quarter of all first births to teenagers living in union in Northeast Brazil occurred within the first seven months of marriage. At the same time, unplanned births are more common among never-married teenage mothers (61% in 1996) than among those who have ever been married (34%) or who ever lived in a common-law union (54%). Moreover, the likelihood of union dissolution is significantly greater in consensual unions than in formal marriages. The interactions between these events and socio-economic and cultural characteristics, as well as the implications for single teenage mothers, merit further exploration.

Résumé

Contexte: Une bonne partie du déclin enregistré récemment au niveau de l'indice synthétique de fécondité du Brésil l'a été parmi les femmes ayant atteint le milieu de leur vie reproductive. En revanche, la contribution de la fécondité des adolescentes (15 à 19 ans) à cet indice augmente avec le temps, la tendance étant particulièrement accentuée dans la région du nord-est du pays.

Méthodes: Les données de trois Enquêtes démographiques et de santé menées dans le nord-est du Brésil en 1986, 1991 et 1996 servent à l'examen des tendances et facteurs déterminants de la fécondité des adolescentes de la région. Des modèles de risque discrets sont utilisés pour évaluer la probabilité pour une femme de connaître une première maternité en cours d'adolescence, ainsi que pour évaluer les facteurs individuels et environnementaux aptes à influencer les choix personnels de fécondité.

Résultats: Le niveau d'instruction d'une jeune femme représente le facteur le plus fortement et le plus uniformément associé à la probabilité de maternité en cours d'adolescence. En particulier, les adolescentes scolarisées au niveau primaire seulement sont plus de deux fois plus susceptibles d'avoir connu une première maternité que celles ayant bénéficié d'une instruction secondaire au moins, même après application des contrôles d'âge, de période et d'autres caractéristiques. L'affiliation religieuse et l'exposition aux médias ne semblent pas affecter uniformément la fécondité des adolescentes avec le temps dans l'analyse multivariée.

Conclusions: La promotion de l'éducation pourrait offrir le moyen le plus efficace de favoriser le recul de la maternité parmi les adolescentes du nord-est brésilien. Il serait utile d'approfondir la recherche relative à l'incidence sur la fécondité des adolescentes des solutions communautaires (les programmes de planning familial et de santé, notamment) ciblant spécifiquement leur groupe d'âges.

Resumen

Contexto: La mayor parte de la disminución reciente de la tasa global de fecundidad en el Brasil se debe a las mujeres que se encuentran en el período medio de su edad reproductiva. En forma inversa, está en aumento la proporción de la fecundidad total que corresponde a las adolescentes (las entre 15 y 19 años de edad). Esta tendencia es particularmente acentuada en la región del Nordeste brasileño.

Métodos: Se han utilizado datos del Nordeste brasileño de tres Encuestas Demográficas y de Salud realizadas en 1986, 1991 y 1996, con el fin de examinar las tendencias y los determinantes de la conducta de fecundidad entre las adolescentes de la región. Se utilizaron modelos de riesgo de tiempo discreto para estimar la probabilidad que tiene una mujer de tener su primer embarazo durante su período de adolescencia, y para evaluar los factores individuales y ambientales que pueden influenciar los deseos personales de fecundidad.

Resultados: El nivel de educación de la mujer joven es el factor que está más sólida y coherentemente relacionado con la probabilidad de que una mujer dé a luz durante la adolescencia. En particular, una adolescente que no tenga más que estudios de enseñanza primaria tiene más del doble de probabilidades de haber dado a luz que una adolescente que tenga por lo menos enseñanza secundaria, aún después de controlar por variables tales como la edad, el período de tiempo y otras características. En el análisis de variables múltiples no se registró un efecto congruente con respecto a la afiliación religiosa o a la exposición a los medios de comunicación.

Conclusiones: La promoción de la educación puede ser el medio más eficaz para alentar a las adolescentes del Nordeste brasileño a postergar su primer alumbramiento. Deben realizarse mayores estudios de investigación con respecto al impacto que producen en la fecundidad de las adolescentes, los programas de la comunidad, especialmente los de salud y de planificación familiar que centran su atención en la población de adolescentes.

References

1. Arruda JM et al., *Pesquisa Nacional sobre Saúde Materno-Infantil e Planejamento Familiar-Brasil, 1986*, Rio de Janeiro, Brazil: Sociedade Civil Bem-Estar Familiar no Brasil (BEMFAM), 1987; and BEMFAM, *Pesquisa Nacional Sobre Demografia e Saúde, 1996*, Rio de Janeiro, Brazil: BEMFAM/Programa de Pesquisas de Demografia e Saúde (DHS), Macro International, 1997.

2. Yinger N et al., *Adolescent Sexual Activity and Childbearing in Latin America and the Caribbean: Risks and Consequences*, Washington, DC: Population Reference Bureau, 1992.

3. Wulf D and Singh S, « Sexual activity, union and childbearing among adolescent women in the Americas, » *International Family Planning Perspectives*, 1991, 17(4): 137-144.

4. BEMFAM, 1997, op. cit. (see reference 1).

5. Ibid.

6. Martine G, « Brazil's fertility decline, 1965-95: a fresh look at key factors, » *Population and Development Review*, 1996, 22(1): 47-75.

7. Martin TC and Juarez F, « Women's education and fertility in Latin America: exploring the significance of education for women's lives, » paper presented at the 22nd general conference of the International Union for the Scientific Study of Population (IUSSP), Montreal, Canada, Aug. 24-Sept. 1, 1993; Robey B, Rutstein SO and Morris L, « The reproductive revolution: new survey findings, » *Population Reports*, 1992, Series M, No. 11; Rutenberg N et al., « Knowledge and use of contraception », *Demographic and Health Surveys, Comparative Studies No. 6*, Columbia, MD, USA: Institute for Resource Development/Macro International, 1991; and Silva NV, Henriques MH and de Souza A, « An analysis of reproductive behavior in Brazil, » *Demographic and Health Surveys Further Analysis Series*, No. 6, São Paulo, Brazil, 1990.

8. Lam D, Sedlacek G and Duryea S, « Increases in education and fertility decline in Brazil, » paper presented at the annual meeting of the Population Association of America, Cincinnati, OH, USA, Apr. 1-3, 1993.

9. Wong LR, « A queda da fecundidade no Nordeste: uma aproximação aos determinantes, » in: BEMFAM, *Fecundidade, Anticoncepção e Mortalidade Infantil*, Rio de Janeiro, Brazil: BEMFAM, 1994, pp. 9-36.

10. Cleland J and Wilson C, « Demand theories of the fertility transition: an iconoclastic view, » *Population Studies*, 1987, 41(1): 5-30.

11. Wong LR, 1994, op. cit. (see reference 9).

12. Faria VE, « Políticas de governo e regulação da fecundidade: consequências não antecipadas e efeitos perversos, » *Revista de Ciência Hoje*, 1989, pp. 62-103; Martine G, « Population in Brazil: agenda for a country strategy, » prepared for the John P. and Catherine T. MacArthur Foundation, Brasilia, Brazil, 1990; and Potter JE et al., « The spread of television and fertility decline in Brazil: a spatial-temporal analysis, 1970-1991, » paper presented at the 23rd general conference of the IUSSP, Beijing, Oct. 11-17, 1997.

13. Potts M and Selman P, *Society and Fertility*, Estover, Plymouth, UK: Macdonald and Evans, 1979; and Henripin J, « Tableaux sur l'évolution séculaire de la fécondité, » in: Henripin J and Martin Y, eds., *La Population du Québec d'hier à Demain*, Montréal, Canada: Les Presses de l'Université de Montréal, 1991.

14. Leite IC, « The determinants of contraceptive choice in northeast Brazil, 1991, » paper presented at the annual meeting of the Population Association of America, Washington, DC, Mar. 27-29, 1997.

15. Wood C and de Carvalho JAM, *The Demography of Inequality in Brazil*, Cambridge, UK: Cambridge University Press, 1988.

16. Miranda-Ribeiro P, « Teenage sexuality, reproductive behavior, and access to health care in northeast Brazil, » in Associação Brasileira de Estudos Populacionais, *Anais do IX Encontro de Estudos Populacionais*, Vol. 3, Caxambu, Brazil, 1994.

17. Arruda JM et al., 1987, op. cit. (see reference 1).

18. Arruda JM, « Impacto de la pesquisa DHS en el Brasil, » in *Proceedings of the Demographic and Health Surveys World Conference*, Vol. III, Columbia, MD, USA: Institute for Resource Development/Macro International, 1991, pp. 1903-1931.

19. Ferraz EA, Ferreira IQ and Rutenberg N, *Pesquisa sobre Saúde Familiar no Nordeste Brasil 1991*, Rio de Janeiro, Brazil: BEMFAM, 1992.

20. BEMFAM, 1997, op. cit. (see reference 1).

21. Allison PD, « Discrete-time methods for the analysis of event histories, » in Leinhardt S, ed., *Sociological Methodology*, San Francisco, CA, USA: Jossey-Bass, 1982, pp. 61-98.

22. Rasbash J and Woodhouse G, *MLn Command Reference*, London: Institute of Education, University of London, 1996.

23. Rodriguez G and Goldman N, « An assessment of estimation procedures for models with binary responses, » *Journal of the Royal Statistical Society (Series A),* 1995, 158(1):73-89.

24. Potter J et al., « The social impact of television on reproductive behavior in Brazil, » unpublished project status report to The Rockefeller Foundation, 1998.

25. Martine G, 1996, op. cit. (see reference 6).

26. Wulf D and Singh S, 1991, op. cit. (see reference 3).

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IV. Sexual Initiation and Contraceptive Use among Adolescent Women in Northeast Brazil

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Abstract:

To estimate trends and determinants of sexual initiation and contraceptive use among adolescent women in Northeast Brazil, multivariate logistic hazard models are used that draw on data from three Demographic and Health Surveys conducted there between 1986 and 1996. Educational attainment is among the variables found to be associated most consistently with differential risk of engaging in first intercourse during adolescence, including premarital intercourse, and of contraceptive use during sexual initiation. Greater frequency of attending religious ceremonies and greater exposure to television are also associated with lower rates of sexual initiation and higher use of contraception. Seemingly diminishing returns of education on delayed sexual activity may help explain, in part, observed increases in the absolute level of adolescent sexual experience across survey periods, however. Multilevel modelling techniques pointing to the existence of cluster-level random variances underline the need for further research into community influences on individual sexual activity.

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Sexual Initiation and Contraceptive Use among Adolescent Women in Northeast Brazil

Sexual activity, especially premarital activity, among adolescent women is becoming increasingly prevalent in Brazil. Results from the Demographic and Health Surveys (DHS) reveal that the incidence of adolescent sexual experience has jumped by more than 50 percent over the period 1986-96, from 19 percent to 33 percent among women aged 15-19. Greater urbanisation and exposure to mass media, together with the declining influence of the Catholic Church, are accompanied by greater sexual freedom for today's teens than their counterparts of even a decade earlier had practised.

Young women's early experience of sexual intercourse raises fundamental concerns about their health and social development. Unprotected intercourse is associated with the risks of acquiring sexually transmitted diseases and of experiencing an unintended pregnancy along with the potential consequences of either clandestine abortion or higher rates of maternal and child morbidity and mortality should the woman choose to bear the child. Early childbearing has also been linked to truncated educational opportunities and lower levels of future family income (see Jones et al., 1986; Menken, 1980; Senderowitz and Paxman, 1985; Voydanoff and Donnelly, 1990; Wulf and Singh, 1991; Yinger et al. 1992). According to the 1996 Brazil DHS, 18 percent of female adolescents (defined here as those aged 15-19) already have become pregnant at least once. Moreover, this trend is particularly evident in the country's Northeast, a region of low socio-economic development. In this region, the figure reaches an estimated 21 percent, despite nearly universal knowledge of modern contraceptive methods.

The need is pressing for a better understanding of the relationships between reproductive behaviour and the characteristics of individuals, as well as of the implications for the health and future of adolescents and related intervention programming. Although Brazil experienced a rapid fertility decline in past decades,

much of the decrease was observed among women in the middle of their reproductive years. The proportional contribution of adolescent fertility to the total fertility rate (TFR) has been increasing over time (Arruda et al. 1987; BEMFAM 1997). A lag in adolescent fertility decline, compared with the overall decline in the TFR, has been observed generally throughout Latin America. Adolescents have taken less advantage than older women of family planning services (Yinger et al. 1992). DHS data reveal that, in Brazil's Northeast region, the percentage of all births (among women aged 15-44)[A] to adolescents rose from 12 percent in the year preceding the 1986 survey to 20 percent ten years later. Meanwhile, the adolescent population remained stable for both periods at 24 percent of all women of reproductive age. Trends and determinants in adolescent sexual activity in Northeast Brazil are examined here using empirical data from three successive DHS conducted in the region in 1986, 1991 and 1996.

4.1 Background

Adolescent Sexual and Reproductive Behaviour

Socio-economically, Northeast Brazil is one of the poorest of the country's regions.[B] The adult literacy rate is significantly lower than the national average (61 percent versus 85 percent), as is the proportion of households with running water (54 percent compared with 85 percent). The infant mortality rate is 74 deaths per thousand live births, as opposed to 48 per thousand for the country as a whole. The region is also marked by the highest TFR: 3,1 children per woman of reproductive age in 1996, compared with 2,5 children nationally (BEMFAM 1997). Although the Northeast has experienced the fastest relative fertility reduction over the past two decades (Martine 1996), fertility rates have actually increased among adolescents: According to DHS

A In the present analysis, women's reproductive span refers to the 15-44 years interval, following the definition retained in the 1986 Brazil DHS. Although the 1991 and 1996 surveys included women aged 15 to 49, the last quinquennial group has been excluded from consideration here to maintain comparability with the findings from 1986.

B See for example, Baer (1995) and Wood and Carvalho (1988) for historical accounts of the sharp regional inequalities that have characterised Brazil from the colonial period to the present.

data, the proportion of teenage girls who ever gave birth rose from 12 percent to 17 percent over the period 1986-96.

This trend has been accompanied by a jump in the reported incidence of sexual activity among women aged 15-19, from 20 percent to 30 percent during the same period. This increase of 10 percentage points has been smaller than that observed in the more prosperous Southeastern region,[X] where sexual initiation among adolescent women has jumped by 16 points (from 16 percent to 32 percent). Rates of union formation, although increasing, have not kept pace with those of sexual activity. The proportion of adolescent women who entered into union increased from 15 percent to 19 percent over the period 1986-96 in the Northeast and from 12 percent to 15 percent in the Southeast.

Over time, the propensity for girls to engage in premarital sexual relations has become the norm -- from just over half (56 percent) of all first experiences in the Northeast in 1986 to an overwhelming majority (86 percent) in 1996 (see Table 4.1). The figures are even higher for the Southeast. At the same time, fertility outcomes remain lower in the latter region: 12% percent of adolescent girls reported ever having given birth in 1996, up from 9 percent ten years earlier (not shown). This increase occurred despite knowledge of family planning methods, which DHS results show as being virtually universal across the country.

In addition to rapidly increasing rates of adolescent sexual activity, several aspects of first sexual experience evolved considerably over the decade of observation. Fewer teenage women in the Northeast list their spouses as their first sexual partner (from 31 percent down to 19 percent). Although some premarital relations probably occur with men they will marry eventually, the choice of first sexual partner and the timing of the experience can affect the way young women are viewed by their parents, peers and society, because the social customs of the region generally discourage women from having sexual relations before marriage (Bastos 1989; Henriques et al. 1989).

X Much attention has been paid in the literature to disparities between the poverty-stricken Northeast and the more affluent Southeast, the two most populous regions of Brazil that together represent more than 70 percent of the country's 158 million inhabitants.

Table 4.1: Percentage distribution of sexually experienced adolescent women (15-19), by reported aspects of their first intercourse, Northeast and Southeast Brazil, 1986, 1991 and 1996

	Northeast			Southeast	
	1986	1991	1996	1986	1996
	(N=86)	*(N=318)*	*(N=315)*	*(N=84)*	*(N=213)*
First intercourse was premarital					
Yes	56	72	86	69	98
No	44	28	14	31	2
Relation to first sexual partner					
Husband/Partner	31	31	19	26	8
Fiancé/Boyfriend	69	67	74	71	88
Other [a]	0	2	6	3	5
Used contraceptive					
Yes	6	20	21	24	48
No	94	80	79	76	52
Method used					
Pill	(33)	38	33	54	21
Condom	(0)	33	48	8	51
Other [b]	(67)	30	20	38	28
Reason for not using a method					
Didn't expect to have sex	17	18	20	36	39
Didn't know methods/sources	30	22	24	32	13
Wanted a child	18	8	6	14	7
Not important/Didn't care	11	44	34	4	29
Other [c]	24	8	16	15	12

Note: Figures in parentheses based on sample of fewer than 20 cases.

[a] Other responses include: friend, relative, stranger, recent acquaintance, rape, don't remember/don't know.

