

Youth Risk-Taking Behavior in Brazil:

Drug Use and Teenage Pregnancy

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The World Bank
Social Development
Sustainable Development Division
March 2008



Abstract

Using an extensive survey that addresses risk factors faced by the population in the shantytowns (favelas) of Fortaleza, Brazil, the aim of this paper is to study risk-taking behavior by youth, focusing on drug use and teenage pregnancy. The paper analyzes the impact of factors such as exposure to mass media, the existence of support networks, self-esteem, and the occurrence of violence at home and in the neighborhood, on the

probability of risk-taking behavior. A bivariate probit model is estimated. The findings indicate that reliance on support networks and exposure to mass media are associated with a lower probability of either type of risk behavior. Living in a violent home increases drug consumption. Race does not have a significant impact on either type of behavior.

This paper—a product of the Sustainable Development Division, Social Development—is part of a larger effort in the department to reduce poverty and increase social inclusion. Policy Research Working Papers are also posted on the Web at <http://econ.worldbank.org>. The author may be contacted at dverner@worldbank.org.

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**Youth risk-taking behavior in Brazil:
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Keywords: drug use; teenage pregnancy; sexual behavior; reproductive health; teenage behavior.

JEL: I12; J13.

1. Introduction

Youth risk-taking behavior, such as drug use, engagement in violence, school dropout, and teenage pregnancy, is known to have far-reaching implications on health, education, employment prospects, and income, which extend into adulthood. The relevance of the issue has led to a profusion of studies. The evidence gathered suggests that this type of behavior is not strictly emotionally driven, because teenagers also react to economic incentives and legal regulations. Illustrations of the economic rationality that drives this behavior, given the constraints faced, include the decline in cigarette or drug consumption as prices increase, or the increase in school dropout rates as teenage employment opportunities improve. The relevance of social norms and the influence of peers, particularly at school, have been shown. The impact of family background and the occurrence and timing of family events (such as parents' divorce) have been pointed out as crucial factors. Recent examples of this literature include Keng and Huffman (2007), Kooreman (2007), Castronova (2004), Antecol and Bedard (2007), and Gruber (2001).

Nevertheless, the interaction between different types of risk-taking behavior has merited little attention, as highlighted by Grueber (2001a), under directions for future research following a thorough multi-author and multi-angle analysis of risky behavior among youths. The current study concentrates on one such interaction, that between drug consumption and teen pregnancy in Brazil.

Several factors point to the relevance of analyzing the Brazilian case. First, trends in teenage pregnancy rates have been the subject of concern. Although a sharp decline in fertility rates has taken place in the country, mostly at older ages, the opposite trend has taken place for teenagers. The expected number of children per woman aged 15 to 49 declined sharply from 6.3 in 1960 to 2.4 in 2000; teenagers aged 15 to 19 accounted for 9% of the births in 1980, 14% in 1991, and 20% in 2000 (Berquó and Cavenaghi 2005: 3–4); from 1980 to 1994, the average number of children born each year per thousand teenage mothers aged 15 to 19 increased from 58 to 88 (UN 2004: 44). Moreover, drug use and unsafe sex are directly linked to the propagation of HIV/AIDS and Brazil has the second largest number of reported cases (Surratt and Inciardi 1999), despite success in its fight against the epidemic (Juarez and LeGrand 2005). Concern with the high rates of pregnancy

and HIV infection among youth in particular has led to interventions such as the Reproductive Health Program in the state of Bahia in 1997 and its evaluation (see Magnani et al. 2001), which pointed to limited results. Teenage fertility rates appear to be responding to cultural and social changes, and the increase is usually seen as reflecting the inability of health programs to reach their target.

This study analyzes the impact of forces such as exposure to mass media, the existence of support networks, self-esteem, or the occurrence of violence at home and in the neighborhood, on risk-taking behavior, thus going beyond factors more traditionally explored. A bivariate probit model is used to jointly model drug use and teen pregnancy; it relies on an extensive survey by Verner and Alda (2004) that specifically addressed risk factors faced by the population in these neighborhoods, with a particular focus on youth. The major advantages of the survey are the wide coverage of the population of youngsters, both males and females, in and out of school, and the wide set of issues addressed.

