Contribution of psychoactive substance use and other environmental factors to adolescent pregnancies in Mexico

Francisco-Javier Prado-Galbarro[1,2], Carlos Sanchez-Piedra[3], Juan-Manuel Martinez- Nuñez[1]

AFFILIATION
1 Orphan Drug Laboratory, Biologic Systems Department, Campus Xochimilco, Metropolitan Autonomous University, Mexico City, Mexico
2 Division of Research, Hospital Infantil de México Federico Gómez, Mexico City, Mexico
3 Instituto de Salud Carlos III, Madrid, Spain

CORRESPONDENCE TO
Carlos Sanchez-Piedra. Instituto de Salud Carlos III, Av. de Monforte de Lemos, 5, 28029 Madrid, Spain.
E-mail: carlos.sanchez@isciii.es ORCID ID: https://orcid.org/0000-0001-5420-7347

KEYWORDS
adolescent pregnancy, psychoactive substance use, environmental factors, neighborhood, Mexico

Received: 23 June 2023, **Revised:** 19 September 2023, **Accepted:** 22 September 2023
Public Health Toxicol. 2023;3(3):17
https://doi.org/10.18332/pht/172566

ABSTRACT

INTRODUCTION Mexico has the highest prevalence of adolescent pregnancies among all the member countries of the Organization for Economic Co-operation and Development (OECD) with a fertility rate of 70.6 births for every 1000 women aged 15–19 years. This study explored the associations between psychoactive substance use and adolescent pregnancy in 3263 adolescents.

METHODS This was a cross-sectional study using data from the National Health and Nutrition Survey 2018. We examined adolescent pregnancy among a sample of currently pregnant, ever pregnant and never pregnant teenage girls. The prevalence of psychoactive substance use was estimated at the state level using the 2016 National Survey of Drug, Alcohol, and Tobacco Use. Multilevel logistic models were fitted to evaluate the association between psychoactive substance use and adolescent pregnancy.

RESULTS Girls living in states with high prevalence of illegal drug use, non-prescription use of medical drugs, alcohol abuse and daily tobacco use had higher odds of having adolescent pregnancy (OR=1.22, 95% CI: 1.17–1.27; OR=2.00, 95% CI: 1.66–2.39; OR=1.10, 95% CI: 1.03–1.13; and OR=1.05, 95% CI: 1.03–1.18, respectively). Finally, adolescent pregnancy was positively associated with population density (OR=0.85, 95% CI: 0.82–0.88) and number of homicides (OR=1.08, 95% CI: 1.03–1.13).

CONCLUSIONS The exposure of adolescents to psychoactive substances may directly contribute to having a pregnancy. Also, these findings highlight the importance of attending school, having high school education and being beneficiaries of the social program CCT-POP in reducing adolescent fertility rates.

INTRODUCTION

Adolescent pregnancy is the leading cause of mortality in women aged 15–19 years in low- and middle-income countries. According to the World Health Organization (WHO), the global adolescent pregnancy rate is estimated at 46 births per 1000 girls, and Latin America and the Caribbean have the second highest rate of adolescent pregnancies in the world, estimated at 66.5 births per 1000 women aged 15–19 years[1]. Mexico has the highest adolescent pregnancy rate among the Organization for Economic Co-operation and Development (OECD) countries[2]. In 2017, two out of ten mothers who gave birth in Mexico were aged <20 years[3].

Multiple factors contribute to adolescent pregnancies, including individual, family and environmental variables. Adolescent pregnancy is linked to poverty, malnutrition, drug use, not using contraceptive methods, and a lack of knowledge about sex. Most pregnancies among adolescent girls are unplanned, especially among the lowest quintiles of poverty. Previous reports showed that when pregnancy occurs in a socioeconomically disadvantaged adolescent, a greater risk

of maternal and newborn morbidity and mortality has been associated with adolescent (15–19 years) pregnancy[4,5].

The neighborhood environment can include both opportunities and barriers in the prevention of adolescent pregnancy. Exposure to psychoactive substance use is one of the disadvantageous neighborhood influences on adolescent pregnancy. In Mexico, the use of psychoactive substances increased between 2011 and 2016, mainly among those aged <25 years[6]. The abuse of these substances during adolescence is associated with risk behaviors among pregnant women and the children born from these pregnancies[7].

Despite the high rates of adolescent pregnancy observed in Mexico, few studies have examined how various factors of the federal entities are related to adolescent pregnancy. This study aims to explore how the environmental and individual factors and psychoactive substance use are associated with adolescent pregnancy in the poorest social groups. We hypothesized that girls aged 15–19 years living in areas with higher prevalence of use of psychoactive substances, more crime, and greater marginalization, would have higher odds of pregnancy.