[b] Other contraceptive methods include: injectables, vaginal methods, periodic abstinence, and withdrawal.

[c] Other reasons may be: fear of side effects, perceived infertility, considered use partner's responsibility, religious beliefs, and don't know.

Source: Demographic and Health Surveys (weighted).

The practise of contraception more than tripled in the Northeast in ten years (from 6 percent to 21 percent). Condom use during first sexual experience warrants special attention, in light of the spread of sexually transmitted diseases and the AIDS epidemic. Once negligible, condom use had become widespread by 1996 and was the choice of nearly half of adolescents surveyed who had used a method. Among those refraining from contraceptive use, ignorance of methods or sources at the time of first intercourse is declining, as is the desire to have a child. On the other hand, adolescents more commonly attribute a lack of importance to such protection, a finding that underlines the need to improve education in reproductive health. Indeed, teens' understanding of human reproduction is poor, as is indicated by the low proportion of adolescent women (14 percent) who can identify the fertile period in the menstrual cycle correctly, a proportion that remained constant between 1986 and 1996.

As regional differences in rates of teenage sexual initiation persist, so do the characteristics of first sexual encounters. The likelihood of the first sexual experience occurring before marriage is distinctly higher in the more economically developed Southeast region, where it has become virtually universal (98 percent in 1996), and seemingly more spontaneous (as is indicated by the consistently higher proportion of young women who reported as the reason for their failure to use a contraceptive that they did not expect their first intercourse to occur when it did). Adolescents in the Southeast, however, are substantially more likely to use a contraceptive during their first experience (48 percent reported doing so in 1996). This use is accompanied by a better understanding of the human reproductive cycle: 30 percent of adolescent women in the Southeast correctly identified the timing of ovulation in the menstrual cycle in the 1996 DHS questionnaire, up from 24 percent a decade earlier.

Characteristics of Adolescent Women

In a context of widespread premarital sexual activity, risk of exposure to intercourse tends to be highly associated with age, increasing steadily from the onset of menarche through marriage. Several other socio-demographic and behavioural traits have also been identified in the literature as affecting, to a certain degree, outcomes

in behaviour related to reproduction. We can examine the evolution of such characteristics as a prelude to modelling the independent effects of these variables on the probability of sexual initiation and contraceptive use during adolescence.

First, we can assume that the trend toward increasing adolescent sexual activity observed in Northeast Brazil over the decade 1986-96 is not highly affected by the age structure of this group, which has not changed greatly (as shown in Table 4.2). On the other hand, obvious progress has been made in the area of education; the proportion of adolescent women who have completed at least five years of schooling rose five percentage points during the decade, from 53 percent to 58 percent. The level and pace of educational attainment for girls remains well below that found in the Southeast (where it increased 13 percentage points, from 72 to 85 percent), however. A strong correlation between women's education and reduced fertility and increased contraceptive use is shown consistently in the literature on reproductive behaviour in developing countries (see, for example, Martin and Juarez 1995; Robey et al. 1992; and Rutenberg et al. 1991), as well as in studies of Brazil (see Lam et al. 1993;Silva et al. 1990; and Wong 1994).

Urbanisation rates are also increasing among adolescents in the Northeast region, in terms of both current and childhood place of residence, although these levels are also lower than those observed among their Southeastern counterparts. In 1996, 89 percent of women 15-19 lived in urban areas in the Southeast, compared with less than 70 percent in the Northeast.

With regard to ethnocultural traits, Brazil is an overwhelmingly Catholic society. In the Northeast, more than 80 percent of adolescents are Catholic. Fewer than two-thirds of these young women can be considered strongly religious, however, in terms of the number who attend religious ceremonies at least monthly.

Table 4.2: Percentage distribution of adolescent women (15-19) surveyed, by selected characteristics, Northeast Brazil, 1986, 1991 and 1996

	1986 *(N=443)*	1991 *(N=1,418)*	1996 *(N=1,032)*
Age			
15-16	44	44	44
17-19	56	56	56
Education (years)			
0-4	47	48	42
5+	53	52	58
Residence			
Urban	62	64	69
Rural	38	36	31
Childhood residence			
Urban	59	59	64
Rural	41	41	36
Religious affiliation			
Catholic	84	80	83
Other/none	16	20	17
Attends religious ceremonies at least monthly			
Yes	58	56	61
No	42	44	39
Watches television weekly			
Yes	68	80	85
No	32	20	15
Household owns television set			
Yes	48	57	48
No	52	43	52
Household has running water			
Yes	41	60	58
No	59	40	42
Household has toilet facility			
Yes	37	60	61
No	63	40	39

Source: Demographic and Health Surveys (weighted).

Regular television viewing, as an indicator of exposure to the influence of the mass media, is becoming increasingly widespread in the Northeast. In 1996, 85 percent of adolescents surveyed reported that they watch television on a weekly basis in 1996, up from 68 percent ten years earlier. At the same time, television viewing remains less prevalent in the Northeast, compared with the Southeast, where 94 percent of adolescents surveyed said that they watched regularly in 1996. Television programming for Brazil's linguistically homogenous populations, particularly the highly popular soap operas (*telenovelas*), has been credited with playing a substantial role in promoting ideological change with respect to reproductive behaviour by portraying lifestyles that favour delayed childbearing and smaller families.[Δ]

A substantially greater proportion of adolescents watch television regularly than live in a household that owns a set. Although ownership of a television depends upon other household characteristics related to socio-economic status, notably access to electricity, television programs can be seen in a number of locations, and therefore, viewing is less strongly correlated with household status than is ownership.

Sharp increases can be noted in certain other indicators of household economic status, such as the proportion of adolescents in the Northeast having access to indoor running water and toilet facilities. By 1996, fewer than 40 percent of those surveyed lived in a household lacking a toilet (that is, in households where human waste was disposed of in a traditional pit, bush or elsewhere), whereas ten years earlier, the opposite was true: 63 percent lived in a household with no toilet.

4.2 Data and Methods

The data used in the analysis presented here are drawn from three Demographic and Health Surveys carried out over the period 1986-96 in the nine states that together form the Northeast region of Brazil. The focus here is on trends and determinants of the

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Δ Faria's (1989) theory of the indirect effects of nationwide penetration of telecommunications on reproductive outcomes in Brazil spawned much interest and research on the impact of television in this society.

probability of an adolescent (aged 15-19) girl's ever engaging in sexual activity and of her using a contraceptive during sexual initiation. Because the histories of these women are incomplete, the experiences of young adults aged 20-24 (that group of women who most recently completed their teen years) are included.

The 1986 *Pesquisa Nacional sobre Saúde Materno-Infantil e Planejamento Familiar* (PNSMIPF) provides the first data set for behaviour related to reproduction and its major documented determinants, considered nationally representative at a 95 percent level (Arruda et al. 1987). Of the total sample of 5,892 women of reproductive age (15-44), among those interviewed in the Northeast, 788 were aged 15-24. The follow-up *Pesquisa sobre Saúde Familiar no Nordeste Brasil* (PSFNe) was conducted in the Northeast region alone in 1991, with findings considered representative of its population (Ferraz et al. 1992). Data were collected from personal interviews with 5,695 women of childbearing age, including 2,550 in the youngest brackets (15-24). Another national survey was conducted in 1996, the *Pesquisa Nacional Sobre Demografia e Saúde* (PNDS), providing the most recent information on fertility and family planning for the country and in particular for the Northeast (BEMFAM 1997). These data cover 1,861 women aged 15-24 interviewed in the Northeast region.

Fortunately, as a result of the similarity of the questionnaires, the individual-level results from these survey data sets are readily comparable. This circumstance presents a distinct advantage in analysing time-trends within a given age group over retrospective studies, which tend to be more highly susceptible to recall errors. By limiting the focus on the youngest cohorts, we may minimise the damaging bias of date omission, more frequent among older women for whom their first sexual experience generally would have taken place several years before the interview.

Some researchers have suggested that respondents, especially teenagers, might be uncomfortable with the topic of sexual activity, in light of the general societal disapproval of premarital intercourse among women (Henriques et al. 1989). This discomfort could lead to underreporting of levels of sexual initiation at young ages. On the other hand, Gage (1995) evaluates the overall level of nonresponse in the DHS as being low. Largely complete recording of the pertinent events among the

target population appears to indicate a willingness among these women to answer such questions. For example, the 1996 Brazil DHS reveals low overall levels of nonresponse or inconsistency in reporting of age at first intercourse: Less than one-half of a percent of women aged 15-19 at the time of interview in the Northeast region refused to answer or gave a response that was inconsistent with other information recorded that was related to reproduction (such as any responses about age at first intercourse that were given after conceiving a first birth or after first marriage). Rates of adolescent sexual initiation in the present analyses should be considered as lower estimates of actual levels, however. The DHS interviews women aged 15 years and over, and therefore, some events occurring among adolescents younger than 15 at the time of the survey are excluded.

The Brazil DHS two-stage cluster-sampling techniques, based on random subsamples of households and districts from the *Instituto Brasileiro de Geografia e Estatística* (national statistics bureau), allow us to evaluate the random effects of community influences. Young women interviewed in the Northeast were distributed across 100, 355 and 283 sampling clusters per survey, in the surveys' chronological order. An important assumption in multivariate statistical analyses is independence across observations. Clustered data may be correlated at the community level, however, that is, individuals from the same community tend to exhibit similar demographic and behavioural characteristics (because of a variety of unmeasured and unmeasurable factors), ignorance of which could lead to underestimated standard errors and inconsistent parameter estimates when standard regression techniques are applied. Thus multilevel modelling is used in this research, the results of which should be of both methodological and policy interest.[E]

E In light of the DHS sampling scheme, which selects all women of reproductive age for interview from households within clusters, ideally the model used here should also consider the random effects of household influences. Individuals living in the same household are likely to exhibit similar characteristics compared with those from different households. In Northeast Brazil, however, average household size tends to be relatively small, particularly when analysis is limited to a select age group. Fewer than 4 percent of households sampled in the region in 1996 included two or more women aged 15-19. Given the computational difficulties of modelling when the number of lower-level units per higher-level unit (in this case, number of adolescents per household) is extremely small, only two levels (women within clusters) are fitted. Although the author is confident that the estimates of the fixed parameters presented are valid, some caution should be exercised in interpreting the random parameter in the two-level model. The cluster-level variation may be overestimated, because it may be picking up some unobserved household-level variance.

The main analytical tool used here is discrete-time hazard models (in multilevel form), an approach considered more flexible for handling the time-varying covariates (that is, the individual's age) and censored observations (those aged 15-19 who have not yet completed their adolescence at the time of the survey) being used (Allison 1982). The model is assigned a logistic link function, the dependent variable being the log odds of a woman's experiencing sexual activity before age 20. Thereby, we can estimate the effect of a specific covariate controlling for a series of other factors that are assumed to influence the response variable, conditioned for random community effects:

$$h_{tij} = P\{y_{tij}=1 \mid y_{kij}=0,\ k<t\} = \frac{e^{\alpha t+X'ij\beta+uij+vj}}{1+e^{\alpha t+X'ij\beta+uij+vj}}$$

Let h_{tij} be the conditional probability at age t (t=10, 11, ..., 19) of woman i in cluster j having first intercourse (given that she had not been sexually active at any previous time). In standard notation, α_t is a function of age (a time-varying variable), x_{ij} the covariates vector, and β its corresponding parameters vector, with u_{ij} representing the error term at the individual level. The remaining term, v_j, expresses the independent random variation across clusters, assumed to be normally distributed with mean zero and variance σ^2.

Because of the confounding effects between marriage and sexual activity, premarital first intercourse (that is, first intercourse occurring at a younger age than first union, formal or informal, or among women never married before the age of 20) is treated distinctly. Given that age at first intercourse is measured in completed years, rates of premarital activity are likely to be conservative estimates, because some sexual relations occurring within the few months preceding marriage are counted as marital events in the discrete-time analysis.

In addition, we can estimate the likelihood of an adolescent woman's using a contraceptive method during her first sexual encounter. Limiting the sample to those who engaged in sexual activity before age 20, our multivariate logistic model for hierarchically clustered data may be presented as:

$$f_{ij} = \frac{e^{X'ij\beta + uij + vj}}{1 + e^{X'ij\beta + uij + vj}}$$

with f_{ij} being the probability of adolescent *i* in cluster *j* using a contraceptive at first intercourse.

A number of individual socio-demographic and community-level variables that are considered likely to influence adolescent reproductive behaviour were chosen for inclusion in our models: education, current place of residence (urban or rural), childhood place of residence (urban or rural), religion (Catholic or non-Catholic), religiosity (measured as a frequency of attending religious ceremonies), mass media exposure, and community-level development context. Although a number of psychological, behavioural, and biological factors, as well as familial, peer and societal influences, undoubtedly exist that could help predict which teens are more likely to engage in early sexual activity, for the purposes of this study, the focus is limited to selected key characteristics likely to be relevant to policy development and program implementation.

Aside from the consideration of age and marital status at sexual initiation, characteristics refer to those reported at the time of the survey. With respect to the education variable at the individual level, in order to minimise effects of selection, the categories are limited to those who have completed at most four years of schooling versus those with five years or more. Religiosity is evaluated as a function of attending religious ceremonies at least monthly versus less often or never. Mass media exposure is measured according to television viewing habits, by whether the respondent watches on a weekly basis.

Two variables related to community development are also considered. The first aggregated at the community level measures household ownership of a television, that is, the proportion of households in the survey cluster having at least one television, a variable controlling for socio-economic status as well as for exposure to the mass media. The variable is divided into three groups: lower (less than 10 percent of households in the cluster have a television), middle (between 10 percent

and 90 percent have one), and upper (more than 90 percent have one). The second variable evaluates the community's relative sanitary infrastructure, that is, in this case, whether the cluster ranks low, medium, or high in terms of the proportion of households that have indoor running water and a toilet facility (delimited as less than 10 percent, 10-90 percent, and more than 90 percent, respectively).[Φ] Because the period of adolescence is transitional by nature, these two variables have been constructed drawing only on the situation of women in later stages of their reproductive life span. Households in which a woman aged 15-24 is a member are excluded from the compilation of the cluster-level aggregates.

The software package used for estimating the parameters is *MLn*, which allows four different procedures for nonlinear multilevel modelling (Rasbash and Woodhouse 1996). For the present analysis, the second-order predictive quasi likelihood (PQL) procedure was chosen, after prior research evaluated this procedure as providing the best estimates for the chosen model (Goldstein and Rasbash 1996; Rodriguez and Goldman 1995). To ease interpretation, the results for the fixed effects are expressed in terms of odds ratios, which are calculated by exponentiating each parameter. A ratio greater than unity implies that an individual in the given category would have a higher risk of adolescent sexual initiation or a greater likelihood of using a contraceptive, compared with her counterpart in the base category, other factors remaining the same, whereas a ratio lower than unity signals less risk.

4.3 Results

Descriptive Analysis

As seen in Table 4.3, preliminary evidence points to education as among the variables that account most clearly for differentials in adolescent sexual activity. Secondary

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Φ Strong inequalities in this society affect the distribution of basic amenities such that, with regard to sanitary infrastructure, in 1986, some 45 percent of women surveyed aged 15-24 years lived in communities that stand in the lowest ranking. The proportion of young women living in such precarious conditions decreased over time but, in 1996, still remained high at 30 percent. In terms of television ownership, the level of inequality is less important but still striking: In 1986, 24 percent of the target sample lived in communities in the lowest ranking, a proportion that eventually decreased to 16 percent ten years later.

schooling (five or more years) appears to lower the likelihood that sexual initiation will occur during a girl's adolescence, a trend consistent over time. In 1996, the difference in the probability of experiencing first intercourse is 14 percentage points between those with five or more years of schooling and those with less. Continual increases in the rates of sexual experience among women who are more educated than others of the same age across the period of observation may lie at the root of increasing absolute levels of sexual activity, however, effectively cancelling any positive impact from previously noted improvements in levels of schooling.

A continuous positive influence of mass media exposure on delayed sexual initiation also is observed over the decade 1986-96. Specifically, the probability of having engaged in sexual activity is ten percentage points lower among adolescents who regularly watched television in 1996, compared with those who did not. Again, however, absolute rates of sexual activity are on the rise, even among those watching television on a weekly basis.

The influences of residence and religious affiliation seem to be negligible or to have dissipated over time. Differentials in probability of sexual initiation remain minimal across the decade between urban and rural teens, in terms of both current and childhood residence. Catholic religious affiliation, once having exercised a slightly depressive influence on rates of sexual initiation among adolescents, no longer affects the incidence of sexual activity in the same downward direction by 1996. Nevertheless, adolescents who attend religious ceremonies regularly, regardless of the faith they practise, are less likely to have had intercourse, compared with those who do not.

