ANTISOCIAL AND CRIMINAL BEHAVIORS OF SECONDARY SCHOOL STUDENTS FROM THE CITY OF CHIHUAHUA IN NORTHERN MEXICO AND ASSOCIATED RISK FACTORS

CONDUCTAS ANTISOCIALES Y DELICTIVAS EN ESTUDIANTES DE SECUNDARIA DE LA CIUDAD DE CHIHUAHUA DEL NORTE DE MÉXICO Y FACTORES DE RIESGO ASOCIADOS

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Abstract

Background: Since the school is a key setting during adolescence, it is crucial to detect deviant social behaviors of individuals in this environment to target corrective measures. Aim: To estimate the prevalence of antisocial and criminal behaviors of secondary school students in the city of Chihuahua, northern Mexico, and to explore associated factors. Methods: Cross-sectional survey with adolescents aged 13-16 years, randomly selected from public and private schools. The Mexican version of the

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validated antisocial and criminal behaviors questionnaire was applied to 430 students from 41 schools. Proportions and mean scores were computed. Results were stratified by individual and school characteristics. Logistic regression was used to identify factors associated with the probability of reporting at least one criminal behavior. Results: Eating when not allowed (67.5 %) and arriving late to school (51.7 %) were the most frequent antisocial behaviors, while spending money gambling (17.2 %) and damaging objects or property in public spaces (15.5 %) were the most frequent criminal behaviors. Men had a higher criminal mean score (1.35 vs. 0.89; $p < .05$), and 9th graders had higher mean than 7th and 8th graders for antisocial (7.05 vs. 5.39 and 4.97; $p < .05$) and criminal (1.44 vs. 0.98 and 0.94; $p < .05$) behaviors. Public schools had a lower antisocial mean than the private (5.52 vs. 6.61; $p < .05$). High-income private schools had the highest mean for antisocial behavior (7.44), followed by tele-secondaries (7.06); for criminal behavior, public technical (1.71) and tele-secondaries (2.31) had the highest means. The schools' lowest academic performance was associated with lower means, especially for criminal behavior. Male sex, higher school grade, low school performance, having failed a year, reporting family problems, and performing specific free-time activities (e.g., hanging out with friends) were associated with a higher adjusted odds ratios of reporting at least one criminal behavior. Conclusion: The most frequent behaviors were quantified, and specific risk groups and factors were identified in order to design and implement preventive programs.

Keywords: Adolescents; antisocial; behavior; criminal; delinquency; Mexico; students.

Resumen

Antecedentes: Dado que la escuela es un escenario clave durante la adolescencia, es crucial detectar conductas sociales desviadas en este entorno para guiar medidas correctivas. Objetivo: Estimar la prevalencia de conductas antisociales y delictivas en estudiantes de secundaria de la ciudad de Chihuahua, norte de México, y explorar factores de riesgo asociados. Métodos: Encuesta transversal con adolescentes de 13 a 16 años seleccionados aleatoriamente de escuelas públicas y privadas. La versión mexicana del cuestionario validado de conductas antisociales y delictivas fue aplicada a 430 estudiantes de 41 escuelas. Se calcularon proporciones y puntuaciones medias. Los resultados se estratificaron por características individuales y escolares. Se empleó regresión logística para identificar factores asociados a la probabilidad de reportar al menos una conducta delictiva. Resultados: Comer cuando no está permitido (67.5 %) y llegar tarde a la escuela (51.7 %) fueron las conductas antisociales más frecuentes, mientras que gastar dinero en juegos de azar (17.2 %) y dañar objetos o propiedad pública (15.5 %) fueron las conductas delictivas más frecuentes. Los hombres tuvieron puntuaciones medias delictivas más altas que las mujeres (1.35 vs. 0.89; $p < .05$), y los alumnos de 9.° grado tuvieron una media más alta que los de 7.° y 8.° para conductas antisociales (7.05 vs. 5.39 y 4.97; $p < .05$) y delictivas (1.44 vs. 0.98 y 0.94; $p < .05$). Las escuelas públicas tuvieron una media antisocial más baja que las privadas (5.52 vs. 6.61; $p < .05$). Las privadas de altos ingresos tuvieron la media más alta de conducta antisocial (7.44), seguidas de las telesecundarias (7.06); para conducta delictiva, las técnicas públicas (1.71) y las telesecundarias (2.31) mostraron las medias más altas. El rendimiento académico más bajo de las escuelas se asoció con promedios más bajos, especialmente para comportamiento delictivo. Sexo masculino, mayor grado escolar, pobre desempeño académico de la escuela, reprobación de un año escolar, referir de problemas familiares, y practicar actividades de tiempo libre específicas (e.g., salir con amigos) se asociaron a mayores razones de momios ajustadas para reportar al menos una conducta delictiva. Conclusión: Se cuantificaron las conductas más frecuentes, y se identificaron grupos y factores de riesgo específicos para poder diseñar e implementar programas preventivos.