Section 2 presents an overview of recent literature on the link between youth drug use and teen pregnancy. Section 3 describes the data and section 4 presents descriptive evidence on the topic. The econometric model and its results are discussed in section 5, before concluding comments are presented.

2. Previous literature on the interaction between youth drug and sexual risk-taking behaviors

Early literature pointed to the existence of a link between substance use and risky sexual behavior. One line of reasoning would state that substance use impairs judgment and decision making, rendering individuals more prone to taking risks. From a statistical point of view, however, such an association could hardly be considered a causal link, since factors associated with both substance use and risky sexual behavior were not controlled for (unobservables). More recent work has therefore aimed at taking into account factors unobservable by the econometrician.

Grossman and Markowitz (2005) aim at identifying the causal impact of alcohol and drug consumption on several types of sexual behavior. They use an instrumental variable procedure in which prices are used as an instrument for alcohol and drug

consumption, on the assumption that these do not have a direct impact on sexual behavior. Their results in terms of the impact of drug use on the probability of engaging in risky sexual behavior are not conclusive, due to the weakness of the instruments used.

Rees et al. (2001) use a bivariate probit model to study the impact of substance use on sexual behaviors (being sexually active and using contraceptives). Substance use is instrumented with state- and county-level variables such as expenditures on police, the number of arrests, and the requirement for alcohol and drug prevention programs in schools. Results are again mixed. The authors find that drug use has no impact on the sexual behavior of females, while it has an impact on that of males.

Sen's work (2002) followed on the path of Rees et al. (2001), dealing with alcohol consumption. A bivariate probit model is estimated, using instrumental variables to capture the causal impact of alcohol use on the probability of sexual intercourse and first sexual intercourse without use of contraceptives. To instrument for alcohol consumption, the variables used included state-level taxes on beer, share of youth arrested for driving under the influence of alcohol, and spending on police. The study claims that drinking leads to an increased likelihood of sexual intercourse and noncontracepted intercourse, even though the instrumental variables used are found to have low predictive power for male alcohol consumption.

The works of Rees et al. (2001) and Sen (2002) have been criticized by Rashad and Kaestner (2004), since the instrumental variables used reveal low capacity to predict substance consumption, and since in most cases the instruments do not meet the exclusion restriction, i.e., they have a direct impact on sexual behavior.

This paper will estimate a bivariate probit model whose aims will be clarified in section 5.

3. Data set

3.1. Fortaleza, Northeast Brazil

Northeast Brazil, and the state of Ceará in particular, is one of the poorest regions

in the country.¹ Ceará's capital, Fortaleza, is Brazil's fifth largest city, with 2.8 million inhabitants. The Military Police have classified 82 of its 402 *favelas* as risk areas. Fortaleza is characterized by large internal disparities. The most developed neighborhood has a Human Development Indicator comparable to that of industrialized countries (0.916), while the least developed ones show values similar to countries in Sub-Saharan Africa (0.338). The three neighborhoods included in the survey are among the poorest in Fortaleza.

3.2. *The survey*

The survey implemented by the World Bank covered three neighborhoods in Fortaleza: Autran Nunes, Edson Queiroz, and Pirambú. Each has a population of around 20,000 people and around 4,500 houses. Approximately 500 questionnaires were applied in each neighborhood and, as a result, the sample contains about every ninth household in each of the three neighborhoods.

The data were collected by two sets of teams: the research team, which included statisticians from the local university, psychologists, NGOs, human rights spokespersons, youth and other people living in the selected neighborhoods; and the interview team, composed of one general coordinator, three neighborhood coordinators, and the interviewers, recruited in each of the neighborhoods. The Institute of Organized Research of Ceará (IPOC), a local NGO operating in the poor neighborhoods, led the interview process. Both the pilot and final interviews were carried out by youth from the neighborhoods. Some of the interviewers were part of the MH2OCE (Organized Hip-Hop Movement of Ceará); this organization, which works on violence prevention in poor neighborhoods in Fortaleza, facilitated the team's access to the most violent areas. The interviews were conducted from June 19 to 29, 2003.

The survey instrument covered five major areas: socioeconomic background; education; health and sexuality; social capital and violence; and employment and economic activity. More details on the data collection procedures can be found in Verner and Alda (2004).