Education and exposure to mass media also seem to play important roles with regard to the likelihood of contraceptive use during sexual initiation among adolescents in Northeast Brazil. Women with five or more years of schooling are at least two and a half times more likely to have practised contraception than are those with at most four years of schooling, a pattern that is maintained for all three survey periods. Adolescents who watch television regularly are also consistently more likely than those do not to have used a contraceptive at sexual initiation.

Table 4.3: Percentage of adolescent women (15-19) who reported having had first sexual intercourse and having used a contraceptive during sexual initiation, by selected characteristics, Northeast Brazil, 1986, 1991 and 1996

	Had first intercourse			Used a contraceptive		
	1986	1991	1996	1986	1991	1996
Education						
0-4 years	29	25	38	2	10	12
5+ years	12	20	24	17	30	31
Residence						
Urban	18	22	30	9	19	27
Rural	22	23	30	0	21	9
Childhood residence						
Urban	19	24	31	9	19	26
Rural	21	21	29	3	21	12
Religious affiliation						
Catholic	19	21	31	5	20	23
Other/None	25	28	28	(13)	19	13
Attends religious ceremonies at least monthly						
Yes	13	18	24	13	27	24
No	30	28	39	2	15	18
Watches television weekly						
Yes	16	21	29	10	24	23
No	28	27	39	3	7	13

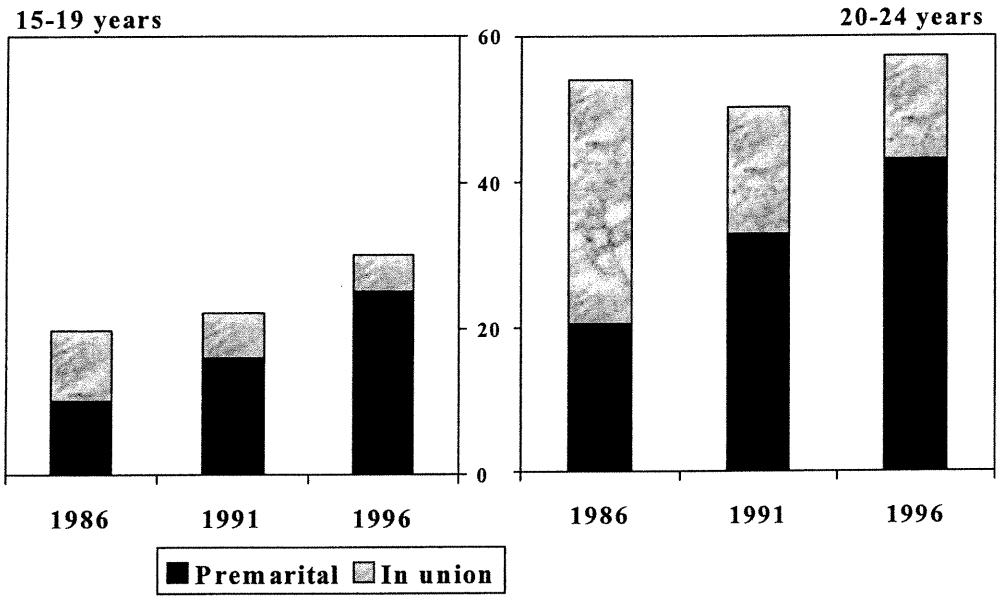
Notes: Figures in parentheses based on sample of fewer than 20 cases. Characteristics relate to those reported at the time of survey.
Source: Demographic and Health Surveys (weighted).

Whereas the impact of residence was negligible in 1991, five years later important differentials had emerged. Adolescents living in urban areas, either during their childhood or currently, more frequently reported in 1996 that they had practised contraception at sexual initiation than did rural teens. The finding may reflect the greater accessibility and availability of family planning services and methods in urban areas.

Catholics reported a higher incidence of contraceptive use than did non-Catholics in 1996, in contrast with the virtually identical rates observed in 1991. The role of the Roman Catholic Church on individual contraceptive practises in Brazil is unclear; prior research suggests that the Church has had more influence on the government's family planning policies in relation to limiting service availability than it has had in terms of discouraging fertility-limiting behaviour among its followers (Leite 1997). Interestingly, teens who attend religious ceremonious regularly, regardless of affiliation, consistently reported higher rates of contraceptive use at sexual initiation, compared with those who do not attend services.

Although such results are useful for examining trends and differentials in adolescent sexual behaviour across subgroups, as previously indicated, the rates of sexual activity presented should be viewed as considerably underestimated. First, although some women reported having had their first intercourse when they were ten years old, for example, the DHS interviews only those aged 15 or older. Therefore, some events experienced by girls younger than 15 at the time of the survey are excluded. Secondly, girls aged 15-19 at the time of the survey have not yet completed their period of adolescence, so observations concerning their reports are censored. As Figure 3 shows, in 1996, 57 percent of women aged 20-24 reported having had intercourse before reaching their twentieth birthday, an increase of 3 percentage points from ten years earlier. Rates of premarital sexual activity increased even faster. The following multivariate analyses incorporate the experiences of women aged 20-24 in order to draw a more complete picture of trends in reproductive behaviour during the course of adolescence.

Figure 3: Percentage of adolescent and young adult women who reported having had their first sexual intercourse by age 20, Northeast Brazil, 1986, 1991 and 1996



Results from the Multivariate Hazard Models: Risk of Sexual Initiation

The risk of sexual initiation among women essentially increases monotonically with age over the period of adolescence; younger teens are less likely to engage in sexual activity compared with those who are older, until the risk stabilises after about 17 years of age, as is shown in Table 4.4. Interestingly, the same pattern does not hold consistently with regard to sexual initiation occurring outside marriage. The risk of premarital intercourse still rises steadily with age through the first half of the period of exposure, but then starts to decrease after 17 years, as more teens enter into union.

Not surprisingly, education also is found to exercise a statistically significant impact on sexual initiation during adolescence ($p<0.01$). Women with at least five years of schooling are at lower risk of sexual initiation relative to those with four years of

schooling at most, all else being equal. The differential appears to be decreasing continually over time, however. In 1986, the odds of a woman with five or more years of schooling being sexually experienced before age 20 was some 71 percent that of her counterpart interviewed in the reference year 1996. In other words, a young woman with more schooling was nearly one and a half times more likely to be sexually experienced in 1996 compared with one with similar characteristics would have been ten years earlier. The differential decreased to 1.2 times when compared with 1991 findings. A similar trend is observed with regard to premarital sexual initiation. By contrast, the influence of educational attainment on the risk of first intercourse within union (formal or informal) remains stable across the period of observation.

Independent effects of current residence on the risk of first intercourse or premarital first intercourse are indiscernible across surveys. Women who experience first sexual relations within marriage, however, are somewhat less likely to live in urban areas. Although current residence plays little role in general, the opposite is true for childhood residence. Women who spent their earliest years in an urban environment are more likely than women whose early environment was rural to engage in sexual activity during adolescence, regardless of marital status. The overall differential appears to be decreasing over time, however, as the odds were lower in previous surveys compared with the findings from 1996. Moreover, although religious affiliation does not seem to exercise an impact, religiosity does. Young women who regularly attend religious ceremonies, regardless of the faith they practise, are significantly less likely to engage in sexual activity, premarital or otherwise.

With respect to mass media exposure, viewing television regularly is inversely associated with the risk of sexual initiation during adolescence, but the independent effects are no longer discernible when analysis is limited to premarital sexual activity. This finding emerges after controlling for level of television ownership and community development.

Each of the models revealed additional significant cluster-level random effects. This finding suggests the existence of unobserved influences conditioned by geographic boundaries (aside from urban-rural differences or level of community development) that may increase or decrease the likelihood of sexual initiation during adolescence.

Table 4.4: Odds ratios and random effects parameter from the multilevel logistic discrete-time hazard models showing the risk of a woman's having first intercourse, premarital first intercourse, or marital first intercourse before age 20, Northeast Brazil, 1986, 1991 and 1996

	First intercourse before age 20 *(N=5,199)*	Premarital first intercourse before age 20 *(N=5,199)*	Marital first intercourse before age 20 *(N=5,199)*
Age (years)			
10	0.01 **	0.05 **	
11	0.02 **	0.07 **	0.02 **
12	0.08 **	0.28 **	0.07 **
13	0.13 **	0.37 **	0.17 **
14	0.29 **	0.80	0.35 **
15	0.47 **	1.15	0.53 **
16	0.69 **	1.21	0.88
17	1.02	1.72 **	1.05
18	1.03	1.38 *	1.05
19 (r)	1.00	1.00	1.00
Education (years)			
0-4 (r)	1.00	1.00	1.00
5+	0.48 **	0.76 *	0.43 **
Education/Survey period interaction			
5+ years –1986	0.71 *	0.63 *	0.92
5+ years –1991	0.81 *	0.66 **	1.11
Residence			
Urban	0.88	1.08	0.78 *
Rural (r)	1.00	1.00	1.00
Childhood residence			
Urban	1.54 **	1.47 **	1.28 *
Rural (r)	1.00	1.00	1.00
Childhood residence /Period interaction			
Urban –1986	0.77 *	0.65 *	1.06
Urban –1991	0.75 **	0.77 *	0.87
Religious affiliation			
Catholic	0.94	0.96	0.94
Other/none (r)	1.00	1.00	1.00
Attends religious ceremonies at least monthly			
Yes	0.58 **	0.55 **	0.79 **
No (r)	1.00	1.00	1.00
Watches television weekly			
Yes	0.86 *	0.98	0.81 *
No (r)	1.00	1.00	1.00
Cluster-level aggregate: television ownership			
Low level	0.83 *	0.83	0.91
Middle level (r)	1.00	1.00	1.00
High level	0.82 *	0.95	0.75 *
Cluster-level aggregate: running water/toilet			
Low level	0.81 *	0.73 *	0.97
Middle level (r)	1.00	1.00	1.00
High level	0.91	0.97	0.88
Random parameter	0.19 **	0.24 **	0.18 **

Source: Demographic and Health Surveys, women aged 15-24.
* Significant at $p<0.05$; ** $p<0.01$. (r) = Reference category.

Contraceptive Use

Effects on the likelihood of an adolescent girl's using a contraceptive during her first sexual encounter are presented in Table 4.5. Although women whose first intercourse occurred before marriage were somewhat less likely to have used a contraceptive, the difference is not statistically significant ($p<0.05$). The differential had been greater in 1986, but was no longer discernible in 1991, compared with the 1996 survey period.

Higher educational attainment and regular exposure to television are the factors most significantly associated with increased use. A woman with at least five years of schooling is more than two times more likely to have used a contraceptive method during sexual initiation, an effect showing little appreciable change over time. Similarly, her counterpart who watches television on a weekly basis is more than two times more likely to have used a contraceptive at first intercourse, even after controlling for effects of local television ownership (degree of ownership among older women at the cluster level).

The overall effects of residence, either current or childhood, are minimal. As previously noted, religious beliefs do not appear to represent a barrier to contraceptive practice among young women in this society. In fact, the opposite is observed. Religiosity (but not religious affiliation) is significantly related to increased likelihood of contraceptive use at sexual initiation. Although the model also reveals a lack of significant cluster-level random effects, whether this finding reflects genuinely low variance across clusters, or simply the low ratio of women in the target group per sampling area, is uncertain.

Table 4.5: Odds ratios from the logistic hazard model with random effects showing the likelihood of an adolescent girl's using a contraceptive at sexual initiation, Northeast Brazil, 1986, 1991 and 1996

	Used contraceptive *(N=1,875)*
First intercourse was premarital	
Yes	0.79
No (r)	1.00
Premarital intercourse/Period interaction	
Premarital first intercourse-1986	0.31 *
Premarital first intercourse-1991	1.01
Education (years)	
0-4 (r)	1.00
5+	2.15 **
Education/Period interaction	
5+ years –1986	2.13
5+ years –1991	0.75
Residence	
Urban	1.37
Rural (r)	1.00
Childhood residence	
Urban	1.13
Rural (r)	1.00
Childhood residence/Period interaction	
Urban childhood residence-1986	0.36 *
Urban childhood residence-1991	0.78
Religious affiliation	
Catholic	1.16
Other/none (r)	1.00
Attends religious ceremonies at least monthly	
Yes	1.33 *
No (r)	1.00
Watches television weekly	
Yes	2.20 **
No (r)	1.00
Cluster-level aggregate: television ownership	
Low level	1.68 *
Middle level (r)	1.00
High level	1.91 **
Cluster-level aggregate: running water/toilet	
Low level	0.75
Middle level (r)	1.00
High level	1.24
Random parameter	0.14

Source: Demographic and Health Surveys, women aged 15-24.
* Significant at $p<0.05$; ** $p<0.01$. (r) = Reference category.

4.4 Discussion

Women's educational attainment is among the variables found to be most consistently associated with adolescent sexual initiation and contraceptive use in Northeast Brazil over the decade 1986-96. According to multivariate two-level logistic hazard models of data from the DHS, teenagers with at least five years of schooling are about half as likely to engage in sexual relations, and more than two times as likely to use a contraceptive at first intercourse, than are their counterparts who have, at most, four years of schooling.

With regard to the risk of sexual initiation, however, the educational differential decreases between the beginning and the end of the period of observation, and this decrease also follows for premarital sexual activity. Adolescent women having more education may better appreciate the health and social advantages of delayed sexual behaviour, and are equally more likely to protect themselves from unplanned pregnancy (and, concomitantly, sexually transmitted diseases including HIV) through contraceptive use. The school setting may provide greater freedom from parental supervision and traditional societal constraints, however, and offer more opportunities for meeting eligible members of the opposite sex and developing intimate relations. The diminishing returns of educational attainment on delayed sexual activity may help explain, in part, the observed increases in the absolute level of sexual experience, including premarital activity, among girls in the target population across the survey periods.

These results, along with certain others - such as the greater probability of early sexual initiation among women who spent their childhood in an urban setting - underline the need for reproductive education and health programming at the earliest possible opportunity. In light of the likelihood that the period of adolescent fecundity is lengthening as the age of menarche decreases with improved health conditions (Meekers 1994), delayed sexual activity and increased contraceptive prevalence are needed to avoid increases in the number of adolescent births, regardless of other changes in behaviour related to reproduction. Although knowledge of family planning methods is widespread, the challenge lies in reversing young people's sense that

contraceptive protection lacks importance and in overcoming their resistance to using methods during premarital intercourse, when their risk of experiencing an unwanted pregnancy or STD/HIV infection is higher compared with their risk of experiencing these events within marriage.

The significant random variances estimated here at the cluster level through multilevel modelling techniques demonstrate the need for further research into contextual variables on patterns of sexual initiation. Among the potential community-level influences that merit investigation are influences of peer groups, local school curriculum for sexual and reproductive education, and the availability of family planning and reproductive health programs targeting the young. Although the DHS data sets allow (even require, from a methodological standpoint) consideration of cluster-level effects, a lack of reliable, chronologically comparable facility- and service-availability data for Northeast Brazil hinders further analysis at this point. Unfortunately, heavy dependence on the private sector for contraceptive procurement (more than two-thirds of adolescents who were practising contraception in 1996 were turning to the private sector as their main method source) has limited interest in an independent collection of family planning service statistics.

Another area in need of further investigation is partner and familial influences. The DHS questionnaire refers only to people living in the same household, and does not collect information about the socio-demographic characteristics of sexual partners or of parents who are not living with the respondent at the time of the survey. Little is known about women's first partners other than the nature of the relationship, although additional information collected in the 1996 survey reveals that fewer than half (44 percent) of adolescent women experienced first intercourse with a man who was also younger than 20. This finding indicates that reproductive health interventions targeting men should be directed toward both adolescent and older men. In light of the transitional nature of adolescence, moreover, information about the woman's household of origin could be useful, particularly information about her mother's educational attainment, with regard to further analysis of eventual sexual activity and union formations.

References

Allison, Paul D. 1982. "Discrete-time Methods for the Analysis of Event Histories." In *Sociological Methodology*, edited by S. Leinhardt. San Francisco: Jossey-Bass. Pp. 61-98.

Arruda, José Maria, Naomi Rutenberg, Leo Morris, and Elizabeth A. Ferraz. 1987. *Pesquisa Nacional sobre Saúde Materno-Infantil e Planejamento Familiar: Brasil, 1986.* Rio de Janeiro: Sociedade Civil Bem-Estar Familiar no Brasil.

Baer, Werner. 1995. *The Brazilian Economy: Growth and Development.* Westport, CT: Praeger Publishers.

Bastos, A.C.S. 1989. "Atitudes do adolescente baiano frente à sexualidade." In *Saúde e Educação Sexual do Jovem: um estudo en Salvador*, edited by A.V.B. Bastos, L. Morris and S.R.P. Fernandes. Salvador: Universidade Federal da Bahia. Pp. 85-93.

BEMFAM. 1997. *Pesquisa Nacional Sobre Demografia e Saúde, 1996.* Rio de Janeiro: Sociedade Civil Bem-Estar Familiar no Brasil and Macro International.

Faria, V ilmar E. 1989. "Politicas de Governo e Regulação da Fecundidade: Consequências Não Antecipadas e Efeitos Perversos". *Revista de Ciência Hoje*, pp. 62-103.