Palabras clave: Adolescentes; antisocial; conducta; criminal; delincuencia; estudiantes; México.

Introduction

Since the 1930s (Glueck & Touroff Glueck, 1930), the interest of identifying antisocial and criminal (i.e.,

destructive actions that bring harm or involve the violation of the rights of others) behaviors in children, adolescents, and young adults has generated abundant research studies in schools, reformatories, and social reintegration centers. Initially, biological perspectives used hereditary somatotypes linked to specific crimes in which body features correlated with different types of behavior pointing to the impulsiveness and aggressiveness of mesomorphic individuals (Sheldon et al., 1954), but with little merit predicting criminality (Bull & Green, 1980; Maddan et al., 2008).

During the last decades, numerous risk factors have been associated with antisocial behaviors and delinquency including sex, age, ethnicity, national origin, substance abuse, socioeconomic status, underachievement in education, pathological gambling, psychiatric conditions, personality traits, child temperament, psychological maturation, poor self-control, contact with offenders, age of first offense, peer-pressure, family dynamics, parent criminality, unreliable parenting, insufficient parental monitoring, and other factors that can interact with each other (Chen et al., 2016; Day & Wanklyn, 2012; Duran-Bonavila et al., 2017; Murray et al, 2018; Savag et al. 2013). Studies have also looked at biological explanations focusing on psychophysiological (e.g., blunted heart rate and skin conductance), brain mechanisms (e.g., structural and functional aberrations of prefrontal cortex, amygdala, and striatum), and genetic (e.g., gene-environment and gene-gene interactions) factors for criminal behaviors (Ling et al., 2019). Some authors have grouped many of these variables into genetic, biologic, and environmental influences (Tuvblad & Beaver, 2013).

Research has also identified risk factors for antisocial behavior early in life, including parent criminality, poverty, child temperament, low intelligence, marital discord, ineffective discipline, poor parental monitoring, impulsiveness, low school achievement, poor parental supervision, child physical abuse, punitive or erratic parental discipline, cold parental attitude, parental conflict, disrupted family, antisocial parents, large family size, low family income, antisocial peers, high delinquency-rate schools, and high crime neighborhoods (Farrington, 2005; Reid & Patterson, 1989).

Unfortunately, antisocial, and criminal risk behaviors among adolescents and young adults have multiplied in many regions, often linked to new environments (e.g., internet, media, pornography, video games, etc.) that enabled the disinhibition of aggressive impulses, triggering risk behaviors and unlawful violence (Ferguson, 2013).

In Mexico, there is evidence that crimes committed by minors, mainly men, have increased and become more recurrent, including robberies, injuries, kidnappings and even homicides. A survey conducted with nearly 300 adolescents who committed severe offences at juvenile detention centers identified robberies with violence (35 %), homicides (17 %), carrying weapons (17 %), vehicle theft (15 %), and kidnappings (15 %) as the most common type of crimes perpetrated (Azaola, 2015); the state of Chihuahua in particular ranks high not only in the list of states where adolescents carry out more crimes, but also where they are victims of organized crime (Comisión Nacional de los Derechos Humanos, 2019).