¹ Section 3 draws heavily on Verner and Alda (2004) and Cardoso and Verner (2006).

3.3. Sample selection

The analysis focuses on teenagers aged 12 to 19 (the lower bound being dictated by data availability, since very few youngsters below the age of 12 were interviewed). Descriptive statistics are presented in Table A1 (see appendix).

4. Preliminary overview of youth risk-taking behavior

Figure 1 indicates that sexual relationships tend to start at an early age among the youngsters interviewed, particularly among females: 42% had their first sexual relationship when they were 15 years old or younger (16% when they were 13 or younger). A comparison of Figures 1 and 2 suggests that on average teenagers are starting to have sex before the age they consider as the ideal one. Indeed, about one-third of both males and females consider 18 or 19 years old as the ideal age for first intercourse.

Figure 1. Age at first sexual relationship, youth aged up to 19 years, males versus females

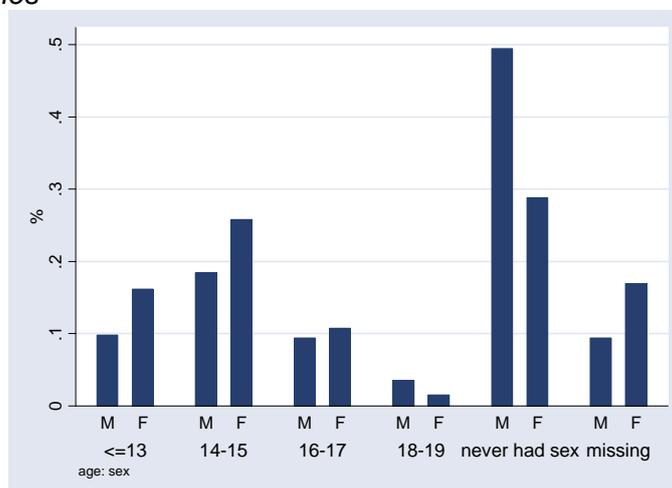


Figure 2. Reported ideal age for first sexual relationship, youth aged up to 19 years, males versus females

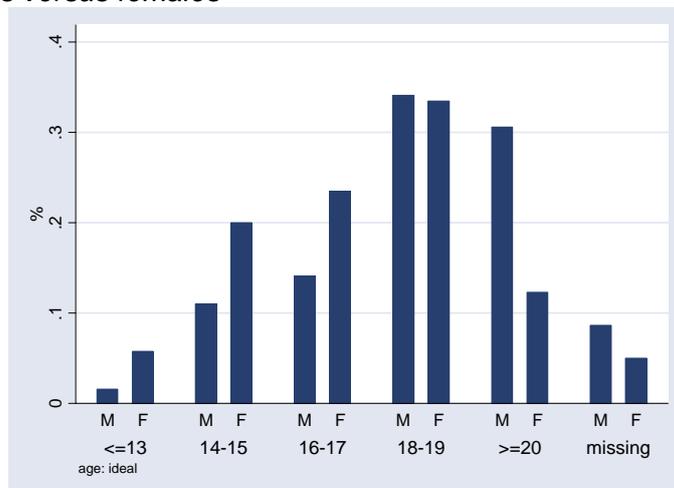


Figure 3. Drug use, males versus females



Figure 3, which plots the answer to the question “Do you currently take or have you taken drugs?” indicates that boys begin consuming drugs at an earlier age than girls. By age 18, however, one-third of the boys and half of the girls state that they have consumed drugs.²

² If we were dealing with longitudinal data, plotting the answers of the same individuals as they grew older, the shares plotted should increase monotonically with age. However, these data refer to a cross-section of individuals.

5. Identifying risk factors: Econometric model

A bivariate probit model is estimated to model two particular types of risky behavior: drug use and teen pregnancy. Estimation of a bivariate probit model facilitates a direct comparison of the impact of each variable across the two types of behavior, as well as the quantification of the nonexplainable correlation between the two decisions, associated with unobserved factors. In this sense, the interrelation between the two decisions can be captured, as opposed to the situation in which two separate binary models are estimated. The model under estimation will not aim at capturing the causal impact of one type of behavior on the other. This has been subject to scrutiny in the literature, with assumptions about behavior, theoretical background, empirical methods, and results that are not always satisfactory. We judge that the variables available in our dataset and their timing do not allow progress along this road. Instead, the novelty of our work resides in the exploration of the impact of variables such as the existence of different types of support networks and the media on drug use and teen pregnancy, while accounting for the nonexplainable correlation between the two decisions.