Ferraz, Elizabeth A., I.Q. Ferreira, and Naomi Rutenberg. 1992. *Pesquisa sobre Saúde Familiar no Nordeste Brasil 1991.* Rio de Janeiro: Sociedade Civil Bem-Estar Familiar no Brasil.

Gage, Anastasia J. 1995. *An Assessment of the Quality of Data on Age at First Union, First Birth, and First Sexual Intercourse for Phase II of the Demographic and Health Survey Program.* Calverton, MD: Macro International.

Goldstein, Harvey and Jon Rasbash. 1996. "Improved approximations for multilevel models with binary responses." *Journal of the Royal Statistical Society, A.* 159:505-13.

Henriques, Maria Helena, Nelson do Valle Silva, Susheela Singh, and Dierdre Wulf. 1989. *Adolescentes de Hoje, Pais do Amanhã: Brasil.* New York: Alan Guttmacher Institute.

Jones, Elise F., Jacqueline Darroch Forrest et al. 1986. *Teenage Pregnancy in Industrialized Countries*. New Haven: Yale University Press.

Lam, David, Guilherme Sedlacek, and Suzanne Duryea. 1993. "Increases in Education and Fertility Decline in Brazil." Paper presented at the Annual Meeting of the Population Association of America, Cincinnati.

Leite, Iúri da Costa. 1997. "The determinants of contraceptive choice in Northeast Brazil, 1991." Paper presented at the Annual Meeting of the Population Association of America, Washington, DC.

Martin, Teresa Castro and Fatima Juarez. 1995. "The Impact of Women's Education on Fertility in Latin America: Searching for Explanations." *International Family Planning Perspectives*, 21(2): 52-57.

Martine, George. 1996. "Brazil's Fertility Decline, 1965-95: A Fresh Look at Key Factors." *Population and Development Review,* 22(1): 47-75.

Meekers, Dominique. 1994. "Sexual Initiation and Premarital Childbearing in Sub-Saharan Africa." *Population Studies*, 48(1): 47-64.

Menken, Jane. 1980. "The Health and Demographic Consequences of Adolescent Pregnancy and Childbearing." In *Adolescent Pregnancy and Childbearing: Findings from Research*, edited by C.S. Chilman. Washington, D.C.: U.S. Department of Health and Human Services. Pp. 157-205.

Rasbash, Jon and Geoff Woodhouse. 1996. *MLn Command Reference.* London: Institute of Education, University of London.

Robey, Bryant, Shea O. Rutstein, and Leo Morris. 1992. "The Reproductive Revolution: New Survey Findings." *Population Reports*, Series M, Number 11.

Rodriguez, German and Noreen Goldman. 1995. "An Assessment of Estimation Procedures for Models with Binary Responses." *Journal of the Royal Statistical Society (Series A),* 158(1): 73-89.

Rutenberg, Naomi, Mohamed Ayad, Luis H. Ochoa, and Marilyn Wilkinson. 1991. "Knowledge and Use of Contraception." *Demographic and Health Surveys Comparative Studies,* No. 6. Columbia, MD: Institute for Resource Development/Macro International.

Senderowitz, Judith and John M. Paxman. 1985. "Adolescent Fertility: Worldwide Concerns." *Population Bulletin*, 40(2): 3-49.

Silva, Nelson do Valle, Maria Helena Henriques, and Amaury de Souza. 1990. "An Analysis of Reproductive Behavior in Brazil." *Demographic and Health Surveys Further Analysis Series*, No. 6. Columbia, MD: Institute for Resource Development/Macro Systems.

Voydanoff, Patricia and Brenda W. Donnelly. 1990. *Adolescent Sexuality and Pregnancy.* Newbury Park, CA: Sage Publications.

Wong, Laura Rodriguez. 1994. "A queda da fecundidade no Nordeste: Uma aproximação aos determinantes." In BEMFAM, *Fecundidade, Anticoncepção e Mortalidade Infantil.* Rio de Janeiro: Sociedade Civil Bem-Estar Familiar no Brasil.

Wood, Charles H. and José Alberto Magno de Carvalho. 1988. *The Demography of Inequality in Brazil.* Cambridge, UK: Cambridge University Press.

Wulf, Deirdre and Susheela Singh. 1991. "Sexual Activity, Union and Childbearing among Adolescent Women in the Americas." *International Family Planning Perspectives,* 17(4): 137-144.

Yinger, Nancy, Alex de Sherbinin, Luis H. Ochoa, Leo Morris, and Jennifer Hirsch. 1992. *Adolescent Sexual Activity and Childbearing in Latin America and the Caribbean: Risks and Consequences.* Washington, DC: Population Reference Bureau.

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V. La formation des unions chez les adolescentes du Nordeste Brésil

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Résumé:

Le Nordeste, Brésil, a connu une hausse dans l'incidence de l'entrée en union chez les adolescentes dans les années récentes. Pour évaluer les déterminants de la formation des premières unions, des analyses de régression logistique multivariée sont menées utilisant des données empiriques tirées de trois Enquêtes démographique et de santé conduites dans la région entre 1986 et 1996. La scolarité fait partie des variables ayant exercées les plus fortes influences sur la probabilité d'une femme de contracter sa première union avant l'âge de 20 ans : une adolescente ayant cinq années ou plus de scolarité a deux fois moins de chance d'entrer en union que celle ayant au plus quatre années de scolarité, une tendance étant demeurée relativement stable dans le temps. La résidence en lieu urbain et la pratique religieuse sont aussi associées à une probabilité plus faible de formation précoce d'une union. Les résultats ne supportent pas l'hypothèse d'un risque plus élevé d'union de type informel chez les femmes de niveau socio-économique plus faible. Un lien trouvé entre conception prénuptiale et catégorie d'union suggère que l'exposition hâtive aux relations sexuelles et une grossesse non-planifiée pourraient être à la base du choix d'union informelle chez un nombre important de jeunes femmes.

La formation des unions chez les adolescentes du Nordeste (Brésil)

Au cours des trois dernières décennies, les adolescentes et adultes brésiliennes ont changé de façon importante leur comportement reproductif. Entre 1970 et 1996, l'indice synthétique de fécondité (ISF) est passé de 5,8 à 2,5 enfants par femme (BEMFAM, 1997). Au cours de la même période, le Brésil a vécu des profonds changements socio-économiques. Le pays s'est industrialisé et s'est urbanisé ; à titre d'exemple, la population vivant en milieu urbain est passée de 56 à 76 pour cent entre 1970 et 1991 (Baer, 1995; Ferreira et Woldvogel, 1997). Si la baisse de fécondité a touché toutes les régions du pays et toutes les couches sociales, et ceci en l'absence de politiques ou de programmes nationaux de planification familiale, le rythme n'a pas été le même partout. Des variations régionales demeurent importantes (Ferreira et Woldvogel, 1997; Martine 1996). Selon l'Enquête démographique et de santé (EDS) de 1996, l'ISF varie entre 2,1 pour l'état de Rio de Janeiro et 3,1 pour la région du Nordeste[Ψ] (BEMFAM, 1997).

La majeure partie de la baisse de la fécondité a été observée chez les femmes ayant atteint le milieu de leur vie reproductive. Ainsi, la contribution procentuelle de la fécondité adolescente (15-19 ans) à la fécondité générale (15-44 ans) a augmenté avec le temps (Arruda et al., 1987; BEMFAM, 1997). Des estimations basées sur les EDS révèlent que la proportion des naissances annuelles due aux mères adolescentes est passée de 12 pour cent à presque 19 pour cent entre 1986 et 1996. Dans le Nordeste, une région particulièrement touchée par la pauvreté, ce taux est passé de 12 à 20 pour cent pour la même période. Une des conséquences de cette croissance du poids de la fécondité adolescente est un rajeunissement de la structure d'âge à la maternité. Il est à noter que la proportion des adolescentes parmi les femmes en âge procréatif est demeurée stable : 24 pour cent pour les deux périodes d'enquête.

Une baisse tardive de la fécondité des adolescentes - voire même une augmentation - comparée aux femmes plus âgées a été observée à travers l'Amérique latine. Il a

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Ψ Les états d'Alagoas, Bahia, Ceará, Maranhâo, Paraíba, Pernambuco, Piauí, Rio Grande do Norte et Sergipe.

été suggéré que les adolescentes ont moins pris avantage des services de planification familiale que leurs aînées (Yinger et al., 1992). La fécondité précoce est une source de soucis en ce qui a trait à la santé des femmes ainsi que pour leur développement social. Une femme ayant des enfants à un âge plus jeune a un plus grand risque de mortalité et de morbidité maternelles-infantiles. De plus, ses perspectives scolaires et professionnelles sont généralement plus limitées. La femme ayant des relations sexuelles non-protégées est susceptible de contracter une maladie transmise sexuellement, incluant le VIH/SIDA, ou de subir un avortement clandestin si elle se trouve en état de grossesse non-désirée. Des familles complétées plus grandes pourraient être l'une des conséquences démographiques à long terme de la fécondité adolescente, l'âge de la femme à la première naissance influant sur le total des enfants en fin de période de procréation (Grindstaff, 1990; Senderowitz et Paxman, 1985; Singh et Wulf, 1990; Yinger et al., 1992).

Mieux connaître les déterminants du comportement reproductif des adolescentes, afin de mieux développer les programmes d'intervention de santé et d'éducation auprès de ces jeunes, semble donc évident. Plusieurs études ont déjà été menées sur les causes et les conséquences de la fécondité différentielle chez les femmes en âge procréatif aux niveaux national et régional du Brésil (voir Alves, 1996; Arruda et al., 1988; Camarano, 1994; Martine, 1996; Rios-Neto et al., 1991; Silva et al., 1990). Jusqu'à récemment, les mécanismes influant le comportement des groupes d'âges les plus jeunes ont reçu moins d'attention dans la littérature. Les facteurs qui jouent sur les décisions reproductives des adolescentes sont moins connus.

L'entrée en vie conjugale est une variable importante dans l'étude du comportement reproductif, spécialement pour une région en développement où la fécondité adolescente est en croissance. La majorité des jeunes femmes sont en union (formelle ou informelle) lors des naissances de leurs enfants. Cependant, le nombre de premières naissances prénuptiales chez les adolescentes aura plus que doublé au cours de la décennie d'observation, de 5 pour cent à presque 11 pour cent entre 1986 et 1996. Des taux croissants d'activité sexuelle prénuptiale pourraient expliquer en partie cette tendance : la majorité des femmes adolescentes ont leur premier rapport sexuel avant d'entrer en union et l'incidence de l'expérience prénuptiale

augmente rapidement avec le temps (de 56 pour cent en 1986 à 86 pour cent en 1996) (Ferraz et al., 1999; Gupta, 2000).

La formation de l'union marque également une transition importante dans la vie d'un individu. Le moment de l'événement peut avoir une incidence profonde sur l'avenir des jeunes femmes, en terme d'autonomie du choix du partenaire et de la réponse adaptive de la famille et de la société. La trajectoire familiale de préférence pour les femmes brésiliennes est celle de la famille nucléaire souvent observée dans les sociétés industrialisées contemporaines : le mariage, de préférence tôt dans la vingtaine, suivi de la naissance d'enfants qui seront élevés avec l'aide de l'époux. Malgré une croissance observée dans le nombre de familles non-traditionelles (divorcées, séparées, mères célibataires), le rôle de la femme comme épouse et mère est considéré socialement plus acceptable (Bastos et Fernandes, 1989; Goldani, 1998).

Les unions formelles, sanctionnées par l'Église ou par l'État, sont typiquement considérées comme idéales. Les femmes peuvent y percevoir plus de stabilité. Le choix alternatif peut provenir du fait que les femmes perçoivent qu'elles manquent du pouvoir de négociation nécessaire pour amener leur partenaire à choisir un mariage formel. De l'autre côté, il a été suggéré que, tout simplement, un nombre de femmes considèrent que la qualité de la relation est plus importante que le type d'union et ne trouvent pas de différences entre les unions formelles et informelles (Greene, 1992).

Nous nous proposons d'étudier les tendances récentes de la formation des unions chez les adolescentes du Nordeste. Les données utilisées dans les analyses empiriques proviennent des trois EDS menées dans la région en 1986, 1991 et 1996. Suite à la présentation d'un bref portrait descriptif de notre population cible, nous ferons des analyses multivariées pour décortiquer les effets indépendants de certaines caractéristiques socio-démographiques sur la probabilité pour une femme de contracter une première union avant l'âge de 20 ans. L'étude vise également à différencier les unions formelles et informelles selon les caractéristiques et les comportements reproductifs des jeunes femmes.

5.1 Contexte

La littérature scientifique a porté beaucoup d'attention aux fortes inégalités régionales que le Brésil a connues au cours de son histoire (voir, par exemple, Baer, 1995; Wood et Carvalho, 1988). Les quelques 45,5 millions d'habitants du Nordeste vivent dans une région largement rurale, ayant plusieurs des indicateurs socio-économiques les plus faibles du pays. À titre d'exemples, le taux d'alphabétisation est nettement inférieur à la moyenne nationale (61 pour cent versus 85 pour cent), toute comme la proportion des ménages ayant l'eau courante (54 pour cent versus 85 pour cent). Les niveaux de fécondité et de mortalité sont parmi les plus élevés du pays. Le taux de mortalité infantile est de 74 décès pour mille naissances vivantes, comparé à 48 pour mille pour l'ensemble du pays. L'ISF est environ 20 pour cent plus élevé que la moyenne nationale (BEMFAM, 1997).

Cette région a connu la plus rapide baisse de la fécondité au cours des dernières années (Martine, 1996). L'ISF est tombé d'environ 40 pour cent, passant de 5,2 à 3,1 enfants par femme entre 1986 et 1996. La plus importante partie de cette baisse a été observée chez les femmes ayant atteint le milieu de leur vie reproductive. Selon l'EDS, la proportion des naissances annuelles dues aux femmes âgées entre 25 et 39 ans a diminué de 11 points de pourcentage, passant de 56 à 45 pour cent pour la même période. Pendant ce temps, la proportion des naissances attribuables aux adolescentes a augmenté de 8 points de pourcentage.

La fécondité des adolescentes a aussi augmenté en termes absolus. Entre 1986 et 1996, la proportion d'adolescentes (15-19 ans) ayant eu un enfant est passée de 12 à 17 pour cent, une augmentation de près du tiers ; cela en dépit de l'augmentation du niveau de scolarité, de l'urbanisation et de l'accès accru aux médias de cette population (tableau 5.1). C'est en contradiction avec les attentes des démographes, la littérature ayant mis en évidence le fait que d'avoir un plus haut niveau de scolarité, de résider en milieu urbain et de regarder la télévision est généralement associé à une plus faible fécondité (voir, par exemple, Lam et al., 1993; Martin et Juarez, 1995; Robey et al, 1992; Silva et al., 1990; Wong, 1994). Il est aussi intéressant de noter que le changement dans le comportement reproductif chez les

adolescentes ne peut pas être attribué au changement de leur structure par âge. En fait, les données du tableau 5.1 nous indiquent que leur structure par âge n'a guère changé au cours de la période d'observation.

Le taux de nuptialité a augmenté chez les adolescentes du Nordeste, la proportion ayant déjà été en union passant de 15 pour cent en 1986 à 19 pour cent en 1996. Cette société est majoritairement catholique et la plupart des adolescentes peuvent être considérées comme étant pratiquantes (assistent fréquemment aux cérémonies religieuses, peu importe la religion). Les naissances demeurent plutôt rares parmi les adolescentes n'ayant jamais été en union (tableau 5.2). Cependant, environ le tiers des premières naissances proviennent d'une conception prénuptiale - c'est-à-dire une naissance observée avant l'union ou dans les 7 premiers mois suivant sa formation.

Les entrées précoces en union et les conceptions prénuptiales chez les adolescentes sont généralement considérées comme étant socialement inacceptables par leurs pairs. L'âge idéal pour une femme de se marier serait entre 20 et 24 ans, la réponse la plus populaire (mentionnée par deux jeunes adultes sur cinq) selon les résultats d'une enquête menée auprès d'un échantillon de femmes et d'hommes âgés entre 15 et 24 ans dans la ville de Salvador, au Nordeste. Moins de 3 pour cent des personnes interviewées considèrent que d'entrer en union à moins de 18 ans serait idéal. Les résultats de cette enquête suggèrent que ce sont les valeurs culturelles qui forment cette chronologie idéale de l'âge à la première union, tôt dans la vingtaine pour les femmes. En revanche, l'importance de l'indépendance économique favorise l'idéal d'un calendrier nuptial retardé pour les hommes (Bastos et Fernandes, 1989).