METHODS

This study involved a secondary analysis of cross-sectional data collected in the National Health and Nutrition Survey 2018 (Spanish acronym: ENSANUT 2018), which is representative at national and state with probabilistic, multi-stage, stratified and cluster sampling. The methodological details of the survey have been described previously[8].

We used data from adolescent girls aged 15–19 years with complete information about reproductive health information. The total sample for this study included 4364 girls aged 10–19 years, but 1101 were eliminated because the respondents belonged to the richest social groups (1051 girls) or had incomplete information (50 girls). The final sample included 3263 girls aged 15–19 years, based on the weighting factor.

Outcomes

The dependent variable was adolescent pregnant among girls aged 15–19 years, which was assessed using two survey questions (did not have an adolescent pregnancy=0; had an adolescent pregnancy=1). A woman was considered to have had an adolescent pregnancy if she answered positively that

Table 1. Exposure variables and other environment variables

Variables	Definition	Source	Year
Prevalence of illegal drug use	Proportion of the population who ever used marijuana, cocaine, crack, hallucinogens, inhalants, heroin or methamphetamines, in the past 12 months	National Survey of Drug, Alcohol, and Tobacco Use (ENCODAT)	2016
Prevalence of non-prescription use of medical drugs	Proportion of the population who ever used opiates, tranquilizers, sedatives or amphetamines, in the past 12 months	National Survey of Drug, Alcohol, and Tobacco Use (ENCODAT)	2016
Prevalence of alcohol abuse	Proportion of the population who presented a maladaptive pattern of substance use leading to clinically significant impairment or distress, as manifested by one (or more) of the following, occurring within a 12-month period: a) recurrent alcohol use resulting in a failure to fulfill major role obligations at work, school, or home; b) recurrent alcohol use in situations in which it is physically hazardous; c) recurrent alcohol-related legal problems; and d) continued alcohol use despite having persistent or recurrent social or interpersonal problems caused or exacerbated by the effects of alcohol	National Survey of Drug, Alcohol, and Tobacco Use (ENCODAT)	2016
Prevalence of daily tobacco use	Proportion of the population who smoke cigarettes every day	National Survey of Drug, Alcohol, and Tobacco Use (ENCODAT)	2016
Number of homicides	Using homicide data from death certificates by state	National Institute of Statistics and Geography (INEGI)	2018
Marginalization index	Multidimensional indicator that measures deprivation on four domains: education, housing quality, distribution of the population, and income	National Population Council (CONAPO)	2020
Population density	Measurement of population per unit area (km^2)	National Institute of Statistics and Geography (INEGI)	2020

she had been pregnant or was currently pregnant.

Covariates

We selected covariates at the individual level that had a theoretical association with adolescent pregnancy. However, information about sexual and contraceptive measures was not collected. At the individual level, the following social and demographic measures were studied: age, ethnicity (indigenous/not indigenous), school attendance, education level, marital status (unmarried or married/in union), health insurance (private vs public health insurance), depressive symptoms [the prevalence of depressive symptomatology was measured with the Depression Scale of the Center for Epidemiologic Studies, Brief Version (CESD-7)[9]], use of computers (whether used a computer during the previous 12 months at least once a week), use of cell phones (whether used the cell phone during the previous 12 months at least once a week), use of internet (whether used the internet during the previous 12 months at least once a week), if the participants were beneficiaries of the conditional cash transfer program 'Progresa/Oportunidades/Prospera' (CCT-POP)[10], region (categorized as North, Center, Mexico City, and South), and residence (rural or urban).

Exposure variables and other environment variables

The influence of prevalence of psychoactive substance use on adolescent pregnancy in Mexican was assessed using data from the 2016 National Survey of Drug, Alcohol, and Tobacco Use (ENCODAT, for its Spanish acronym)[6]. We determined the prevalence of drug, alcohol, and tobacco use (Table 1). Furthermore, other environment variables, such as population density[11], marginalization index[12], and number of reported homicides[13], were considered in the study.

We used a harmonized dataset of individual and state-level data for 32 states (Mexico is a federal republic composed of 32 states). Therefore, we aggregated state-level data to individual data for girls aged 15–19 years based on the girl's place of residence.

Statistical analysis

The descriptive analysis was done according to whether or not women had an adolescent pregnancy, using means and standard deviations for continuous variables, and percentages and 95% confidence intervals for categorical variables. Means were compared with Student's t-test, and the statistical significance of observed differences between groups was determined with the chi-squared test. Finally, multilevel binary logistic regression models were performed with individuals nested within states, to test the association between adolescent pregnancy and psychoactive substance use within the context of an ecological analysis.