Since school constitutes a key setting during childhood and adolescence, it is essential to detect antisocial and criminal behaviors in this environment. Identifying vulnerable students and relevant risk factors associated with these behaviors is crucial for the design and implementation of preventive programs at the school level. Therefore, the purpose of this study was to estimate the prevalence of antisocial and criminal behaviors of secondary school students in the city of Chihuahua, and to explore associated factors.

Methods

Participants

This cross-sectional survey was conducted using a probabilistic sample of 430 adolescents selected from secondary schools located within the geographic limits of Chihuahua, the capital city of the homonymous state in northern Mexico with a population of one million inhabitants (Instituto Nacional de Estadística y Geografía, 2015). This city is highly ranked in human and social development (Human Development Index of 0.91), and it

is one with the highest literacy rates (99 %) in the country (Programa de las Naciones Unidas para el Desarrollo, 2019). The study focused on grades 7-9 in international standards, with most students aged 13-16 years.

The sample size was computed based on the expected prevalence of antisocial and criminal behaviors using a formula for estimating a single proportion (Lwanga & Lemeshow, 1991). To maximize the sample, it was assumed that 50 % of the students in the population had the factor of interest (i.e., a positive response for each of the items included in the measuring instrument). Based on a 0.50 expected proportion with a 4 % absolute precision and 95 % confidence level, the computed sample was 580 students. An extra 10 % for potential non-responders was added (n = 58), resulting in a final sample of 638 students. However, the final number of respondents was 430. With this number of participants, retrospective calculations led, all other factors unchanged, to a margin of error for the estimates of ±4.6 %.

Instruments

To understand, measure, and prevent risky behaviors, various tools have been proposed (Frick & Hare, 2001; Mezquita et al., 2021; Seisdedos-Cubero, 1995; Shapland, 1978). For this survey, the following instrument was used:

Antisocial and criminal behavior (ACB) questionnaire: This tool was developed in Spain (Seisdedos-Cubero, 1995). It has a reliability coefficient (Cronbach's alpha) of 0.90 (Programa de las Naciones Unidas para el Desarrollo, 2019). The Spanish version was later adapted for use in the Mexican population (Seisdedos-Cubero & Sánchez-Escobedo, 2001), and since then it has been used by various authors in Mexico (Gaeta & Galvanovskis, 2011; Sánchez-Velasco et al., 2017). The instrument includes two scales ranging from 0 to 20 points each, one for antisocial (e.g., arriving late, fighting, swearing, entering a forbidden place, etc.), and one for criminal (e.g., damaging objects or property, stealing objects or money, carrying a weapon, using drugs, etc.) domain, with 20 dichotomous (yes = 1 point, no = 0 points) items each.

Three additional tools were used to collect data to characterize individuals and schools:

General questionnaire: It was used to collect basic socio-demographic, academic, and personal data containing the following variables: sex (male, female), school grade (7th, 8th, 9th), failing at least one school grade in the past (yes, no), family situation (doesn't live with parents, lives with father, lives with mother, lives with both parents), reported family problems (none, few, some, many), most common free time activity (meeting with family, playing sports, social networking, watching TV & playing videogames, hanging out with friends), and currently working in any job (yes, no).

Grouping of schools: Secondary schools were categorized according to the following two methods: 1). By type: public/general, public/technic, public/TV-secondary, private/high-income (tuition ≥ 100 USD/month), and private/middle-income (tuition <100 USD/month), and 2). By ratio of students to school personnel (< 5:1, 5-9:1, 10-14:1, and 15-19:1). Data was obtained directly from the schools' authorities.