Selon les données provenant de la même enquête, moins du tiers des jeunes hommes et moins du cinquième des femmes considèrent comme acceptable qu'une femme soit sexuellement active avant le mariage. D'un autre coté, plus de 80 pour cent des répondants des deux sexes acceptent qu'un homme ait des expériences sexuelles prénuptiales. Le fait que les jeunes, surtout les jeunes femmes, ont des attitudes plus restrictives pour les comportements sexuel et nuptial des femmes pourrait être représentatif du chauvinisme "machismo" dominant dans la société brésilienne (Bastos, 1989).

Tableau 5.1: Distribution procentuelle des femmes adolescentes (15-19 ans) selon certaines caractéristiques socio-démographiques, Nordeste Brésil, 1986, 1991 et 1996

	1986	1991	1996
Age			
15-16	44	44	44
17-19	56	56	56
Scolarité			
0-4 années	47	48	42
5 années et plus	53	52	58
Résidence			
Urbaine	62	64	69
Rurale	38	36	31
Résidence en enfance			
Urbaine	59	59	64
Rurale	41	41	36
Regarde la télévision chaque semaine			
Oui	68	80	85
Non	32	20	15
Religion			
Catholique	84	80	83
Non catholique	16	20	17
Assiste à une cérémonie religieuse au moins une fois par mois			
Oui	58	56	61
Non	42	44	39

Source: Enquêtes démographique et de santé (données pondérées).

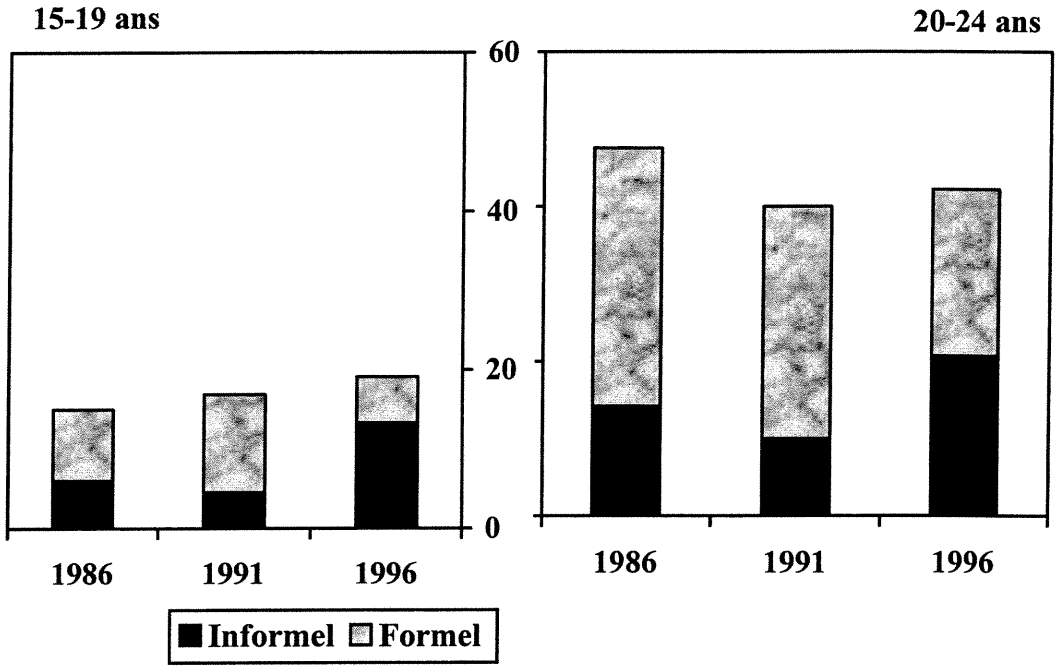
Il a été aussi observé que les femmes du Nordeste entrent dans une union informelle plus souvent que leurs homologues dans le reste du Brésil. Les unions informelles seraient plus communes dans les basses classes économiques, le coût du mariage formel pouvant être une barrière monétaire (Greene, 1992). La proportion des unions de type informel est en croissance chez les adolescentes au Nordeste, étant passée d'environ 40 à 70 pour cent entre 1986 et 1996 (figure 4). L'augmentation du nombre d'unions informelles et une plus grande liberté sexuelle ont été liées à une exposition aux rapports sexuels à un âge de plus en plus jeune (Lazo, 1994). La combinaison des taux croissants d'unions informelles avec un plus grand risque de maternité parmi les femmes dans ce type d'union pourrait expliquer au moins en partie les niveaux absolus plus élevés de la fécondité adolescente dans cette région. Comme on voit dans le tableau 5.2, il y a eu une très forte croissance de la maternité chez les femmes qui sont entrées en union informelle avant l'âge de 20 ans, une hausse de 58 à 71 pour cent entre 1986 et 1996.

Tableau 5.2: Pourcentage des femmes adolescentes (15-19 ans) ayant déjà eu un enfant, selon l'état matrimonial, Nordeste Brésil, 1986, 1991 et 1996

	1986	1991	1996
Déjà eu enfant(s)			
Jamais en union	2	2	4
Déjà en union formelle	75	56	73
Déjà en union libre	58	53	71
TOTAL	12	11	17
Conception prénuptiale			
Déjà en union formelle	28	33	28
Déjà en union libre	(33)	35	34
TOTAL	30	34	32

Source: Enquêtes démographique et de santé (données pondérées).
Note: Chiffre entre parenthèses basé sur un échantillon de moins de vingt cas.

Figure 4 : Pourcentage des femmes ayant déjà été en union avant l'âge de 20 ans, selon le groupe d'âge actuel et le type d'union, Nordeste Brésil, 1986, 1991 et 1996



Si ces résultats sont utiles pour étudier l'entrée en union chez les adolescentes, il est important de souligner que les taux de formation des unions parmi les femmes de 15-19 ans sont considérablement sous-estimés. L'histoire de ces jeunes femmes est encore incomplète. Parmi les femmes dans le groupe d'âge 20-24 ans, c'est-à-dire celles qui ont terminé leur adolescence le plus récemment, les proportions ayant contracté leur première union avant l'âge de 20 ans sont nettement plus élevées (figure 4). La propension à entrer en mariage formel est demeurée relativement stable, mais les unions informelles deviennent de plus en plus populaires. En 1986, moins du tiers des unions contractées avant l'âge de 20 ans étaient informelles, une proportion passant à la moitié des cas dans une décennie. Les analyses multivariées qui suivent incorporent les expériences des femmes dans les deux tranches d'âge, 15-19 ans et

20-24 ans, au moment de l'enquête. Cela nous permet d'illustrer de façon plus complète les schémas des comportements nuptiaux et reproductifs au cours de la période d'adolescence.

5.2 Données et méthodologie

Les données empiriques pour cette étude sont tirées de trois EDS menées au Nordeste entre 1986 et 1996. Notre première source d'information sur le comportement reproductif et ses déterminants est la *Pesquisa Nacional sobre Saúde Materno-Infantil e Planejamento Familiar* (Arruda et al., 1987). Menée en 1986, l'enquête comprenait un échantillon de 788 femmes âgées de 15 à 24 ans, résident au Nordeste. La deuxième source de données, la *Pesquisa sobre Saúde Familiar no Nordeste Brasil* de 1991 (Ferraz et al., 1992), a recueilli des informations à l'aide d'entrevues personnelles auprès de 2550 jeunes femmes (15-24 ans) de cette région. Tout récemment, la *Pesquisa Nacional sobre Demografia e Saúde* (BEMFAM, 1997) nous offre des informations sur 1861 femmes de 15 à 24 ans, interviewées en 1996 dans la même région.

Les enquêtes ont recueilli de l'information sur le statut matrimonial des répondantes, le type d'union, l'âge lors de la première union, le calendrier des naissances et autres caractéristiques démographiques. Nous nous intéresserons principalement aux tendances et déterminants de la probabilité pour une femme de contracter une première union lors de l'adolescence. Les questionnaires des EDS étant similaires, les données au niveau individuel sont largement comparables. La disponibilité de trois enquêtes successives présente un avantage certain pour faire des analyses temporelles à l'intérieur d'un groupe d'âge. Nous limitant ainsi aux groupes d'âge les plus jeunes, nous pouvons minimiser les biais causés par les erreurs de récollection (omission ou déplacement) de la date de l'événement, erreurs généralement plus fréquentes chez les femmes plus âgées.

En revanche, il est à souligner que les taux d'union chez les adolescentes y sont probablement légèrement sous-estimés. Les femmes ont indiqué comme âge à la

première union des valeurs aussi basses que 11 ans. Étant donné que l'EDS n'interviewe que les femmes d'au moins 15 ans, certains événements chez les femmes plus jeunes au moment de l'enquête sont donc exclus.

Pour faire notre analyse multivariée des déterminants du choix des adolescentes de se mettre en union, nous proposons d'appliquer des analyses de survie en temps discret à multi-niveaux. La flexibilité de l'analyse de survie nous permettra de manipuler des variables explicatives variant dans le temps (en particulier, l'âge des femmes). Cela nous permet d'incorporer à la fois des données censurées sur les femmes âgées entre 15 et 19 ans lors de l'enquête et des données sur les femmes âgées entre 20 et 24 ans (Allison, 1982). La modélisation consiste à recoder une variable qui indique, grâce à des mesures répétées, si une première union est contractée à chaque âge d'exposition (âge en années complètes). Lorsque l'événement se produit, la femme est enlevée du modèle. Par exemple, une femme âgée de 20 ans lors de l'enquête, qui a contracté sa première union à l'âge de 17 ans, contribue pour sept observations : six indiquant qu'elle n'était pas en union entre l'âge de 11 et 16 ans et une indiquant qu'elle l'était à l'âge de 17 ans. Une femme de 16 ans jamais en union lors de l'enquête contribue à cinq observations : une pour chaque année d'âge entre 11 et 15 ans où l'événement n'a pas été connu.

FAUX: Analyse fausse

Grâce à l'échantillonnage stratifié en grappes utilisé par les EDS, nous pouvons évaluer les effets indépendants des influences communautaires sur le comportement individuel. Les jeunes femmes enquêtées ont été distribuées en 100, 355 et 283 grappes ou unités primaires de sondage pour les enquêtes de 1986, 1991 et 1996 respectivement. Pour appliquer des régressions statistiques standards, on suppose l'indépendance entre les observations. Lorsque les échantillons sont sélectionnés en deux étapes, comme pour le cas des EDS, on constate une certaine corrélation entre les individus provenant d'une même grappe. Les individus vivant dans la même communauté ont tendance à se ressembler en terme de comportements et de caractéristiques (à cause d'une multitude de facteurs non-mesurés et non-mesurables). Il est donc essentiel d'un point de vue méthodologique de prendre en compte cette dépendance entre les observations à l'intérieur des grappes. Si on ne tient pas compte de ce fait, les erreurs standards associées aux variables fixes pourraient être sous-estimées, ayant pour effet d'augmenter le risque d'accepter

erronément la signification non-nulle d'une variable explicative (erreur statistique de type I). L'emploi des modèles de régression à multi-niveaux, une approche relativement récente dans les analyses démographiques, est donc plus approprié pour tenir compte de la structure hiérarchique des données.

Nous utilisons le logiciel MLn (*multilevel analysis*) qui permet de modéliser des régressions non-linéaires à multi-niveaux selon la procédure *second-order predictive quasi-likelihood* (Rasbash et Woodhouse, 1996), considérée comme étant une meilleure méthode pour estimer les paramètres et les erreurs standards pour ce type de modèle (Goldstein et Rasbash, 1996; Rodriguez et Goldman, 1995).

Le modèle suppose une distribution logistique, la variable dépendante étant le logarithme de cote (*log odds*) d'une femme entrant en première union à l'âge t (t = 11, 12,..., 19). Nous pouvons ainsi estimer l'effet d'une variable explicative spécifique en contrôlant pour une série d'autres facteurs qui sont supposés influencer la variable dépendante. Notre modèle multivarié s'exprime de la façon suivante :

$$h_{tij} = P\{y_{tij}=1 \mid y_{kij}=0, k<t\} = \exp(a_t+X'_{ij}B+u_{ij}+v_j)/[1+\exp(a_t+X'_{ij}B+u_{ij}+v_j)]$$

On définit h_{tij} comme la probabilité conditionnelle d'une femme i dans la grappe j de se marier à l'âge t, étant donné qu'elle ne s'est jamais mariée auparavant. Selon la notation scientifique standard, a_t est une fonction de l'âge de l'individu (une variable qui varie dans le temps), X'_{ij} est le vecteur des variables explicatives et B le vecteur des paramètres correspondants, avec u_{ij} représentant l'erreur au niveau des individus. Le terme v_j exprime la variation aléatoire au niveau des grappes, que l'on considère étant distribuée selon la loi normale avec une moyenne de zéro et une variance de σ^2.

Dans un deuxième temps, en limitant l'échantillon aux femmes qui sont entrées en union avant l'âge de 20 ans, nous pouvons examiner les déterminants du choix d'une union formelle ou informelle pour une adolescente. Le modèle multivarié s'écrit :

$$f_{ij} = \exp(X'_{ij}B+u_{ij}+v_j)/[1+\exp(X'_{ij}B+u_{ij}+v_j)]$$

où f_{ij} est la probabilité d'une adolescente *i* dans la grappe *j* de choisir une union de type informelle. Ici, il faut noter une faiblesse des informations tirées de l'EDS : l'inhabilité de faire la distinction entre les unions informelles qui sont plus tard formalisées et les unions qui étaient formelles dès le début. Comme les données font référence au type d'union (courant ou dissous) au temps de l'enquête, le nombre de premières unions informelles doit donc être considéré comme étant sous-estimé.

Nous incluons dans notre modèle un certain nombre de variables socio-démographiques et culturelles qui pourraient exercer une influence sur le comportement différentiel des individus : scolarité, lieu de résidence, résidence durant l'enfance, religion, pratique religieuse et exposition aux médias. Ces caractéristiques sont celles reportées au moment de l'enquête. Pour minimiser les effets de sélection chez les adolescentes, la scolarité sera définie comme une variable dichotomique : celles qui ont complété quatre années d'école au maximum (le point de passage du niveau primaire au secondaire dans le système scolaire brésilien) versus celles avec cinq années ou plus d'éducation.

Deux variables liées au développement communautaire sont aussi incluses. La première variable, agrégée au niveau grappe, évalue la proportion des ménages possédant une télévision. La variable est divisée en trois catégories: niveau faible (moins de 10 pour cent des ménages ont une télévision), moyen (entre 10 et 90 pour cent) et élevé (plus de 90 pour cent). La deuxième variable, également agrégée au niveau grappe, évalue les infrastructures sanitaires de la communauté, c'est-à-dire si elle se trouve dans la catégorie faible, moyenne ou élevée en terme de la proportion des ménages ayant l'eau courante et une toilette. Ces variables contrôlent le niveau de développement socio-économique de la communauté de la jeune femme ainsi que la pénétration des médias. Comme l'adolescence est par nature une période de transition, les deux indicateurs sont basés seulement sur les informations tirées des femmes à un stage plus avancé de leur vie. Les ménages où réside une femme âgée entre 15 et 24 ans sont exclus du calcul des variables agrégées.

Pour faciliter l'interprétation des paramètres estimés, nous présenterons les résultats en terme de rapports de risque. Un rapport supérieur à l'unité indique un risque plus élevé de formation de l'union pendant l'adolescence pour un individu dans une catégorie donnée par rapport à son homologue dans la catégorie de référence. Un rapport inférieur à l'unité indique un risque moins élevé, ceteris paribus.

5.3 Résultats

Analyse descriptive

A première vue, il semble que les femmes plus instruites ont moins tendance à contracter une première union (formelle ou informelle) pendant l'adolescence, et ceci pour chacune des périodes d'enquête (tableau 5.3). En 1986 et 1996, la proportion des adolescentes avec 5 années ou plus de scolarité qui ont déjà été en union est deux fois moins élevée que celle des adolescentes ayant entre 0 et 4 années de scolarité. L'écart est beaucoup moins important en 1991, mais est toutefois présent. (En limitant les catégories de scolarité aux niveaux 0-4 années versus 5 années ou plus, nous tentons de minimiser les effets de sélection : une jeune femme pourrait décider de retarder son mariage pour continuer ses études, ou au contraire pourrait être obligée d'abandonner l'école de façon précoce pour se marier.)

Les adolescentes vivant ou ayant vécu pendant l'enfance en milieu urbain ont également moins tendance à entrer en union. Il en est de même pour celles qui regardent régulièrement la télévision. On ne discerne aucune tendance constante au cours de la décennie, ni dans la direction ni dans la magnitude du différentiel de la probabilité de formation des unions selon l'affiliation religieuse. Cependant, les femmes plus pratiquantes, c'est-à-dire celles qui assistent à des cérémonies religieuses régulièrement, sont caractérisées par des proportions nettement moins élevées de contracter une première union avant l'âge de 20 ans.