Models were adjusted for individual and environmental variables whose bivariate tests had a $p<0.25$. A model was fitted separately for each of psychoactive substance (prevalence of illegal drug use, non-prescription use of medical drugs, alcohol abuse and daily tobacco use). Also, excluded variables were reintroduced in the model to assess their association in the multivariable environment, variables that became significant or that changed the coefficient of state variables by more than 10% were maintained in the model. All models were adjusted by the same set of individual-level covariates: age, school attendance, education level, use of computers, use of cell phones, use of internet, and being a CCT-POP beneficiary.

Statistical analyses were performed using STATA version 16.0 (StataCorp, Stata Statistical Software, 2019). Significance was set at alpha=0.05 with a 95% CI. All analyses considered the original multistage stratified sampling design of the surveys using the SVY module for complex samples.

RESULTS

Table 2 provides the individual characteristics of the weighted sample by outcome; 15.9% were girls who had a pregnancy, and the average age was significantly higher in the group with adolescent pregnancy (17.8 ± 1.2 years) than in the group without adolescent pregnancy (16.7 ± 1.4 years). Girls who quit school had a higher proportion of pregnancies than those who attended school. The proportion of adolescent pregnancy was significantly higher for girls with primary school or less (40.5%) and middle school (21.1%) than for those with a high school (8.7%) or college (8.2%). Most married or in union girls reported having been pregnant (79.3%). Among those using computers, cell phones and internet, the proportion of women reporting ever having been pregnant was lower than among those who did not use Information and Communication Technology (ICT). The prevalence of depressive symptomatology and indigenous background were not significantly associated with adolescent pregnancy.

Table 3 presents the environmental characteristics where adolescent women resided at the time of survey by outcome. Although none of the environmental variables showed a significant association, we observed that adolescent women who had a pregnancy lived in areas with a higher prevalence of psychoactive substance use than those who did not have a pregnancy.

Based on multilevel logistic models, girls who quit school were more likely to have had a pregnancy compared to those who attended school (AOR=9.60, 95% CI: 6.64–14.00). Similarly, girls with college (AOR=0.21, 95% CI: 0.09–0.53) or high school education (AOR=0.26, 95% CI: 0.16–0.44) were less likely to have has a pregnancy that those with primary education or less. Girls who did not use internet had a greater risk of pregnancy than those who used internet (AOR=1.50, 95% CI: 1.10–2.01), and being CCT-POP beneficiary decreased a woman's risk of adolescent pregnancy (AOR=0.50, 95% CI: 0.37–0.67) (Table 4).

Regarding environmental factors, psychoactive substance use was directly associated with an increase in adolescent pregnancies. The increase in one unit of prevalence of

Table 2. Baseline characteristics of girls according to adolescent pregnancy outcome

