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Ana Rute Cardoso
Dorte Verner

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Ana Rute Cardoso
IZA

Dorte Verner
World Bank

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IZA

P.O. Box 7240
53072 Bonn
Germany

Phone: +49-228-3894-0
Fax: +49-228-3894-180
E-mail: iza@iza.org

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ABSTRACT

Youth Risk-Taking Behavior in Brazil: Drug Use and Teenage Pregnancies*

Using an extensive survey addressing risk factors faced by the population in the shantytowns of Fortaleza, Brazil, the aim of this paper is to study interactions among different types of risk-taking behavior by youth, namely drug use and teenage pregnancy. We check 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, on the probability of risk-taking behavior. A bivariate probit model is estimated. 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 increased drug consumption. Race does not have a significant impact on either type of behavior.

JEL Classification: I12, J13

Keywords: drug use, teenage pregnancy, sexual behavior, reproductive health, teenage behavior

Corresponding author:

Ana Rute Cardoso
IZA
P.O. Box 7240
53072 Bonn
Germany
E-mail: cardoso@iza.org

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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, with the evidence gathered suggesting that this type of behavior is not strictly emotionally driven, as teenagers react also to economic incentives and legal regulations. Illustrations of the economic rationality driving this behavior, given the constraints faced, include the decline in cigarette or drug consumption as the price increases, or the increase in school dropout rates as the teenage employment opportunities improve. The relevance of social norms and the influence of peers, namely at school, have been shown. The impact of the 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 deserved little attention, as highlighted by Grueber (2001a), under directions for future research after 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 of all, trends in teenage pregnancy rates have been the subject of concern. While 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 15-19 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 (15 to 19 years old) 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 presents the second largest number of reported cases (Surratt and Inciardi, 1999), despite the successes 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 seem to be responding to cultural and social changes, and its 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 model jointly drug use and teen pregnancy, relying 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 the 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 overviews 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 take 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, using an instrumental variable procedure, where prices instrument for alcohol and drug consumption, on the assumption that they do not have a direct impact on sexual behavior. Their results on the impact of drug use on the probability of engaging in risky sex 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 sexual behavior of females, while it has an impact on 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, variables such as state level taxes on beer, share of youth arrested for driving under the influence of alcohol, and spending on police, were used. The study claims that drinking leads to an increase in the likelihood of sexual intercourse and non-contracepted 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 and its 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] Its capital, Fortaleza, is the fifth largest city in Brazil, with 2.8 million inhabitants. Eighty two of its 402 favelas have been classified as risk areas by the Military Police. 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 sub-Saharan Africa countries (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; 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), an organization that works on violence prevention in poor neighborhoods in Fortaleza, which facilitated the team's access to the most violent areas. The interviews were conducted June

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

19-29, 2003.

The survey instrument covered five major areas: socio-economic 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).

3.3 Sample selection

The analysis focuses on teenagers aged 12 to 19 years (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 in 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 inquired, in particular females: 42% had their first sexual relationship when they were 15 years old or younger (16% when they were 13 or younger). 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.

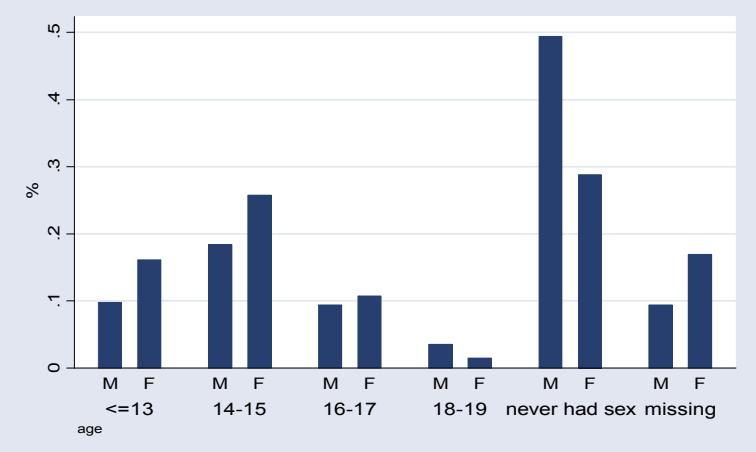

Figure 1: Age at first sexual relationship, youth aged up to 19 years, males versus females.