Tableau 5.3: Pourcentage des femmes adolescentes (15-19 ans) ayant déjà été en union, selon certaines caractéristiques, Nordeste Brésil, 1986, 1991, 1996

	1986	1991	1996
Scolarité			
0-4 années	22	19	29
5+ années	9	15	12
Résidence			
Urbaine	13	15	17
Rurale	19	21	23
Résidence en enfance			
Urbaine	14	16	17
Rurale	17	18	23
Regarde la télévision chaque semaine			
Oui	10	15	17
Non	24	24	32
Religion			
Catholique	14	16	19
Non catholique	18	22	17
Assiste à une cérémonie religieuse au moins une fois par mois			
Oui	24	22	25
Non	8	13	15

Analyse multivariée : Risque d'entrer en union durant l'adolescence

Comme on peut le voir dans le tableau 5.4, au cours de l'adolescence, le risque d'entrer en union pour une femme augmente essentiellement de façon monotonique avec l'âge. L'éducation exerce aussi un impact statistiquement significatif sur la probabilité d'une jeune femme d'entrer en union avant l'âge de 20 ans ($p<0,01$). En contrôlant pour les autres variables culturelles et socio-démographiques, une adolescente ayant cinq années ou plus de scolarité a deux fois moins de chance d'entrer en union que celle ayant au plus quatre années de scolarité. Cette tendance est relativement stable dans le temps.

Tableau 5.4: Résultats de l'analyse de survie en temps discret logistique multivariée à effets aléatoires mesurant les risques pour une femme d'entrer en première union pendant l'adolescence, Nordeste Brésil, 1986, 1991 et 1996

	Moyenne de l'échantillon	Rapport de risque
Age		
11	0.00	0.01 **
12	0.01	0.04 **
13	0.01	0.09 **
14	0.03	0.19 **
15	0.04	0.34 **
16	0.05	0.59 **
17	0.05	0.81 *
18	0.04	0.86
19 (r)	0.04	1.00
Scolarité		
0-4 années (r)	0.43	1.00
5+ années	0.57	0.41 **
Interaction: Scolarité - Période d'enquête		
5+ années – 1986	0.08	0.93
5+ années – 1991	0.28	1.11
Résidence		
Urbaine	0.70	0.82 *
Rurale (r)	0.30	1.00
Résidence en enfance		
Urbaine	0.63	1.17
Rurale (r)	0.37	1.00
Interaction: Résidence en enfance - Période d'enquête		
Urbaine – 1986	0.09	0.95
Urbaine – 1991	0.30	0.94
Regarde la télévision chaque semaine		
Oui	0.79	0.92
Non (r)	0.21	1.00
Interaction: Regarde la télévision - Période d'enquête		
Oui – 1986	0.10	0.91
Oui – 1991	0.39	0.77 *
Religion		
Catholique	0.80	0.90
Non catholique (r)	0.20	1.00
Assiste à une cérémonie religieuse au moins une fois par mois		
Oui	0.53	0.66 **
Non (r)	0.47	1.00
Classement au niveau grappe: % des ménages possédant une télévision		
Faible	0.17	0.83 *
Moyen (r)	0.65	1.00
Elevé	0.18	0.76 **
Classement au niveau grappe: % des ménages ayant l'eau courante et une toilette		
Faible	0.31	0.89
Moyen (r)	0.55	1.00
Elevé	0.13	0.79 *
Paramètre aléatoire au niveau grappe		0.17 **
(N=5199)		

Source: Enquêtes démographique et de santé, femmes âgées de 15-24.
* p<,05; ** p<,01 r=catégorie de référence

Les femmes vivant en milieu urbain sont moins sujettes à contracter une première union durant l'adolescence, ceteris paribus. Il en est de même pour celles qui assistent régulièrement à des cérémonies religieuses, toutes religions confondues.

De plus, le modèle à deux niveaux révèle une variation aléatoire significative au niveau grappe. Ceci suggère l'existence d'influences non-observées, conditionnées par le contexte géographique local (autre que milieu urbain/rural ou niveau de développement communautaire), qui peuvent augmenter ou diminuer la probabilité d'une femme de former une union durant l'adolescence.

Catégorie d'union

Plus jeune est une femme lors de sa première union, plus grande est la chance que cette union soit de type informel (tableau 5.5). Une femme qui est entrée en union à l'âge de 14 ans ou moins se retrouve deux fois plus souvent dans une union informelle, comparé à une femme entrant en union entre 17 et 19 ans, toutes choses égales par ailleurs. De plus, une femme ayant eu une conception prénuptiale a significativement plus de chance d'être dans une union informelle que dans une union formelle ($p<0,01$). Ces résultats semblent confirmer la notion qu'une exposition plus jeune à la vie de couple ou aux relations sexuelles joue en faveur des unions informelles.

D'un autre côté, il y a peu d'évidence suggérant qu'une femme de statut socio-économique faible a un plus haut risque de s'établir dans une union informelle. Ni le niveau de scolarité, ni le niveau de développement de la communauté en terme de possession de biens durables (télévision), n'exercent un impact sur le type d'union ($p<0,05$). Les femmes vivant dans les communautés où les conditions sont les plus précaires (peu de ménages ont l'eau courante et une toilette) ont moins de chance d'être dans une union informelle. Il apparaît donc que les valeurs culturelles, en particulier celles mesurées par le lieu de résidence durant l'enfance et la pratique religieuse, jouent un rôle important dans le type d'union choisi par une jeune femme.

Tableau 5.5: Résultats de l'analyse logistique multivariée à effets aléatoires mesurant les risques pour une femme déjà en union pendant l'adolescence d'être en union informelle, Nordeste Brésil, 1986, 1991 et 1996

	Moyenne de l'échantillon	Rapport de risque
Age à la première union		
14 ou moins	0.18	2.04**
15-16	0.35	1.43**
17-19 (r)	0.47	1.00
Conception prénuptiale		
Oui	0.21	1.91**
Non	0.79	1.00
Interaction: Conception prénuptiale - Période d'enquête		
Oui – 1986	0.03	0.54
Oui – 1991	0.09	0.58*
Scolarité		
0-4 années	0.58	1.00
5+ années	0.42	0.76
Interaction: Scolarité - Période d'enquête		
5+ années – 1986	0.05	0.78
5+ années – 1991	0.20	0.66
Résidence		
Urbaine	0.62	1.05
Rurale (r)	0.38	1.00
Résidence en enfance		
Urbaine	0.57	3.03**
Rurale (r)	0.43	1.00
Interaction: Résidence en enfance - Période d'enquête		
Urbaine – 1986	0.08	0.35**
Urbaine – 1991	0.25	0.38**
Regarde la télévision chaque semaine		
Oui	0.70	0.79
Non	0.30	1.00
Religion		
Catholique	0.78	1.02
Non catholique (r)	0.22	1.00
Assiste à une cérémonie religieuse au moins une fois par mois		
Oui	0.41	0.61**
Non	0.59	1.00
Classement au niveau grappe: % des ménages possédant une télévision		
Faible	0.21	1.04
Moyen (r)	0.67	1.00
Elevé	0.12	1.1
Classement au niveau grappe: % des ménages ayant l'eau courante et une toilette		
Faible	0.38	0.54**
Moyen (r)	0.52	1.00
Elevé	0.10	0.81
Paramètre aléatoire au niveau grappe		0.48**
(N=1455)		

Source: Enquêtes démographique et de santé, femmes âgées de 15-24.
* p<,05; ** p<,01 r=catégorie de référence

5.4 Discussion

Mis à part l'âge, l'éducation fait partie des variables ayant exercées les plus fortes influences sur la probabilité d'une femme de contracter sa première union durant l'adolescence dans le Nordeste, au cours de la décennie 1986-1996. Les jeunes femmes plus instruites sont vraisemblablement plus en mesure d'évaluer les avantages d'un mariage tardif, en terme de pouvoir poursuivre ses études pour mieux satisfaire aux exigences du marché de l'emploi, et de pouvoir choisir son conjoint de façon autonome et d'exercer une plus grande influence sur son ménage et sa famille.

Le niveau de scolarité n'a cependant pas d'impact discernable sur le type d'union. S'il a été suggéré ailleurs que les femmes de niveau socio-économique plus faible sont à plus grand risque d'être dans une union de type informelle, nos résultats ne confirment pas cette hypothèse. La progression de l'union libre dans cette société semble plus liée à la diffusion de ce mode adopté davantage par les groupes souvent considérés les plus innovateurs : les jeunes, urbains et séculiers. En même temps, le lien entre conception prénuptiale et type d'union suggère que l'exposition hâtive aux relations sexuelles et une grossesse non-planifiée pourraient être le catalyste d'un nombre important d'unions informelles chez les jeunes.

Cette étude présente un nombre d'avantages dans l'analyse des tendances et déterminants de la formation de l'union durant l'adolescence, mais aussi certaines limitations. La disponibilité de trois bases de données successives ayant de l'information sur les comportements nuptiaux des femmes, nous permet de limiter l'échantillon aux groupes d'âges les plus jeunes. Elles nous procurent des données de meilleure qualité, comparées aux études rétrospectives, étant donné que les erreurs d'omission et de déplacement des dates sont généralement plus fréquentes parmi les femmes plus âgées. Cependant, il est nécessaire que les variables utilisées dans les analyses multivariées se retrouvent dans chacune des trois enquêtes. Malgré des similarités importantes dans les questionnaires EDS, une comparabilité exacte n'est pas toujours possible. Par exemple, la variable race n'a pas été inclue dans le questionnaire de 1986. Des études antérieures avaient suggéré que la race pourrait être un facteur explicatif de la différentielle des expériences des femmes sur le marché

matrimonial (voir Berquó, 1998; Greene, 1992). Mais nos analyses multivariées menées sur les données de 1991 et de 1996 ne montrent aucun impact discernable de la race (blanche/non-blanche) sur la probabilité d'une première union pendant l'adolescence, après avoir contrôlé pour les effets des variables reliées au statut socio-économique de la femme (résultats non montrés).

Des lacunes dans certaines détails en terme d'histoire nuptiale, ménage d'origine et variables contextuelles nuisent aux recherches plus approfondies. En particulier, les caractéristiques des partenaires autre que l'époux actuel manquent. En 1996, plus de 10 pour cent des adolescentes ont indiqué qu'elles ont déjà été dans plus qu'une union, lors du moment de l'enquête. Peu d'informations sur leurs premiers partenaires sont disponibles. Des données supplémentaires amassées auprès des hommes, pour la première fois dans l'enquête de 1996, montrent que la proportion des hommes adolescents qui sont déjà entrés en union est beaucoup moins élevée (5 pour cent). Ceci suggère qu'un grand pourcentage des adolescentes contracte leurs premières unions avec des hommes adultes plus âgés.

Des influences familiales pourraient également jouer un rôle sur les éventuels comportements nuptiaux et reproductifs des jeunes femmes. Le schéma des EDS ne fait pas référence aux membres de la famille qui ne résident pas avec la répondante. En 1996, seulement les deux-tiers des adolescentes vivaient dans une situation où un parent est indiqué comme le chef de ménage. Plus d'informations sur les caractéristiques des parents, en particulier la scolarité de la mère, peu importe la composition du ménage, seraient utiles.

Enfin, la structure hiérarchique des données EDS nous oblige à considérer la corrélation des résidus au sein des contextes. Les résultats de nos modèles d'analyse à deux niveaux montrent l'hétérogénéité des situations locales et soulignent la nécessité d'approfondir la recherche des influences communautaires sur le comportement des individus. L'inclusion des variables qualitatives contextuelles, entre autres l'influence des pairs et les programmes de santé et d'éducation reproductives auprès des jeunes, demeure difficile vue le manque de données appropriées.

Abstract: Union Formation among Adolescent Women in Northeast Brazil

The proportion of women entering into union during adolescence is becoming increasing prevalent in Northeast Brazil. To measure determinants of union formation, multivariate logistic hazard models are used drawing on data from three Demographic and Health Surveys conducted in the region between 1986 and 1996. Education is among the covariates found to most strongly associated with probability of union formation before the age of 20: a teenage woman with five or more years of schooling is less than half as likely to enter into union compared to her counterpart with less schooling, a trend that has remained relatively stable over time. Urban residence and religiosity are also associated with lower risk of union formation among adolescent women. While union formation early in adolescence seemingly operates in favour of informal unions over formal ones, there is little evidence to suggest that women's lower socio-economic status entails greater risk of an informal union. The link found between premarital conception and union type suggests that early exposure to intercourse and unplanned pregnancy could be a strong catalyst in the choice of informal union type among young women.

REFERENCES BIBLIOGRAPHIQUES

ALLISON, P.D., 1982. "Discrete-time Methods for the Analysis of Event Histories" dans S. Leinhardt (éd.), *Sociological Methodology*. San Francisco, Jossey-Bass, pp. 61-98.

ALVES, J.E.D., 1996. "Relações de Genero e Transição da Fecundidade" dans Associação Brasileira de Estudos Populacionais, *Anais doEncontro nacional de estudos populacionais*, Caxambu.

ARRUDA, J. M., L. MORRIS, et al., 1988. "Tendências Recentes da Fecundidade e do Planejamento Familiar na Região Nordeste, 1980-1986" dans Associação Brasileira de Estudos Populacionais, *Anais do VI Encontro Nacional de Estudos Populacionais*, Olinda.

ARRUDA, J.M., N. RUTENBERG, L. MORRIS et E.A. FERRAZ, 1987. *Pesquisa Nacional sobre Saúde Materno-Infantil e Planejamento Familiar: Brasil, 1986*. Rio de Janeiro, Sociedade Civil Bem-Estar Familiar no Brasil.

BAER, W., 1995. *The Brazilian Economy: Growth and Development.* Westport CT, Praeger Publishers.

BASTOS, A.C.S., 1989. "Atitudes do adolescente baiano frente à sexualidade" dans A.V.B. Bastos, L. Morris et S.R.P. Fernandes (éds.), *Saúde e Educação Sexual do Jovem: um estudo en Salvador*. Salvador, Universidade Federal da Bahia, pp. 85-93.

BASTOS, A.V.B. et FERNANDES, S.R.P., 1989. "Alguns aspectos do comportamento reprodutivo – a opinião do jovem" dans A.V.B. Bastos, L. Morris et S.R.P. Fernandes (éds.), *Saúde e Educação Sexual do Jovem: um estudo en Salvador*. Salvador, Universidade Federal da Bahia, pp. 75-84.

BEMFAM, 1997. *Pesquisa Nacional sobre Demografia e Saúde 1996*. Rio de Janeiro, Sociedade Civil Bem-Estar Familiar no Brasil/Macro International.

BERQUÓ, E., 1998. "The Demography of Inequality: Considerations on black people in Brazil." *Brazilian Journal of Population Studies*, vol. 1, pp. 165-177.

CAMARANO, A.A., 1994. "Os determinantes proximos da fecundidade nordestina: uma analise agregada" dans *Fecundidade, Anticoncepção e Mortalidade Infantil: Pesquisa sobre Saúde Familiar no Nordeste, 1991*. Rio de Janeiro, BEMFAM/DHS.

FERRAZ, E.A., I.Q. FERREIRA, L. MORRIS, C. SIU et I.P. NEGRAO, 1999. *Adolescentes, Jovens e a Pesquisa Nacional sobre Demografia e Saúde: Um estudo sobre fecundidade, comportamento sexual e saúde reproductiva*. Rio de Janeiro, Sociedade Civil Bem-Estar Familiar no Brasil.

FERRAZ, E.A., I.Q. FERREIRA et N. RUTENBERG, 1992. *Pesquisa sobre Saúde Familiar no Nord-est Brasil 1991*. Rio de Janeiro, Sociedade Civil Bem-Estar Familiar no Brasil.

FERREIRA, C.E.C. et B. WALDVOGEL , 1997. "La nouvelle face du Brésil: La modernisation et ses disparités" dans J.C. Chasteland et J.C. Chesnais (éds.), *La Population du Monde: Enjeux et Problèmes*. Paris, Éditions de l'Institut National D'Études Démographiques, pp. 79-92.

GOLDANI, A.M., 1998. "Family life course of Brazilian women: variations by cohorts in the 20th century." *Brazilian Journal of Population Studies*, Vol. 1, pp. 229-244.

GOLDSTEIN, H. et J. RASBASH, 1996. "Improved Approximations for Multilevel Models with Binary Responses." *Journal of the Royal Statistical Society, Série A,* 159:505-513.

GREENE, M., 1992. "Formal and Informal Marriage in Brazil: Changes and Consequences for Family Structure" dans *Anais do 8o Encontro Nacional de Estudoes Populacionais*, Vol. I, Brasília.

GRINDSTAFF, C.F., 1990. "Long-Term Consequences of Adolescent Marriage and Fertility" dans J. Dumas (éd.), *Report on the Demographic Situation in Canada 1988.* Ottawa, Statistique Canada.

GUPTA, N., 2000. "Sexual Initiation and Contraceptive Use Among Adolescent Women in Northest Brazil." *Studies in Family Planning*, 31(3): 228-238 (reproduit dans ce volume).