Individual characteristics	Without adolescent pregnancy	With adolescent pregnancy	p	Total
Total, n	2695	568		3263
Total (weighted), n (%)	3356268 (84.14)	632734 (15.86)		3989002
Age (years), mean ± SD	16.69 ± 1.35	17.76 ± 1.24	<0.001*	16.97 ± 1.48
Ethnicity	% (95% CI)	% (95% CI)		% (95% CI)
Indigenous	87.4 (81.69–91.51)	12.6 (8.49–18.31)	0.227	6.52 (5.18–8.19)
Not indigenous	83.91 (81.95–85.7)	16.09 (14.3–18.05)		93.48 (91.81–94.82)
School attendance				
Yes	97.33 (96.4–98.03)	2.67 (1.97–3.6)	<0.001*	61.39 (58.88–63.84)
No	63.16 (59.26–66.89)	36.84 (33.11–40.74)		38.61 (36.16–41.12)
Education level				
Primary school or less	59.49 (50.19–68.15)	40.51 (31.85–49.81)	<0.001*	6.41 (5.35–7.67)
Middle school	78.94 (75.51–82.01)	21.06 (17.99–24.49)		41.62 (39.15–44.12)
High school	91.3 (89.34–92.94)	8.7 (7.06–10.66)		48.01 (45.52–50.51)
College	91.78 (81.86–96.5)	8.22 (3.5–18.14)		3.96 (3.11–5.03)
Marital status				
Unmarried	96.74 (95.83–94.76)	3.26 (2.54–4.17)	<0.001*	83.42 (81.49–85.18)
Married/in union	20.74 (16.51–25.71)	79.26 (74.29–83.49)		16.58 (14.82–18.51)
Health insurance				
Private	89.32 (85.56–92.18)	10.68 (7.82–14.44)	0.002*	26.64 (24.34–29.07)
Public	82.26 (80.04–84.28)	17.74 (15.72–19.96)		73.36 (70.93–75.66)
Depressive symptoms				
No	84.22 (82.28–85.99)	15.78 (14.01–17.72)	0.783	88.48 (86.69–90.05)
Yes	83.49 (77.76–87.97)	16.51 (12.03–22.24)		11.52 (9.95–13.31)
Use of computers				
Yes	89.44 (85.86–92.19)	10.56 (7.81–14.14)	<0.001*	33.54 (31.2–35.98)
No	81.46 (79.19–83.54)	18.54 (16.46–20.81)		66.46 (64.02–68.8)
Use of cell phones				
Yes	85.04 (83.14–86.77)	14.96 (13.23–16.86)	<0.001*	89.63 (88–91.06)
No	76.33 (69.27–82.19)	23.67 (17.81–30.73)		10.37 (8.94–12)
Use of internet				
Yes	89.45 (86.38–91.89)	10.55 (8.11–13.62)	<0.001*	35.24 (32.9–37.64)
No	81.25 (78.83–83.44)	18.75 (16.56–21.17)		64.76 (62.36–67.1)
CCT-POP				
Non-beneficiary	81.9 (79.22–84.3)	18.1 (15.7–20.78)	0.004*	43.66 (41.19–46.16)
Beneficiary	87.02 (84.5–89.19)	12.98 (10.81–15.5)		56.34 (53.84–58.81)
Region				
North	80.28 (75.97–83.98)	19.72 (16.02–24.03)	0.17	14.05 (13.09–15.06)
Center	84.73 (81.06–87.8)	15.27 (12.2–18.94)		37.59 (35.34–39.9)
Mexico City	89.74 (80.75–94.8)	10.26 (5.2–19.25)		7.74 (6.44–9.27)
South	83.86 (81.29–86.13)	16.14 (13.87–18.71)		40.62 (38.79–42.48)
Residence				
Urban	84.72 (82.48–86.72)	15.28 (13.28–17.52)	0.351	68.24 (66.36–70.07)
Rural	82.89 (79.35–85.93)	17.11 (14.07–20.65)		31.76 (29.93–33.64)

CCT-POP: conditional cash transfer program 'Progresa/Oportunidades/Prospera'. * Significant at p< 0.05.

Table 3. Characteristics for the states of girls without adolescent pregnancy (N=2695) and with adolescent pregnancy (N=568)

Characteristics	Without adolescent pregnancy Mean (SD)	With adolescent pregnancy Mean (SD)	p	Total Mean (SD)
% Using illegal drugs	2.56 (0.91)	2.61 (0.98)	0.525	3.12 (0.94)
% Using non-prescription medical drugs	0.48 (0.24)	0.50 (0.27)	0.336	0.51 (0.19)
% Using daily tobacco	5.71 (2.78)	5.86 (3.15)	0.361	7.86 (2.13)
% Alcohol abuse	3.87 (0.90)	3.84 (1.01)	0.606	4.14 (0.86)
Marginalization index	18.69 (3.18)	18.56 (3.59)	0.551	21.11 (1.65)
Number of homicides	1593.66 (1077.02)	1506.89 (1127.10)	0.293	1789.02 (1136.31)
Population density by state (inhabitants/km^2)	406.5 (1085.54)	343.28 (1110.34)	0.461	674.97 (1653.93)

* Significant at $p<0.05$.

Table 4. Adjusted associations between adolescent pregnancy and psychoactive substance use