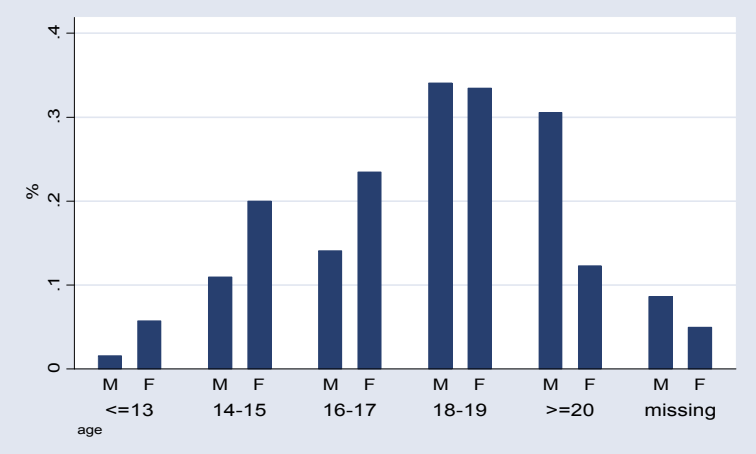

Figure 2: Reported ideal age for first sexual relationship, youth aged up to 19 years, males versus females.

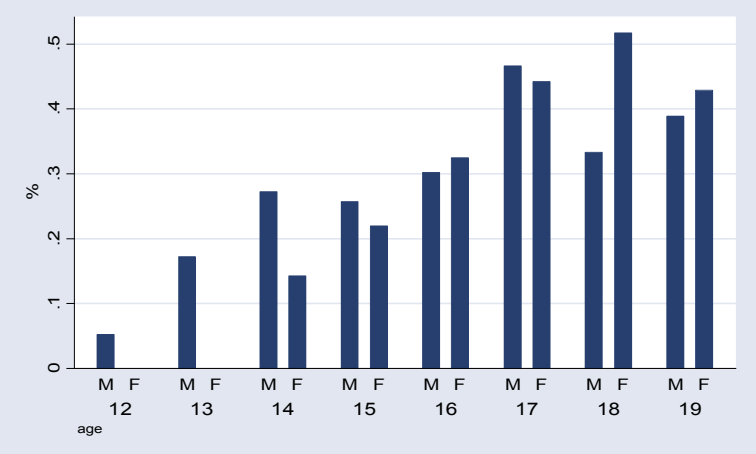

Figure 3: Drug use, males versus females.

Figure 3 plots the answer to the question "Do you currently take or took drugs?", indicating that boys start consuming drugs at an earlier age than girls. By age 18, however, one third of the boys and half the girls declare having consumed drugs.[2]

[2]If we were dealing with longitudinal data, plotting the answer 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 enables easy direct comparison of the impact of each variable across the two types of behavior, as well as the quantification of the non-explainable 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 when 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. That has been subject to scrutiny in the literature, with assumptions about behavior, theoretical background, empirical methods, and results 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 non-explainable correlation between the two decisions.

More formally, consider that the probability that a youngster engages in drug consumption or becomes pregnant (in the case of females; in the case of males, makes someone pregnant) is given by the following equations:

$$y_1^* = X_1\beta_1 + u_1 \tag{1}$$

$$y_2^* = X_2\beta_2 + u_2 \tag{2}$$

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

$$y_i = \begin{cases} 1 & \text{if } y_i^* > 0 \\ 0 & \text{if } y_i^* \leq 0 \end{cases}$$

where $i = 1, 2$, for drug consumption and teen pregnancy, respectively. If the correlation between the error terms is non-zero, $cov(u_1, u_2) \neq 0$, results of the

estimation of two separate models will be inconsistent. We therefore assume a bivariate normal distribution for the errors, with zero means, unit variances and covariance ρ. (see Greene, 2003)

The explanatory variables include demographic information on age, gender and race (non-white), and the educational level of the mother, meant to capture the socio-economic 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 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 discouraging youth risky behavior. 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.