LAM, D., G. SEDLACEK et S. DURYEA, 1993. "Increases in Education and Fertility Decline in Brazil." Communication présentée au congrès annuel du Population Association of America, Cincinnati.

LAZO, A.V., 1994. "Marital Fertility in Brazil: Differential by Type of Union and Its Importance in the Fertility Transition, 1976-1991." *Demographic and Health Surveys Working Papers*, No. 15. Calverton MD, Macro International.

MARTIN, T.C. et F. JUAREZ, 1995. "The Impact of Women's Education and Fertility in Latin America: Searching for Explanations." *International Family Planning Perspectives*, 21(2): 52-57.

MARTINE, G., 1996. "Brazil's Fertility Decline, 1965-95: A Fresh Look at Key Factors." *Population and Development Review*, 22(1):47-75.

RASBASH, J. et G. WOODHOUSE, 1996. *MLn Command Reference*. London, Institute of Education, University of London.

RIOS-NETO, E.L.G., S.D. MCCRACKEN, et al., 1991. "Contraceptive Use and Fertility in Brazil" dans *Proceedings of the Demographic and Health Surveys World Conference.* Columbia MD, Institute for Resource Development/ Macro International.

ROBEY, B., S.O. RUTSTEIN et L. MORRIS, 1992. "The Reproductive Revolution: New Survey Findings." *Population Reports, Série M*, No. 11.

RODRIGUEZ, G. et N. GOLDMAN, 1995. "An Assessment of Estimation Procedures for Models with Binary Responses." *Journal of the Royal Statistical Society, Série A,* 158(1):73-89.

SENDEROWITZ, J. et J.M. PAXMAN, 1985. "Adolescent Fertility: Worldwide Concerns." *Population Bulletin*, 40(2):3-49.

SILVA, N.V., M.H. HENRIQUES et A. DE SOUZA, 1990. "An Analysis of Reproductive Behavior in Brazil." *Demographic and Health Surveys Further Analysis Series*, Number 6. Calverton MD, Macro International.

SINGH, S. et D. WULF, 1990. *Today's Adolescents, Tomorrow's Parents: A Portrait of the Americas*. New York, Alan Guttmacher Institute.

WONG, L.R., 1994. "A queda da fecundidade no Nordeste: uma aproximação aos determinantes" dans BEMFAM (éd.), *Fecundidade, Anticoncepção e Mortalidade Infantil.* Rio de Janeiro, Sociedade Civil Bem-Estar Familiar no Brasil.

WOOD, C. et J.A.M. DE CARVALHO, 1988. *The Demography of Inequality in Brazil.* Cambridge, Cambridge University Press.

YINGER, N., A. DE SHERBININ, L.H. OCHOA, L. MORRIS et J. HIRSCH, 1992. *Adolescent Sexual Activity and Childbearing in Latin America and the Caribbean: Risks and Consequences*. Washington DC, Population Reference Bureau.

Cet article a été conçu dans le cadre des études doctorales en démographie de l'auteure à l'Université de Montréal. Une version préliminaire des résultats a été présentée au 68e Congrès annuel de l'ACFAS, Montréal, 15-19 mai 2000. L'auteure tient à remercier Thomas LeGrand pour son aide dans la réalisation de cette étude.

VI. Conclusion

If the three most important factors when buying real estate are said to be "location, location, location," then it is probably safe to suggest that the three most important factors regarding differentials in adolescent reproductive behaviour in Northeast Brazil are "education, education, education." In this dissertation we have examined trends and determinants of reproductive behaviour among young women in the impoverished region, amidst growing concerns of the health and social consequences of recently observed increasing levels of fertility in the earliest stages of their reproductive lives.

Based on multivariate statistical analyses of data drawn from three Demographic and Health Surveys (DHS) conducted in Northeast Brazil in 1986, 1991 and 1996, women's education emerges as among the variables most consistently and significantly associated with differential outcomes in adolescent fertility and its main proximate determinants. In particular, women with at most 4 years of schooling are found to be twice as likely to have had a first birth before the age of 20 compared to their more educated counterparts, a trend that holds over time, even after controlling for other socio-economic and cultural characteristics. It is the only descriptive variable (other than the woman's age) that consistently exercised an independent influence on the probability of having a first birth during adolescence for all three survey periods in our discrete-time hazard model.[Φ] That women's educational attainment shapes reproductive outcomes is hardly surprising, echoing both the expected finding based on the main theoretical perspectives of fertility as well as results obtained from a multitude of other empirical studies conducted across the developing world, Brazil and the Northeast region.

However, simultaneously observed increases in both overall levels of educational attainment and rates of childbearing among adolescents in the Northeast may initially appear contradictory. A closer examination of trends across the main proximate determinants of fertility helps shed some light on the phenomenon. Educational attainment remains among the variables most strongly associated with delayed

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Φ The use of the discrete-time model presents a number of advantages in analysing event histories, notably allowing consideration of censored observations and time-varying explanatory variables. For such models, a dummy variable is created for each age of exposure in completed years, less one (Allison, 1982). While a certain loss of information when aggregating data to years of exposure is acknowledged, use of shorter intervals of time becomes computationally problematic.

sexual activity and union formation, as well as increased contraceptive use during sexual initiation. Adolescent women who are more educated may better appreciate the health and social advantages of delayed reproductive-related behaviour, and are equally more likely to protect themselves from unplanned pregnancy (and presumably sexually transmitted diseases) through contraceptive use. Interestingly, the differential in risk of sexual initiation by educational attainment is found to be decreasing continually over time. Seemingly diminishing returns of education on delayed sexual activity may help explain in part observed increases in the absolute levels of sexual experience, and subsequent fertility, among our target population between the beginning and the end of the period of observation. The school setting may provide young women with greater freedom from parental supervision and traditional societal constraints, and more opportunities for meeting eligible members of the opposite sex and eventually developing intimate relations. Moreover the lack of a significant impact of educational attainment on women's choice of union type, combined with greater risk of premarital conception among women in consensual unions, may play in favour of higher net fertility outcomes.

Other micro-level variables viewed as relevant in the discussion of fertility regulation were also considered in the multivariate analyses. In a first step, effects of religious affiliation, place of residence, mass media exposure (and, where available, race) on the probability of first birth during adolescence were found to be negligible or dissipating over time. Subsequent, expanded models on the main proximate determinants suggested that it is likely religiosity (regardless of the faith practised) and childhood residence that play a greater role in terms of risk of early sexual initiation in particular. The latter variables point to the importance of cultural values in young women's reproductive-related outcomes, and underline the need for reproductive education and health programming at the earliest stages of the life course.

While our ability to conduct quality research in this area has been vastly improved in recent years, in particular thanks to the multitude of data collected through the DHS programme in Brazil and the Northeast region, in many ways empirical analyses are strongly limited by the surveys' design. Despite growing interest in young women's reproductive behaviour and health, as well as the social and economic consequences, there remains a lack of available information concerning well-defined

indicators and trustworthy data from community-level surveys using standardised designs.

For one, the definition of adolescence itself is subject to interpretation. The period of transition from childhood to adulthood encompasses many of the key demographic events that set the stage for the rest of an individual's life (Bongaarts and Cohen, 1998). The choice of which actual age bracket covers this crucial period is somewhat arbitrary. The definition adopted in the present study (15 to 19 years) has been guided as much by DHS convention as representing the real experiences of Brazilian youth.

The role of men - as fathers, husbands and sexual partners - is notably absent from our equation. While the inclusion of an independent sub-sample of males in the 1996 survey allowed for the first time opportunities for cross-sectional analyses, there remains a lack of comparable data over time. Other areas in need of investigation include long-term effects of adolescent fertility and consequences for children of teenage parents, contraceptive use-effectiveness and method switching, alternative pregnancy resolutions (particularly recourse to abortion), patterns of childrearing (such as adoption practises and parental/familial support systems), and the impact of union type on union stability.

The link between micro- and macro-perspectives of fertility is regrettably weak in empirical applications. Demographic theory focuses on the role of "modernisation" on changes in fertility behaviours across populations. An attempt to measure aspects of modernisation through the intermediary of the level of community development can be made through multilevel modelling, incorporating cluster-level aggregates based on individual survey responses from hierarchically structured datasets. Such attempts may not be fully satisfactory, however, failing to completely overcome problems of endogeneity of contextual variables collected in surveys. Our first analysis of determinants of childbearing during adolescence responded to the need to consider community influences through a random effects model, which pointed to significant cluster-level effects on individual fertility outcomes. Further analyses of the main proximate determinants also included cluster-level aggregates, of the relative sanitary infrastructure and degree of household ownership of durable goods (in particular,

ownership of a television set), drawing on information compiled from women in their latter reproductive years to minimise biases of selectivity.

Nevertheless, significant random cluster-level variances remained for the probability of early sexual initiation and union formation even after controlling for other measures of community development. While there is an obvious need for further investigation in this area, the lack of a reliable service availability module from each of the Brazil DHS phases hampers further analyses of community influences on individual reproductive behaviours at this point. Indeed plans for a new demographic and health-type survey early in the new millennium do not include provisions for independent collection of facility or service statistics, in part due to the heavy reliance on the private sector for family planning methods in this society. Likewise, increasing the ratio of women per cluster in the sampling frame is not being considered (Siân Curtis, personal communication). Either of these options would have tremendously facilitated future multilevel analyses.

Moreover, while theory points to the need to consider macro-level variables in analyses of reproductive patterns, and indeed theoretically multilevel modelling should be able to incorporate an unlimited number of contexts, the means of empirical applications remain problematic. The demographic literature is still sparse in terms of the number of applications with more than three levels, with most considering two (Schoumaker and Tabutin, 1999). The software used in the present research, *MLn*, estimates *n*-level effects through an approximation technique of linear (Taylor Series) expansion, and admittedly tends to be prone to convergence problems (Rasbash and Woodhouse, 1996). Our own attempts to estimate three-level models (individuals within households within clusters) failed to converge. On the other hand, advances in software development may help fulfil some analytical needs. Another newer multilevel statistical programme, one of the few commercially available, is *MIXNO* (for mixed-effects nominal logistic regression), which implements a full-information maximum likelihood approach that may be more computationally robust (Hedeker, 1999), and worth consideration for subsequent analyses.

That said, the DHS remains one of the most important and validated sources of empirical information on individual-related reproductive behaviour in Brazil and

across the developing world. The ongoing programme promises to provide ample additional opportunities for in-depth, time-trend analyses. Some demographers even "envy" the rich potential for reproductive health and behaviour-related studies in contexts of development offered through this instrument, a comparable equivalent lacking for many contemporary industrialised societies (Kim Moesgaard Iburg, personal communication). While tailor-made surveys supplemented with qualitative interviews would have been ideal, analyses currently allowed under the DHS fit the purposes of this dissertation, and were further useful in highlighting several areas for future research.

Bibliography

Ainsworth, M. (1994), *Socioeconomic Determinants of Fertility in Sub-Saharan Africa.* Washington DC: World Bank, 28 pages.

Allison, P.D. (1982). "Discrete-time Methods for the Analysis of Event Histories" in S. Leinhardt (ed.), *Sociological Methodology.* San Francisco: Jossey-Bass.

Alves, J. E. D. (1996). "Relações de Genero e Transição da Fecundidade" in Associação Brasileira de Estudos Populacionais, *Anais do IX Encontro nacional de estudos populacionais*, Caxambu.

Anderson, J.E. and J.G. Cleland (1984), "The World Fertility Survey and Contraceptive Prevalence Surveys: A Comparison of Substantive Results." *Studies in Family Planning*, 15(1):1-13.

Arruda, J.M. (1991). "Impacto de la pesquisa DHS en el Brasil" in *Proceedings of the Demographic and Health Surveys World Conference, Vol. III.* Columbia MD: Institute for Resource Development/Macro International.

Arruda, J. M., L. Morris, et al. (1988). "Tendências Recentes da Fecundidade e do Planejamento Familiar na Região Nordeste, 1980-1986" in Associação Brasileira de Estudos Populacionais, *Anais do VI Encontro Nacional de Estudos Populacionais*, Olinda.

Arruda, J.M., N. Rutenberg, L. Morris and E.A. Ferraz (1987). *Pesquisa Nacional sobre Saúde Materno-Infantil e Planejamento Familiar: Brasil, 1986.* Rio de Janeiro: Sociedade Civil Bem-Estar Familiar no Brasil.

Baer, W. (1995). *The Brazilian Economy: Growth and Development.* Westport CT: Praeger Publishers.

Balakrishnan, T.R. and F. Hou (1993), "Status of Women, Economic Development and Fertility." Paper presented at the XXIInd General Conference, International Union for the Scientific Study of Population, Montreal.

Bastos, A.C.S. (1989). "Atitudes do adolescente baiano frente à sexualidade" in A.V.B. Bastos, L. Morris and S.R.P. Fernandes (eds.), *Saúde e Educação Sexual do Jovem: um estudo en Salvador.* Salvador: Universidade Federal da Bahia, pp. 85-93.

Bastos, A.V.B. and Fernandes, S.R.P. (1989). "Alguns aspectos do comportamento reprodutivo – a opinião do jovem" in A.V.B. Bastos, L. Morris and S.R.P. Fernandes (eds.), *Saúde e Educação Sexual do Jovem: um estudo en Salvador.* Salvador: Universidade Federal da Bahia, pp. 75-84.

BEMFAM (1997). *Pesquisa Nacional Sobre Demografia e Saúde, 1996.* Rio de Janeiro: Sociedade Civil Bem-Estar Familiar no Brasil/Macro International.

BEMFAM (1999). *Adolescentes, Jovens e a Pesquisa Nacional Sobre Demografia e Saúde: Um estudo sobre fecundidade, comportamento sexual e saúde reproductiva.* Rio de Janeiro: Sociedade Civil Bem-Estar Familiar no Brasil.

Berelson, B. (1967), "On Family Planning Communication" in D.J. Bogue (ed), *Mass Communication and Motivation for Birth Control.* Chicago: Community and Family Study Center, University of Chicago, pp. 42-57.

Berquó, E. (1998). "The Demography of Inequality: Considerations on black people in Brazil." *Brazilian Journal of Population Studies*, Vol. 1, pp. 165-177.

Bertrand, J.T., M.A. Pineda and E. Soto (1978), *Communicating Family Planning to Rural Guatemala*. Chicago: Community and Family Study Center, University of Chicago.

Blake, J. and P. Das Gupta (1975), "Reproductive Motivation Versus Contraceptive Technology: Is Recent American Experience an Exception?" *Population and Development Review*, 1(2): 229-249.

Bongaarts, J. (1978). "A Framework for Analyzing the Proximate Determinants of Fertility." *Population and Development Review*, 4(1):105-32.

Bongaarts, J. (1985), "The Concept of Potential Fertility in Evaluation of the Fertility Impact of Family Planning Programmes" in United Nations, *Studies to Enhance the Evaluation of Family Planning Programmes*. New York: United Nations Department of International Economic and Social Affairs.

Bongaarts, J. and B. Cohen (1998). "Adolescent Reproductive Behavior in the Developing World: Introduction and Overview." *Studies in Family Planning*, 29(2):99-105.

Bogue, D.J. (1967a), "Attitude Change and Adoption of New Behaviors" in D.J. Bogue (ed), *Mass Communication and Motivation for Birth Control.* Chicago: Community and Family Study Center, University of Chicago, pp. 31-34.

Bogue, D.J. (1967b), "The Demographic Breakthrough" in D.J. Bogue (ed), *Mass Communication and Motivation for Birth Control.* Chicago: Community and Family Study Center, University of Chicago, pp. 1-7.

Bogue, D.J. (1967c), "What Are the Motives For and Against Birth Control in Various Cultures?" in D.J. Bogue (ed), *Mass Communication and Motivation for Birth Control.* Chicago: Community and Family Study Center, University of Chicago, pp. 21-25.

Bogue, D.J. (1983), "Normative and Psychic Costs of Contraception" in R.A. Bulatao and R.D. Lee (eds) (1983), *Determinants of Fertility in Developing Countries,* Vol. II. New York: Academic Press.

Bulatao, R.A. (1989), "Toward a Framework for Understanding Contraceptive Method Choice" in R.A. Bulatao, J.A. Palmore and S.E. Ward (eds.), *Choosing a Contraceptive: Method Choice in Asia and the United States*. Boulder, CO: Westview Press, pp. 277-304.

Bulatao, R.A. (1993), "Effectiveness and evolution of family planning programs" in *International Population Conference, Proceedings,* Vol. I. Montreal: International Union for the Scientific Study of Population, pp. 189-200.

Bulatao, R.A. and R.D. Lee (1983), "An Overview of Fertility Determinants in Developing Countries" in R.A. Bulatao and R.D. Lee (eds), *Determinants of Fertility in Developing Countries*, Vol. II. New York: Academic Press, pp. 757-787.

Cain, M. (1988), "Patriarchal Structure and Demographic Structure" in International Union for the Scientific Study of Population, *Conference on Women's Position and Demographic Change in the Course of Development*, Oslo, pp. 19-41.