Predictor	Category	Adolescent pregnancy							
		Model 1		Model 2		Model 3		Model 4	
		AOR	95% CI	AOR	95% CI	AOR	95% CI	AOR	95% CI
Age		1.76*	1.55–2.01	1.76*	1.55–2.01	1.76*	1.55–2.01	1.76*	1.55–2.01
School attendance	Yes (Ref.)	1		1		1		1	
	No	9.64*	6.64–14.02	9.62*	6.64–13.94	9.63*	6.63–13.99	9.61*	6.64–13.90
Education level	Primary or less (Ref.)	1		1		1		1	
	Middle school	0.87	0.53–1.42	0.86	0.53–1.40	0.85	0.52–1.41	0.87	0.53–1.43
	High school	0.26*	0.16–0.44	0.26*	0.16–0.43	0.26*	0.15–0.43	0.26*	0.16–0.44
	College	0.21*	0.09–0.53	0.21*	0.09–0.53	0.21*	0.08–0.52	0.21*	0.09–0.53
Use of computers	Yes (Ref.)	1		1		1		1	
	No	0.91	0.60–1.38	0.91	0.59–1.38	0.91	0.60–1.38	0.91	0.60–1.39
Use of cell phones	Yes (Ref.)	1		1		1		1	
	No	1.14	0.71–1.84	1.15	0.72–1.83	1.13	0.70–1.84	1.15	0.72–1.85
Use of internet	Yes (Ref.)	1		1		1		1	
	No	1.49*	1.10–2.01	1.49*	1.10–2.02	1.50*	1.11–2.02	1.48*	1.09–2.02
CCT-POP	No (Ref.)	1		1		1		1	
	Yes	0.50*	0.37–0.67	0.50*	0.37–0.68	0.50*	0.37–0.69	0.50*	0.37–0.67
Population density by state[a]		0.90*	0.88–0.93	0.89*	0.86–0.92	0.84*	0.82–0.87	0.85*	0.82–0.88
Number of homicides**								1.08*	1.03–1.13
Use illegal drugs		1.22*	1.17–1.27						
Use medical drugs without prescription				2.00*	1.66–2.39				
Use tobacco daily						1.05*	1.03–1.08		
Abuse alcohol								1.10*	1.03–1.18

AOR: adjusted odds ratio; all models adjusted by the set of individual variables of each girl: age, school attendance, education level, use of computers, use of cell phones, use of internet and CCT-POP. **Model 4 adjusted by number of homicides: re-scaled using z-scores, so that a one-unit change represents a one standard deviation change in homicides of states. aPer 1000 inhabitants. CCT-POP: conditional cash transfer program 'Progresa/Oportunidades/Prospera'. *Significant at $p<0.05$.

illegal drug use, non-prescription use of medical drugs, alcohol abuse and daily tobacco use was associated with an increase in the odds of adolescent pregnancy (AOR=1.22, 95% CI: 1.17–1.27; AOR=2.00, 95% CI: 1.66–2.39; AOR=1.10, 95% CI: 1.03–1.13; and AOR=1.05, 95% CI: 1.03–1.18, respectively). In the four models, higher state population density was associated with higher odds of adolescent pregnancy. In addition, in Model 3 we observe that a one standard deviation increase in homicides was associated with a 8% increase in the odds of inadequate early childhood education (AOR=1.08, 95% CI: 1.03–1.13).

DISCUSSION

The most relevant findings from this work can be summarized as follows: First, we found that a higher prevalence of illegal drug use, non-prescription use of medical drugs, and tobacco and alcohol consumption in federal entities were associated with greater odds of adolescent pregnancy. Second, regarding individual characteristics, not attending school, low education level, not using the internet, and not being a CCT-POP beneficiary, were associated with an increased risk of adolescent pregnancy.

Adolescent substance use is an enduring problem in Mexico. One of the problems associated with the psychoactive substance use is risky sexual behavior among adolescents, since sexual activity and lack of contraceptive use are carried out under the effects of these substances. These behaviors are associated with unplanned pregnancies[14–16]. Our study adds evidence related to the presence of strong associations of higher prevalence of psychoactive substance use with greater risk of adolescent pregnancy in Mexico, after adjustment for individual characteristics. Studies have reported that the unintended pregnancy rate was highest among adolescent girls who used marijuana, cocaine, and opioid analgesics. Adolescents who used tobacco, alcohol, or other drugs, were more likely to be sexually active compared to adolescents who did not used psychoactive substances[17].

Several studies reported that marijuana use among adolescents is associated with sexual risk behaviors[18,19]. The activation of cannabinoid receptors can increase sexual desire and sexual satisfaction in women[18]. These receptors affect brain regions that influence pleasure, memory, thought, concentration, sensory and time perception[20]. Sumnall et al.[21] found that cannabis use improved the sexual experience and facilitated the sexual encounter.

Our findings also showed that living in more densely populated areas was associated with lower odds of having adolescent pregnancy. Large cities allow greater access to education, childcare facilities, and better employment opportunities for girls[22]. The highest rates of adolescent pregnancy were found in populations living in more marginalized areas where residents have a lack of information and restricted access to services[23]. Economic growth and development plays an important role to understand determinants associated with adolescent pregnancy rate[24].

Recent studies found that adolescents living in neighborhood with higher homicide rates have a significant impact on health and adolescent well-being[25–29]. Our findings are similar to this previous evidence, which may be due to widespread violence and organized crime in Mexico. Crime can potentially exacerbate drug use that has unintended consequences such as adolescent pregnancy and sexually transmitted diseases, and becoming a victim of physical or sexual abuse[26,30–32].