Schools' academic performance: Schools were stratified according to academic performance assessments from data available online (www.mejoratuescuela.org/) based on two assessments: 1). The result in ENLACE (National Assessment of Academic Achievement in Schools) test of 2013 (www.educacionbc.edu.mx/departamentos/evaluacion/evaluaciones/ebasica/enlace.php): This is an evaluation used to rank schools based on the students' performance in Spanish and mathematics (graded as failed, fair, good, excellent, and not assessed); the schools' percentile performance was stratified based on its position out of the 765 schools in the State of Chihuahua (≥ 90th, 80-89th, 70-79th, 50-69th, 25-49th, and 0-24th), and 2). The result in the PLANEA (National Plan for Learning Assessment) test of 2017 (http://planea.sep.gob.mx/Diagnostica/): A formative assessment that replaced the ENLACE test; it informs about how students are progressing in cognitive and non-cognitive skills and abilities (graded as failed, fair, good, excellent, and not assessed).

The questionnaires used were self-administered in a private area of the school during the months of January and February of 2020 under the supervision of trained and standardized field workers. The mean duration for the completion of the questionnaires was 15 minutes (range 10-20 min).

Procedures

A probabilistic sampling procedure was used, based on the 16,360 students registered in the 62 secondary schools available in the city. First, a sampling frame was built containing all students from these schools. Then, a systematic sampling technique was used as follows: in a first column, the schools were numbered and ranked from 1 to 62; in the second column, the number of students in each school was registered; the third column contained the cumulative frequency of students; and in the four column the range of students from the previous school to the next school was registered. Thereafter, a sampling interval was computed based on the calculated sample size and the total number of students (16,360/638 = 25). A random number from 1 to 10 was taken (seven), and the sampling interval was added consecutively throughout the sampling frame (7+25 = 32, 32+25 = 57, 57+25 = 82, etc.). In this way, more students were sampled from the larger schools, and fewer students from smaller schools, so that the final sample was proportional-to-size.

The school approval was sought in an initial visit. If the school authorities agreed, then the informed consent form was sent to the students' parents or tutors a few days prior to the scheduled visit. Once signed by parents or tutors, students were also asked to read the inform consent form and requested to assent their participation. The study proposal was revised and approved by the Ethics and Research Committee at Christus Muguerza Hospital Chihuahua (ID: HCMP-CEI-52-02122019).

Once in the schools, the numbers in the lists of the students were harmonized according to the predefined numbers outlined in the sampling strategy to determine which students had to be sampled in each school. In total, 41 out of the 62 schools agreed to participate (66.1 %), resulting in 430 students sampled out of the 638 selected (individual response rate of 67.4 %).

Data analysis

The proportion of the most frequent responses for each domain were tabulated. The points obtained by the students for each scale were added and the mean scores and standard deviations (s.d.) for the antisocial and criminal behaviors were computed and compared by students' individual and school characteristics. Student's t-tests were used for comparisons between two groups,

Table 1.

Questions with most frequent positive responses for the antisocial and criminal domains by secondary students in the City of Chihuahua, 2020.

Item	Behavior asked	N (%)
Antisocial		
A17	Eating when not allowed at class, job, public place	291 (67.5)
A7	Arriving late to school or meeting	223 (51.7)
A16	Knocking at someone house's door and run away	215 (49.9)
A20	Fighting with others (beating, cursing)	187 (43.4)
A5	Swearing/insulting with violence/discrimination	156 (36.2)
A18	Answering rudely to an authority/superior at school, home, job	153 (35.5)
Criminal		
C14	Spending money in gambling more than what is possible	74 (17.2)
C19	Damaging objects/property in public spaces	67 (15.5)
C15	Stealing objects/money from automatic machines, public phones	50 (11.6)
C11	Stealing objects in supermarkets and stores when opened	34 (7.9)
C6	Carrying a weapon (e.g. knife) in case of fight	32 (7.4)
C13	Stealing materials/tools from working people	29 (6.7)

and ANOVA with Tukey's post-hoc tests for more than two groups. A p-value < 0.05 was considered statistically significant.