Caldwell, J. (1976), "Toward a Restatement of Demographic Transition Theory." *Population and Development Review*, 2(3-4): 321-366.

Caldwell, J. (1978), "A Theory of Fertility: From High Plateau to Destabilization." *Population and Development Review*, 4(4): 553-578.

Camarano, A.A. (1994). "Os determinantes proximos da fecundidade nordestina: uma analise agregada" in *Fecundidade, Anticoncepção e Mortalidade Infantil: Pesquisa sobre Saúde Familiar no Nordeste, 1991*. Rio de Janeiro: BEMFAM/DHS.

Casterline, J.B., S. Singh, J. Cleland and H. Ashurst (1984), *The Proximate Determinants of Fertility*. WFS Comparative Studies, No. 39. London: World Fertility Survey, 57 pages.

Casterline, J.B., A.E. Perez and A.E. Biddlecom (1995), "Factors underlying unmet need for family planning in the Philippines." Paper presented at the annual meetings of the Population Association of America, San Fransisco.

Cleland, J. and C. Wilson (1987). "Demand theories of the fertility transition: an iconoclastic view. " *Population Studies*, 41(1): 5-30.

Coale, A.J. (1973), "The Demographic Transition." *Congrès international de la population*, Vol. I., Liège, pp. 53-71.

Coale, A.J. (1986), "The Decline of Fertility in Europe since the Eighteenth Century as a Chapter in Human Demographic History" in A.J. Coale and S.C. Watkins (eds), *The Decline of Fertility in Europe*. Princeton, NJ: Princeton University Press, pp. 1-30.

Davis, K. and J. Blake (1956), "Social Structure and Fertility: An Analytic Framework." *Economic Development and Cultural Change*, 4(3): 211-235.

Easterlin, R.A. (1975), "An Economic Framework for Fertility Analysis." *Studies in Family Planning*, 6(3): 54-63.

Easterlin, R.A. (1983), "Modernization and Fertility: A Critical Essay" in R.A. Bulatao and R.D. Lee (eds), *Determinants of Fertility in Developing Countries*, Vol. II. New York: Academic Press, pp. 562-586.

Easterlin, R.A. and E.M. Crimmins (1985), *The Fertility Revolution - A Supply Demand Analysis*. Chicago: University of Chicago Press.

Elmendorf, M. (1981), "Changing Role of Maya Mothers and Daughters" in R. Dauber and M. Cain (eds), *Women and Technological Change in Developing Countries*. Boulder, CO: Westview Press, pp. 149-180.

Faria, V.E. (1989). "Politicas de Governo e Regulação da Fecundidade: Consequências Não Antecipadas e Efeitos Perversos" in *Revista de Ciência Hoje*, pp. 62-103.

Farooq, G. and D. DeGraff (1988), *Fertility and development: An introduction to theory, empirical research and policy issues*. Geneva: International Labour Office.

Ferraz, E.A., I.Q. Ferreira and N. Rutenberg (1992). *Pesquisa sobre Saúde Familiar no Nordeste Brasil 1991.* Rio de Janeiro: Sociedade Civil Bem-Estar Familiar no Brasil.

Ferraz, E.A., L. Morris, I. Quental and V. Loppi (1998). "Increases in Premarital Sexual Experience among Young Adults in Brazil over a Ten-Year Period: 1986-1996." Paper presented at the Annual Meeting of the Population Association of America, Chicago.

Ferreira, C.E.C. and B. Waldvogel (1997). "La nouvelle face du Brésil: La modernisation et ses disparités" in J.C. Chasteland and J.C. Chesnais (eds.), *La Population du Monde: Enjeux et Problèmes*. Paris: Editions de l'Institut National d'Etudes Démographiques.

Freedman, R. (1995), "Asia's recent fertility decline and prospects for future demographic change." *Asia-Pacific Population Research Reports*, 1(January): 1-27.

Freedman, R. and B. Berelson (1976), "The Record of Family Planning Programs." *Studies in Family Planning*, 7(1): 1-40.

Freedman, R. and D. Freedman (1992), "The Role of Family Planning Programmes as a Fertility Determinant" in J.F. Phillips and J.A. Ross (eds), *Family Planning Programmes and Fertility*. Oxford: Clarendon Press, pp. 10-27.

Gage, A.J. (1995). *An Assessment of the Quality of Data on Age at First Union, First Birth, and First Sexual Intercourse for Phase II of the Demographic and Health Survey Program.* Calverton MD: Macro International.

Goldani, A.M. (1998), "Family life course of Brazilian women: variations by cohorts in the 20th century." *Brazilian Journal of Population Studies*, vol. 1, pp. 229-244.

Goldscheider, G. (1982), "Societal Change and Demographic Transitions: Selected Theoretical Issues and Research Strategies" in *Population et structures sociales, Chaire Quételet 81*, Université Catholique de Louvain, pp. 83-106.

Goldstein, H. and J. Rasbash (1996). "Improved Approximations for Multilevel Models with Binary Responses." *Journal of the Royal Statistical Society (A),*159: 505-513.

Greene, M. (1992). "Formal and Informal Marriage in Brazil: Changes and Consequences for Family Structure" in Associação Brasileira de Estudos Populacionais, *Anais do 8o Encontro Nacional de Estudoes Populacionais*, Vol. I, Brasília.

Grindstaff, C.F. (1990). "Long-Term Consequences of Adolescent Marriage and Fertility" in J. Dumas (ed.), *Report on the Demographic Situation in Canada 1988*. Ottawa: Statistics Canada.

Guzman, J.-M. (1986), "Fécondité et classes sociales en République Dominicaine" in D. Gavreau, J. Gregory, M. Kempeneers and V. Piché (eds), *Démographie et sous-développement dans le Tiers-Monde*. Montréal: McGill University Centre for Developing Area Studies.

Hedeker, D. (1999). *MIXNO: a computer program for mixed-effects nominal logistic regression*. Chicago: Division of Epidemiology and Biostatistics, School of Public Health, University of Illinois.

Henripin, J. (1991). "Tableaux sur l'évolution séculaire de la fécondité" in J. Henripin and Y. Martin (eds.), *La Population du Québec d'hier à Demain*. Montréal: Les Presses de l'Université de Montréal.

Henriques, M.H., N.V. Silva, S. Singh and D. Wulf (1989). *Adolescentes de Hoje, Pais do Amanhã: Brasil*. New York: Alan Guttmacher Institute.

Johnson, N.E. (1984), "Rural Development and the Value of Children: Implications for Human Fertility" in W.A. Schutjer and C.S. Stokes (eds), *Rural Development and Human Fertility*. New York: Macmillan, pp. 172-193.

Johnson-Acsadi, G. and M.B. Weinberger (1980), "Factors Affecting Use and Non-use of Contraception" in A.I. Hermalin (ed), *The Role of Surveys in the Analysis of Family Planning Programmes*. Liège: Ordina Editions, pp. 51-84.

Johnstone, J. (1967), "Theories of Mass Communication" in D.J. Bogue (ed), *Mass Communication and Motivation for Birth Control*. Chicago: Community and Family Study Center, University of Chicago, pp. 35-41.

Jones, G.W. (1982), "Fertility Determinants: Sociological and Economic Theories" in J.A. Ross (ed-in-chief), *International Encyclopedia of Population*. New York: The Free Press, pp. 279-285.

Jones, E.F., J.D. Forrest et al. (1986). *Teenage Pregnancy in Industrialized Countries.* New Haven: Yale University Press.

Katz, E. (1967), "The Characteristics of Innovations and the Concept of Compatibility" in D.J. Bogue (ed), *Mass Communication and Motivation for Birth Control.* Chicago: Community and Family Study Center, University of Chicago, pp. 131-153.

Kojima, H. (1993), "The Effects of Mass Media on Contraception and Fertility in African Countries." Paper presented at the International Population Conference, International Union for the Scientific Study of Population, Montreal.

Lakshmanna, M. (1988), *Population Control and Family Planning in India*. Delhi: Discovery Publishing House, 201 pages.

Lam, D., G. Sedlacek and S. Duryea (1993). "Increases in Education and Fertility Decline in Brazil." Paper presented at the Annual Meeting of the Population Association of America, Cincinnati.

Lapham, R.J. and W.P. Mauldin (1985), "Contraceptive Prevalence: The Influence of Organized Family Planning Programs." *Studies in Family Planning*, 16(3): 117-137.

Lazo, A.V. (1994). *Marital Fertility in Brazil: Differential by Type of Union and Its Importance in the Fertility Transition, 1976-1991.* Demographic and Health Surveys Working Papers, No. 15. Calverton MD: Macro International.

Lê, T.N. and V.K. Verma (1997). *An Analysis of Sample Designs and Sampling Errors of the Demographic and Health Surveys.* Calverton, MD: Macro International.

Leite, I.C. (1997). "The determinants of contraceptive choice in Northeast Brazil, 1991." Paper presented at the Annual Meeting of the Population Association of America, Washington DC.

Lloyd, C. and S. Ivanov (1988), "The Effects of Improved Child Survival on Family Planning Practice and Fertility." *Studies in Family Planning*, 19(3): 141-161.

Martin, T.C. and F. Juarez (1995). "The Impact of Women's Education and Fertility in Latin America: Searching for Explanations." *International Family Planning Perspectives*, 21(2): 52-57.

Martine, G. (1990). *Population in Brazil: Agenda for a country strategy.* Report prepared for the John P. and Catherine T. MacArthur Foundation, Brasilia.

Martine, G. (1996). "Brazil's Fertility Decline, 1965-95: A Fresh Look at Key Factors." *Population and Development Review,* 22(1): 47-75.

Mason, K.O. (1988), *A Feminist Perspective on Fertility Decline*. Ann Arbor, Michigan: Population Studies Center, University of Michigan.

Mason, K.O. and A.M. Taj (1987), "Differences between Women's and Men's Reproductive Goals in Developing Countries". *Population and Development Review*, 13(4):611-638.

Meekers, D. (1993). *Sexual Initiation and Premarital Childbearing in Sub-Saharan Africa.* Columbia MD: Macro International.

Menken, J. (1980). "The Health and Demographic Consequences of Adolescent Pregnancy and Childbearing" in C.S. Chilman (ed.), *Adolescent Pregnancy and Childbearing: Findings from Research*. Washington DC: US Department of Health and Human Services.

Miranda-Ribeiro, P. (1994). "Teenage sexuality, reproductive behavior, and access to health care in northeast Brazil" in Associação Brasileira de Estudos Populacionais, *Anais do IX Encontro de Estudos Populacionais*, Vol. 3, Caxambu.

Muhuri, P.K., A.K. Blanc and S.O. Rutstein (1994), *Socioeconomic Differentials in Fertility*. Demographic and Health Surveys Comparative Studies, No. 13. Calverton MD: Macro International.

Njogu, W. (1991), "Trends and Determinants of Contraceptive Use in Kenya." *Demography*, 28(1): 83-99.

Potter, J.E. et al. (1997). "The spread of television and fertility decline in Brazil: a spatial-temporal analysis, 1970-1991." Paper presented at the 23rd General Conference of the International Union for the Scientific Study of Population, Beijing.

Potter, J. et al. (1998). "The social impact of television on reproductive behavior in Brazil." Unpublished project status report prepared for the Rockefeller Foundation.

Potts, M. and P. Selman (1979). *Society and Fertility*. Estover: Macdonald and Evans.

Rasbash, J. and G. Woodhouse (1996). *MLn Command Reference*. London: Institute of Education, University of London.

Phillips, J.F. and J.A. Ross (1992), "Family Planning Programmes and Fertility Effects: An Overview" in J.F. Phillips and J.A. Ross (eds), *Family Planning Programmes and Fertility*. Oxford: Clarendon Press, pp. 325-332.

Rao, N.B., P.M. Kulkarni and P.H. Rayappa (1986), *Determinants of Fertility Decline: A Study of Rural Karnataka.* New Delhi: South Asian Publishers, 192 pages.

Ringheim, K. (1993), "Factors that Determine Prevalence of Use of Contraceptive Methods for Men." *Studies in Family Planning*, 24(2): 87-99.

Rios-Neto, E.L.G., S.D. McCracken et al. (1991). "Contraceptive Use and Fertility in Brazil" in *Proceedings of the Demographic and Health Surveys World Conference*. Columbia MD: Institute for Resource Development/ Macro International.

Robey, B., S.O. Rutstein and L. Morris (1992). "The Reproductive Revolution: New Survey Findings." *Population Reports*, Series M, Number 11.

Rodriguez, G. and N. Goldman (1995). "An Assessment of Estimation Procedures for Models with Binary Responses." *Journal of the Royal Statistical Society (Series A),* 158(1): 73-89.

Rosen, B. and A. Simmons (1971), "Industrialization, Family and Fertility: A Structural-Psychological Analysis of the Brazilian Case." *Demography*, 8(1):49-70.

Rutenberg, N., M. Ayad, L.H. Ochoa and M. Wilkinson (1991). *Knowledge and Use of Contraception*. Demographic and Health Surveys Comparative Studies, No. 6. Columbia MD: Institute for Resource Development/Macro International.

Safilios-Rothschild, C. (1982), "Female Power, Autonomy and Demographic Change in the Third World" in R. Anker, M. Buvinic and N. Youssef (eds), *Women's Roles and Population Trends in the Third World*. London: International Labour Organisation, pp. 117-132.

Schoumaker, B. and D. Tabutin (1999). "Analyse multi-niveaux des déterminants de la fécondité : problématique, modèles et applications au Maroc rural" in *Proceedings of the Third African Population Conference*, Vol. I., Durban.

Senderowitz, J. and J.M. Paxman (1985). "Adolescent Fertility: Worldwide Concerns." *Population Bulletin*, 40(2): 3-49.

Silva, N.V., M.H. Henriques and A. de Souza (1990). *An Analysis of Reproductive Behavior in Brazil*. Demographic and Health Surveys Further Analysis Series, No 6. Calverton MD: Macro International.

Simmons, G.B. (1985), "Theories of Fertility" in G.M. Farooq and G.B. Simmons (eds), *Fertility in Developing Countries: An Economic Perspective on Research and Policy Issues*. London: MacMillan Press, pp. 20-66.

Singh, S. and J. Casterline (1985), "The Socio-Economic Determinants of Fertility" in J. Cleland and J. Hobcraft (eds), *Reproductive Change in Developing Countries*. Oxford, UK: Oxford University Press, pp. 199-222.

Singh, S. and D. Wulf (1990). *Today's Adolescents, Tomorrow's Parents: A Portrait of the Americas*. New York: Alan Guttmacher Institute.

Stycos, J.M. (1968), "Contraception and Catholicism in Latin America" in J.M. Stycos (ed), *Human Fertility in Latin America*. Ithaca, NY: Cornell University Press.

Tsui, A.O. (1985), "The rise of modern contraception" in J. Cleland and J. Hobcraft (eds), *Reproductive Change in Developing Countires*. Oxford, UK: Oxford University Press, pp. 115-138.

United Nations (1989), *Levels and Trends of Contraceptive Use As Assessed in 1988*. New York: United Nations Department of International Economic and Social Affairs.

United Nations (1995), *Contraceptive Requirements and Logistics Management Needs in Brazil*, Technical Report No. 21. New York: United Nations Population Fund.

Van de Walle, E. and J.E. Knodel (1980), "Europe's Fertility Transition: New Evidence and Lessons for Today's Developing World." *Population Reference Bureau Bulletin*, No. 34.

Vock, J. (1988), "Demographic Theories and Women's Reproductive Labour" in S. Stitcher and J. Parpart (eds), *Patriarchy and Class: African Women in the Home and Workforce*. London: Westview Press, pp. 81-96.

Voydanoff, P. and B.W. Donnelly (1990). *Adolescent Sexuality and Pregnancy.* Newbury Park: Sage Publications.

Weinberger, M.B. (1990), "Changes in the Mix of Contraceptive Methods During Fertility Decline: Latin America and the Carribean" in *Seminar on Fertility Transition in Latin America*. Buenos Aires: International Union for the Scientific Study of Population.

Wong, L.R. (1994), "A queda da fecundidade no Nordeste: uma aproximação aos determinantes" in BEMFAM, *Fecundidade, Anticoncepção e Mortalidade Infantil.* Rio de Janeiro: Sociedade Civil Bem-Estar Familiar no Brasil.

Wood, C. and J.A.M. de Carvalho (1988). *The Demography of Inequality in Brazil.* Cambridge: Cambridge University Press.

Wulf, D. and S. Singh (1991). "Sexual Activity, Union and Childbearing Among Adolescent Women in the Americas." *International Family Planning Perspectives,* 17(4): 137-144.

Yinger, N., A. de Sherbinin, L.H. Ochoa, L. Morris and J. Hirsch (1992). *Adolescent Sexual Activity and Childbearing in Latin America and the Caribbean: Risks and Consequences*. Washington, D.C.: Population Reference Bureau.

Appendix A: Map of Brazil