Additionally, our findings show that adolescent pregnancy was strongly associated with school attendance, use of Information and Communication Technology, education, and targeted programs. Prior research found that adolescents living in neighborhoods with concentrated poverty are associated with higher unemployment rates, lower education level, and higher adolescent pregnancy rates, initiating sexual intercourse at younger ages[33–38]. Furthermore, being a CCT-POP beneficiary in Mexico was associated with a lower prevalence of early unions and pregnancies, as well as a higher school prevalence, which could be due to the cash incentives provided by the program, so that adolescents stay in school[39,40].

Strengths and limitations

To our knowledge, this is the first study in Mexico showing nationally representative information with strong association between adolescent pregnancy and psychoactive substance use. Nonetheless, some limitations must be considered. First, causality cannot be determined due to the cross-sectional nature of the study design. Second, it was not possible to analyze whether a girl/woman used illegal drugs or non-prescribed medical drugs. Third, the environmental factors were measured at the federal entity level, which was the geographical level that was available for ENCODAT. The lack of disaggregated information on key exposures might limit our ability observe associations. For example, we acknowledge that homicide rates might not capture all the violence occurring in an area, which might be underestimating the association between the true contextual violence and adolescent pregnancy. Finally, we do not have the information of new psychoactive substances (NPS) use. Previous studies showed that adolescents may be more vulnerable to the harmful effects of these drugs than adults[41,42].

CONCLUSIONS

Our findings show that a mix of individual and environmental factors was associated with adolescent pregnancy. Individual factors such as school attendance, education level, and cash transfer programs, as well as environmental factors such as prevalence of psychoactive substance use and population density, influenced adolescent pregnancy. Our study provides

insights that can be used to lead policies and plan actions to prevent adolescent pregnancy and reduce high rates in the Mexican population.

REFERENCES

1 Pan American Health Organization/World Health Organization. Latin America and the Caribbean have the second highest adolescent pregnancy rates in the world. PAHO/WHO; 2018. Accessed September 19, 2023. https://www3.paho.org/hq/index.php?option=com_content&view=article&id=14163

2 Serván-Mori E, Quezada-Sánchez AD, Sosa-Rubí SG, Heredia-Pi I, Lozano R. Intergenerational replication of teenage pregnancy and educational attainment in mexico. Arch Sex Behav. 2022;51(8):4023-4034. doi:10.1007/s10508-022-02309-4

3 Instituto Nacional de Estadística y Geografía. Natalidad y fecundidad. INEGI; 2020. Accessed September 19, 2023. https://www.inegi.org.mx/temas/natalidad/

4 Rodríguez Vignoli J. Fecundidad no deseada entre las adolescentes latinoamericanas: un aumento que desafía la salud sexual y reproductiva y el ejercicio de derechos. CEPAL; 2017. Accessed September 19, 2023. https://www.cepal.org/es/publicaciones/42511-fecundidad-deseada-adolescentes-latinoamericanas-un-aumento-que-desafia-la-salud

5 Juarez F, Singh S, Maddow I, Wulf D. Embarazo no planeado y aborto inducido en México: causas y consecuencias. Guttmacher Institute; 2013. Accessed September 19, 2023. https://www.guttmacher.org/es/report/embarazo-no-planeado-y-aborto-inducido-en-mexico-causas-y-consecuencias

6 Villatoro-Velázquez JA, Resendiz-Escobar E, Mujica-Salazar A, et al. Encuesta nacional de consumo de drogas, alcohol y tabaco, ENCODAT 2016-2017. Encuesta Nac Consum Drog Alcohol y Tab 2016-2017 Rep Drog. Accessed September 19, 2023. https://www.researchgate.net/publication/321365272_Encuesta_Nacional_de_Consumo_de_Drogas_Alcohol_y_Tabaco_2016-2017_Reporte_de_Alcohol/link/5a1ed8ef458515a4c3d2209c/download

7 Reitan T. Substance abuse during pregnancy: a 5-year follow-up of mothers and children. Drugs Educ Prev Policy. doi:10.1080/09687637.2018.1432568

8 Romero-Martínez M, Shamah-Levy T, Vielma-Orozco E, et al. National Health and Nutrition Survey 2018-19: methodology and perspectives. Salud Publica Mex. 2019;61(6):917-923. doi:10.21149/11095

9 Herrero J, Gracia E. Una medida breve de la sintomatología depresiva (CESD-7). Salud Ment 2007;30(5):40-46. SCIELO. Accessed September 19, 2023. https://www.scielo.org.mx/scielo.php?script=sci_isoref&pid=S0185-33252007000500040&lng=es&tlng=es