More formally, the probability of a youngster engaging in drug consumption or becoming pregnant (in the case of females; in the case of males, making someone pregnant) is given by the following equations:

$$y_1^* = X_1\beta_1 + u_1$$

$$y_2^* = X_2\beta_2 + u_2 ,$$

where y_1^* stands for drug consumption and y_2^* for teen pregnancy, X_1 and X_2 are the sets of explanatory variables, and u_1 and u_2 are error terms that capture the unobservable factors influencing drug use and teen pregnancy, respectively. Y_1^* and Y_2^* are latent variables and what is actually observed is

$$y_1 = \begin{cases} 1 & \text{if } y_1^* > 0 \\ 0 & \text{if } y_1^* \leq 0 \end{cases} \quad \text{and} \quad y_2 = \begin{cases} 1 & \text{if } y_2^* > 0 \\ 0 & \text{if } y_2^* \leq 0 \end{cases}$$

If the correlation between the error terms is nonzero, $\text{cov}(u_1, u_2) \neq 0$, results of the estimation of two separate models will be inconsistent. We therefore assume a

bivariate normal distribution with zero means, unit variances, and covariance ρ (see Greene 2003).

The explanatory variables, which include demographic information on age, gender, and race (nonwhite), and the educational level of the mother, are meant to capture the socioeconomic position of the family. A set of factors less often considered will be explored. An indicator of exposure to mass media is derived from the question “What do you do when you are not in school?” which achieves the value one if the answer “Watch TV or listen to the radio” was among those chosen, and zero otherwise. Different studies have called attention to the impact that living in a violent family environment can have on undermining self-esteem and motivating risky behavior by youngsters. The questionnaire includes the direct questions, “Is there violence in your house?” and “Are there groups that use violence against other groups in your neighborhood?” which were coded into “violence at home” and “violence in the neighborhood” if the answer was “yes.” Finally, the relevance of relying on support networks has been highlighted in several studies as a factor that discourages risky behavior by youth. We consider the answer to the question “Suppose that someone in your family suffered a loss. In that situation, who do you think would assist him/her financially?” The answer “friends” was taken as an indication of the existence of a support network, as perceived by the youngster.³ Another possibility was considered, with agreement with the statement “Most people in the neighborhood are willing to help if you need it” similarly expressing trust in support networks, in this case by neighbors. Results are reported in Table 1 below.

³ “The family” received 82% of the answers to this question; “friends” was the next most reported answer, with 8%, while neighbors gathered 4%, and all other options (religious leader, community leader, central government, local administration, employer, police) had negligible shares of answers, below 1%). More than one option could be chosen.

Table 1. Probability of drug use and teen pregnancy, bivariate probit model

	Coef.	Std. Err.
Drug use		
age	.1731	.0331
female	-.0117	.1287
race (nonwhite)	.0488	.1294
education mother>=intermediate complete	-.1284	.2517
watch TV while not in school	-.3163	.1359
violence at home	.6118	.1734
violence in neighborhood	.1710	.1308
support of neighbors	.0005	.1348
support of friends	-.4221	.2458
constant	-3.3988	.5647
Pregnancy		
age	.3678	.0518
female	-1.2210	.1959
race (nonwhite)	.0146	.1727
education mother>=intermediate complete	-.0908	.3038
watch TV while not in school	-.3679	.1898
violence at home	-.0479	.2523
violence in neighborhood	.1657	.1792
support of neighbors	-.3527	.1765
support of friends	-.1091	.3140
constant	-6.4578	.8728
Number of obs.	486	
Log likelihood	-398.934	
Wald chi2(18)	121.74	
Rho	.3249	.1040
Likelihood-ratio test of rho=0	chi2(1)=8.8867	Prob>chi2=0.0029