Both the probability of consuming drugs and becoming pregnant (or making someone pregnant) increase as the teenager grows, from 12 to 19 years old, an expected result (see tables 1 and 2). After controlling for other factors, the likelihood of using drugs is not significantly different for males and females. Males are more likely during their teen years to engage in sexual relationships that lead

[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 answer, below 1%). More than one option could be chosen.

	Coef.	Std. Err.
Drug use		
age	.1731	.0331
female	-.0117	.1287
race (non-white)	.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 (non-white)	.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 $\chi^2(18)$	121.74	
ρ	.3249	.1040
Likelihood-ratio test of $\rho = 0$	$\chi^2(1) = 8.8867$	Prob> $\chi^2 = 0.0029$

Table 1: Probability of using drugs and teen pregnancy, bivariate probit model.

to pregnancy (possibly of non-teenager 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 the shantytowns (in Rio de Janeiro) there is little correlation between race and outcomes such as schooling, occupational status, political attitudes, social mobility, or perceptions of prejudice. Similarly, the educational level of the mother does not have a significant impact on the probability of using drugs or having sex that leads to pregnancy while a teenager.

Frequent exposure to television and radio is associated with a lower probability

	Marg. Impact	Std. Err.
Drug use		
age	0.0568	0.0107
female	-0.0038	0.0422
race (non-white)	0.0160	0.0422
education mother≥intermediate complete	-0.0406	0.0765
watch TV while not in school	-0.1011	0.0421
violence at home	0.2216	0.0664
violence in neighborhood	0.0558	0.0424
support of neighbors	0.0002	0.0442
support of friends	-0.1218	0.0607
Pregnancy		
age	0.0423	0.0067
female	-0.1569	0.0282
race (non-white)	0.0017	0.0198
education mother≥intermediate complete	-0.0098	0.0308
watch TV while not in school	-0.0400	0.0197
violence at home	-0.0054	0.0275
violence in neighborhood	0.0189	0.0204
support of neighbors	-0.0448	0.0248
support of friends	-0.0117	0.0313

Table 2: Probability of using drugs and teen pregnancy, marginal impacts from bivariate probit.
Note: For the dummy variables, the impact of a discrete change from 0 to 1 is reported.

of consuming drugs and of teen pregnancy. Results by Gupta (2000) on sex 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 drug use, increasing its consumption. Living in a violent family or neighborhood environment does not have a significant impact on teen pregnancy.

Support networks matter for youth risky behavior. Teenagers who declared to 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, socio-economic

background, media exposure, existence of support networks, and the degree of violence in the environment are accounted for, there remains a positive correlation between drug use and teen pregnancy of roughly 0.32.

6 Conclusion

This paper studied interactions between two types of youth risk-taking behavior, namely drug use and teen pregnancy, checking 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

Variable	Mean (or Percent)	Std. Dev.
Full sample		
drug use	0.2951	
pregnancy	0.1437	
age	15.84	2.0665
female	0.5049	
race (non-white)	0.5723	
education mother≥intermediate complete	0.068	
watch TV while not in school	0.384	
violence at home	0.1445	
violence in neighborhood	0.5508	
support of neighbors	0.6700	
support of friends	0.0835	
Males		
drug use	0.2941	
pregnancy	0.2314	
age	15.740	2.1635
race (non-white)	0.5873	
education mother≥intermediate complete	0.0745	
watch TV while not in school	0.3661	
violence at home	0.1429	
violence in neighborhood	0.6429	
support of neighbors	0.6816	
support of friends	0.0706	
Females		
drug use	0.2962	
pregnancy	0.0577	
age	15.940	1.9659
race (non-white)	0.5577	
education mother≥intermediate complete	0.0615	
watch TV while not in school	0.4015	
violence at home	0.1462	
violence in neighborhood	0.4615	
support of neighbors	0.6587	
support of friends	0.0962	

Table 3: Descriptive statistics.