10 Parker SW, Todd PE. Conditional cash transfers: the case of progresa/oportunidades. Journal of Economic Literature, 55(3), 866-915. doi:10.1257/jel.20151233

11 Instituto Nacional de Estadística y Geografía. México en Cifras. INEGI; 2020. Accessed September 19, 2023. http://cuentame.inegi.org.mx/poblacion/asistencia.aspx?tema=P

12 Consejo Nacional de Población. Dirección General de Planeación en Población y Desarrollo / Índices de Marginación. GDM; 2020. Accessed September 19, 2023. http://www.conapo.gob.mx/es/CONAPO/Indices_de_Marginacion

13 Instituto Nacional de Estadística y Geografía. Defunciones en México 2018. INEGI; 2022. Accessed September 19, 2023. https://www.inegi.org.mx/contenidos/programas/mortalidad/doc/defunciones_registradas_2018_nota_tecnica.pdf

14 Mendoza Tascón LA, Claros Benítez DI, Peñaranda Ospina CB. Actividad sexual temprana y embarazo en la adolescencia: estado del arte. Revista chilena de obstetricia y ginecología. 2016;81(3):243-253. doi:10.4067/s0717-75262016000300012

15 Edelman NL, Patel H, Glasper A, Bogen-Johnston L. Sexual health risks and health-seeking behaviours among substance-misusing women. J Adv Nurs. 2014;70(12):2861-2870. doi:10.1111/jan.12442

16 Bastías EM, Stiepovich J. Una revisión de los estilos de vida de estudiantes universitarios iberoamericanos. Ciencia y enfermería. 2014;20(2):93-101. doi:10.4067/S0717-95532014000200010

17 Connery HS, Albright BB, Rodolico JM. Adolescent substance use and unplanned pregnancy: strategies for risk reduction. Obstet Gynecol Clin North Am. 2014;41(2):191-203. doi:10.1016/j.ogc.2014.02.011

18 Lynn BK, López JD, Miller C, Thompson J, Campian EC. The relationship between marijuana Use prior to sex and sexual function in women. Sex Med. 2019;7(2):192-197. doi:10.1016/j.esxm.2019.01.003

19 Storholm ED, Ewing BA, Holliday SB, et al. Using marijuana, drinking alcohol or a combination of both: the association of marijuana, alcohol and sexual risk behaviour among adolescents. Sex Health. 2018;15(3):254-260. doi:10.1071/SH16218

20 National Institute of Drug Abuse. Research Report Series: Marijuana Abuse. NIDA; 2012. Accessed September 19, 2023. https://cdpsdocs.state.co.us/safeschools/Resources/NIDA%20National%20Institute%20on%20Drug%20Abuse/NIDA%20Research%20Report%20Marijuana.pdf

21 Sumnall HR, Beynon CM, Conchie SM, Riley SC, Cole JC. An investigation of the subjective experiences of sex after alcohol or drug intoxication. J Psychopharmacol. 2007;21(5):525-537. doi:10.1177/0269881106075590

22 Santelli JS, Song X, Garbers S, Sharma V, Viner RM. Global Trends in adolescent fertility, 1990-2012, in relation to national wealth, income inequalities, and educational expenditures. J Adolesc Health. 2017;60(2):161-168. doi:10.1016/j.jadohealth.2016.08.026