Table 2. Probability of drug use and teen pregnancy (marginal effects after bivariate probit)

	dy/dx	Std. Err.
Drug use		
age	.0568	.0107
female	-.0038	.0422
race (nonwhite)	.0160	.0422
education mother>=intermediate complete	-.0406	.0765
watch TV while not in school	-.1011	.0421
violence at home	.2216	.0664
violence in neighborhood	.0558	.0424
support of neighbors	.0002	.0442
support of friends	-.1218	.0607
Pregnancy		
age	.0423	.0067
female	-.1569	.0282
race (nonwhite)	.0017	.0198
education mother>=intermediate complete	-.0098	.0308
watch TV while not in school	-.0400	.0197
violence at home	-.0054	.0275
violence in neighborhood	.0189	.0204
support of neighbors	-.0448	.0248
support of friends	-.0117	.0313

Note: The marginal impact considers a discrete change in a dummy variable from 0 to 1. Age is the only continuous regressor.

The probability of consuming drugs and becoming pregnant (or making someone pregnant) both increase as the teenager grows, from 12 to 19 years old, and is an expected result. The likelihood of using drugs is not significantly different for males and females, but males are more likely during their teen years to engage in sexual relationships that lead to pregnancy (possibly of nonteenaged women). Race does not have a significant impact on the probability of engaging in either of these two types of behavior. This evidence is consistent with that in Cardoso and Verner (2006), who found that the likelihood of being out of school in these neighborhoods does not differ significantly across race groups. Similarly, Perlman (2004: 128) shows that in Rio de Janeiro's shantytowns there is little correlation between race and outcomes such as schooling, occupational status, political attitudes, social mobility, or perceptions of prejudice. The educational level of the mother does not have a significant impact on a teenager's probability of using drugs or having sex that leads to pregnancy.

Frequent exposure to television and radio is associated with a lower probability of consuming drugs and of teen pregnancy. Results by Gupta (2000) on the sexual behavior of female adolescents in Brazil pointed in the same direction. This might suggest some success of health campaigns disseminated through these means of communication.

Living in a violent home has a significant detrimental impact on the use of drugs, increasing their consumption. Living in a violent family or neighborhood environment does not have a significant impact on teen pregnancy.

Support networks matter for risky behavior by youth. Teenagers who stated that they rely on friends' support are less likely to use drugs, while reliance on people in the neighborhood seems to be associated with a lower probability of teen pregnancy.

There is a positive and significant correlation between the error terms of the two equations. This positive value of ρ indicates that unobservable factors not captured in the regression influence in the same direction the two risk-taking types of behavior. In other words, after the influence of gender, race, socioeconomic background, media exposure, existence of support networks, and the degree of violence in the environment are accounted for, there remains a positive correlation of roughly 0.32 between drug use and teen pregnancy.

6. Conclusion

This paper studied interactions between two types of youth risk-taking behavior—drug use and teen pregnancy—and checked the impact of factors such as exposure to mass media, the existence of support networks, self-esteem, or the occurrence of violence at home and in the neighborhood. Results indicate that exposure to mass media is associated with a lower probability of either type of behavior, which could point to some success in health campaigns disseminated through these means. Similarly, reliance on support networks is associated with a lower probability of either type of behavior. Living in a violent home has a significant detrimental impact on drug consumption. Race does not have a significant impact on either type of behavior.

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Appendix: additional tables

Table A1. Descriptive statistics

Variable	Mean (or percent)	Std. Dev.
Full sample		
drug use	.2951	2.0665
pregnancy	.1437	
age	15.84	
female	.5049	
race (nonwhite)	.5723	
education mother>=interm. complete	.0680	
watch TV while not in school	.3840	
violence at home	.1445	
violence in neighborhood	.5508	
support of neighbors	.6700	
support of friends	.0835	
Males		
drug use	.2941	2.1635
pregnancy	.2314	
age	15.74	
race (nonwhite)	.5873	
education mother>=interm. complete	.0745	
watch TV while not in school	.3661	
violence at home	.1429	
violence in neighborhood	.6429	
support of neighbors	.6816	
support of friends	.0706	
Females		
drug use	.2962	1.9659
pregnancy	.0577	
age	15.94	
race (nonwhite)	.5577	
education mother>=interm. complete	.0615	
watch TV while not in school	.4015	
violence at home	.1462	
violence in neighborhood	.4615	
support of neighbors	.6587	
support of friends	.0962	

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