The mean scores were also compared with two national, Tlalnepantla (Sánchez-Velasco et al., 2018) and Puebla (Gaeta & Galvanovskis, 2011), and with two international, Colombia (Uribe-Rodríguez et al., 2016) and Almería, Spain (Perez-Fuentes et al., 2014), populations that used the same ACB instrument for variables in which data was reported by the authors. Finally, a binary logistic regression model with crude and adjusted odds ratios (OR) with 95 % confidence intervals (CI) was used to identify those variables (i.e., risk factors) associated with the probability of having any kind of criminal behavior (i.e., at least one positive response out of the 20 included in the domain).

Results

Table 1 ranks the six most frequent positive responses for the antisocial and criminal domains. Half or more of the students gave an affirmative response for the following antisocial behaviors: "eating when not allowed at class, job, or public place" (67.5 %), "arriving late to school or meeting" (51.7 %), and "knocking at someone house's door and run away" (49.9 %). Criminal behaviors were less common, with the following three reaching 10-20 % of affirmative answers: "spending money in gambling more than what is possible" (17.2 %), "damaging objects/property in public spaces" (15.5 %), and "stealing objects/money from automatic machines, public phones" (11.6 %).

Table 2 compares mean scores for antisocial and criminal behaviors by students' characteristics.

Table 2.

Mean scores for antisocial and criminal behaviors in students of secondary school by selected individual characteristics in the City of Chihuahua, northern Mexico, 2020.

Variable	Category	n	Mean (s.d.)*	
			Antisocial	Criminal
Student's sex	Male	210	6.01±4.64	1.35±2.03[a]
	Female	221	5.52±4.21	0.89±1.69[b]
School grade	7th (1st secondary)	158	4.97±4.38[a]	0.94±1.78[a]
	8th (2nd secondary)	132	5.39±4.35[a]	0.98±1.86
	9th (3rd secondary)	140	7.05±4.28[b]	1.44±1.97[b]
Has failed a school year	Never	395	5.69±4.33	1.04±1.79[a]
	At least once	34	6.62±5.38	1.91±2.64[b]
Family situation	Doesn't live with parents	9	6.00±3.64	1.00±1.65
	Lives with father	10	4.50±3.50	1.60±2.27
	Lives with mother	151	5.54±4.71	1.19±1.88
	Lives with parents	258	5.97±4.32	1.07±1.88
Reported family problems	No, none	212	4.58±3.88[b]	0.70±1.32[b]
	Yes, few	161	6.57±4.63[a]	1.42±2.20[a]
	Yes, some	42	7.95±4.60[a]	2.02±2.31[a]
	Yes, many	14	8.00±4.11[a]	1.36±2.24
Most common free time activity	Meeting with family	117	4.74±3.92[b]	0.67±1.41[b]
	Playing sports	86	5.24±4.40	1.09±2.19
	Social networking	94	6.49±4.75[a]	1.28±1.78[a]
	TV & playing videogames	70	6.77±4.16[a]	1.44±1.92[a]
	Hanging out with friends	42	6.62±4.80	1.52±2.27
Currently working (any job)	No	378	5.81±4.37	1.12±1.86
	Yes	51	5.53±4.88	1.12±2.03
Total		430	5.78±4.42	1.12±1.88

* Student's t-tests were used for two groups, and ANOVA with Tukey's post hoc tests for >2 groups

Table 3.
Mean scores for antisocial and criminal behaviors in students of secondary school by selected school characteristics in the City of Chihuahua, northern Mexico, 2020.