23 Caffe S, Plesons M, Camacho AV, et al. Looking back and moving forward: can we accelerate progress on adolescent

pregnancy in the Americas? Reprod Health. 2017;14. doi:10.1186/s12978-017-0345-y
24 Decker MJ, Gutmann-Gonzalez A, Lara D, Brindis CD. Exploring the influence of neighborhood-level factors on adolescent birth rates in California: a social-ecological approach. Youth Soc. 2016;51(1). doi:10.1177/0044118X16660323
25 Albus KE, Weist MD, Perez-Smith AM. Associations between youth risk behavior and exposure to violence: implications for the provision of mental health services in urban schools. Behav Modif. 2004;28(4). doi:10.1177/0145445503259512
26 Brahmbhatt H, Kågesten A, Emerson M, et al. Prevalence and determinants of adolescent pregnancy in urban disadvantaged settings across five cities. J Adolesc Health. 2014;55(6 Suppl):S48-S57. doi:10.1016/j.jadohealth.2014.07.023
27 Chacham AS, Simão AB, Caetano AJ. Gender-based violence and sexual and reproductive health among low-income youth in three Brazilian cities. Reprod Health Matters. 2016;24(47):141-152. doi:10.1016/j.rhm.2016.06.009
28 Minnis AM, Moore JG, Doherty IA, et al. Gang exposure and pregnancy incidence among female adolescents in San Francisco: evidence for the need to integrate reproductive health with violence prevention efforts. Am J Epidemiol. 2008;167(9):1102-1109. doi:10.1093/aje/kwn011
29 Neal S, Stone N, Ingham R. The impact of armed conflict on adolescent transitions: a systematic review of quantitative research on age of sexual debut, first marriage and first birth in young women under the age of 20 years. BMC Public Health. 2016;16:225. doi:10.1186/s12889-016-2868-5
30 Brochu S, Brunelle N, Plourde C. Drugs and Crime: A Complex Relationship. 3rd ed. University of Ottawa Press. 2018
31 Contreras C, Hipp JR. Drugs, Crime, Space, and Time: a spatiotemporal examination of drug activity and crime rates. Justice Q. doi:10.1080/07418825.2018.1515318
32 Laursen L, Hebert L, Newton S, Norcott C, Gilliam M. Community violence exposure and adolescent pregnancy in Chicago. J Interpers Violence. 2022;37(1-2):NP742-NP756. doi:10.1177/0886260520917509
33 Decker MJ, Isquick S, Tilley L, et al. Neighborhoods matter. A systematic review of neighborhood characteristics and adolescent reproductive health outcomes. Health Place. 2018;54:178-190. doi:10.1016/j.healthplace.2018.09.001
34 Sommer M, Mmari K. Addressing structural and environmental factors for adolescent sexual and reproductive health in low- and middle-income countries. Am J Public Health. 2015;105(10):1973-1981. doi:10.2105/AJPH.2015.302740
35 Orihuela CA, Mrug S, Davies S, et al. Neighborhood disorder, family functioning, and risky sexual behaviors in adolescence. J Youth Adolesc. 2020;49(5):991-1004. doi:10.1007/s10964-020-01211-3
36 Maslowsky J, Powers D, Hendrick CE, Al-Hamoodah L. County-level clustering and characteristics of repeat versus first teen births in the United States, 2015–2017. J Adolesc Health. 2019;65(5):674-680. doi:10.1016/j.jadohealth.2019.05.031
37 Odimegwu C, Mkwananzi S. Factors associated with teen pregnancy in sub-Saharan Africa: a multi-country cross-sectional study. Afr J Reprod Health. 2016;20(3):94-107. doi:10.29063/ajrh2016/v20i3.14
38 Wado YD, Sully EA, Mumah JN. Pregnancy and early motherhood among adolescents in five East African countries: a multi-level analysis of risk and protective factors. BMC Pregnancy Childbirth. 2019;19(1). doi:10.1186/s12884-019-2204-z
39 Feldman BS, Zaslavsky AM, Ezzati M, Peterson KE, Mitchell M. Contraceptive use, birth spacing, and autonomy: an analysis of the oportunidades program in Rural Mexico. Stud Fam Plann. 2009;40(1):51-62. doi:10.1111/j.1728-4465.2009.00186.x
40 Hernandez-Prado B, Urquieta-Salomon J, Ramirez Villalobos M. D., Figueroa JL. Impact of Oportunidades on the reproductive health of its beneficiary population. External evaluation of the impact of the human development Program Oportunidades. México: Instituto Nacional de Salud Pública. 2004. Accessed September 19, 2023. https://www.insp.mx/resources/images/stories/Produccion/pdf/EVEXIMPO/oport06-tIII-metodologico.pdf
41 Etemadi-Aleagha A, Akhgari M. Psychotropic drug abuse in pregnancy and its impact on child neurodevelopment: A review. World J Clin Pediatr. 2022;11(1):1-13. doi:10.5409/wjcp.v11.i1.1
42 Orsolini L, Chiappini S, Corkery JM, Guirguis A, Papanti D, Schifano F. The use of new psychoactive substances (NPS) in young people and their role in mental health care: a systematic review. Expert Rev Neurother. 2019;19(12):1253-1264. doi:10.1080/14737175.2019.1666712

CONFILCTS OF INTEREST
The authors have completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest and none was reported.

FUNDING
There was no source of funding for this research.

ETHICAL APPROVAL AND INFORMED CONSENT
Ethical approval and informed consent were not required for this study.

DATA AVAILABILITY
Data sharing is not applicable to this article as no new data was created.

AUTHORS' CONTRIBUTIONS
Analysis and interpretation of data: FJPG, CSP and JMMN. Acquisition of data analysis and interpretation of data: FJPG, CSP and JMMN. All authors revised the manuscript, and approved the final version.

PROVENANCE AND PEER REVIEW
Not commissioned; externally peer reviewed.