Variable	Category	n	Mean (s.d.)*	
			Antisocial	Criminal
Type of school	Public	336	5.52±4.49[a]	1.15±1.95
	Private	95	6.61±4.11[b]	0.99±1.58
School categorization	Public	286	5.29±4.37[a]	0.98±1.72[a]
	Private, high-income	61	7.44±3.77[b]	0.98±1.50[a]
	Private, middle-income	34	5.12±4.34[a]	1.00±1.75[a]
	Public, technic	14	6.29±3.29	1.71±1.89
	TV-secondary	36	7.06±5.49	2.31±3.05[b]
Ratio students:school personnel	<5:1	38	5.63±3.85	0.89±1.59
	5-9:1	79	5.65±4.30	0.68±1.20[a]
	10-14:1	258	6.03±4.58	1.33±2.07[b]
	15-19:1	56	4.77±4.18	0.88±1.76
School performance, percentile[1]	≥90	86	5.15±3.99	0.69±1.46
	80-89	93	6.05±4.57	1.22±1.81
	70-79	33	5.06±3.86	1.03±1.70
	50-69	39	5.67±3.52	0.59±1.04[a]
	25-49	82	5.72±5.11	1.43±2.32
	0-24	20	6.80±4.54	2.35±2.96[b]
School result in PLANEA test	Failed	72	5.69±4.65	1.06±1.92
	Fair	41	4.78±3.78	0.88±1.56
	Good	145	5.60±4.44	1.08±1.79
	Excellent	34	5.71±3.81	0.44±0.82[a]
	Not assessed	139	6.27±4.60	1.41±2.16[b]
School result in ENLACE test	Failed	148	6.55±4.77[a]	1.58±2.33[b]
	Fair	120	5.03±4.22[b]	0.81±1.46[a]
	Good	131	5.26±4.20	0.93±1.67[a]
	Excellent	13	5.62±3.79	0.62±1.12
	Not assessed	19	7.79±3.53	1.00±1.33
Total		430	5.78±4.42	1.12±1.88

Nota. PLANEA: National Plan for Learning Evaluation; ENLACE: National Assessment of Schools' Academic Performance
[1] According to the PLANEA test, out of 765 schools in the State of Chihuahua
* Student's t-tests were used for two groups, and ANOVA with Tukey's post hoc tests for >2 groups

Statistically significant differences were observed for various individual attributes: Men had higher criminal mean scores compared with women (1.35 vs. 0.89); 9th graders also had higher means for both antisocial and criminal behaviors compared with 7-8th graders; students who had failed at least one previous school year had a

Table 4.

Comparison of antisocial and criminal mean scores according to the Antisocial-Criminal Questionnaire among secondary school students from Chihuahua and from other Mexican and Hispano-American students.

Stratified variables	Mean score ± s.d. (n)*				
	Chihuahua, 2020 (public/private, grades 7-9)	Colombia, 2016 (public, grades 6-11)[1]	Almería, Spain, 2013 (public, grades 7-10)[2]	Tlalnepantla, Mexico, 2017 (public, grades 7-9)[3]	Puebla, Mexico, 2011 (private, grades 7-12)[4]
Antisocial	5.70±4.4 (430)	5.48±5.4 (770)	9.30 (885)	9.89 (30)	11.14 (150)
Male	6.01±4.6 (210)	5.75±5.7 (368)	9.76±5.6 (441) [a]	10.76 (17)	12.16±4.8 (77) [a]
Female	5.52±4.2 (221)	2.33±3.8 (402)	8.45±5.2 (444) [b]	8.77 (13)	10.08±4.1 (73) [b]
7th grade	4.97±4.3 (158) [a]	4.15±4.7 (141)			
8th grade	5.39±4.3 (132) [a]	4.77±4.8 (147)			
9th grade	7.05±4.2 (140) [b]	6.11±5.5 (118)			
Has failed a school year	6.62±5.3 (34)			10.50 (18)	
Has not failed a school year	5.69±4.3 (395)			9.00 (12)	
Lives with both parents	5.97±4.3 (258)			10.05 (20)	
Lives with one parent	5.47±4.6 (161)			9.60 (10)	
Criminal	1.12±1.8 (430)	1.75±3.4 (770)	2.20 (885)	1.96 (30)	2.01 (150)
Male	1.35±2.0 (210) [a]	5.16±4.9 (368)	3.07±4.0 (441) [a]	2.35 (17)	3.29±3.8 (77) [a]
Female	0.89±1.6 (221) [b]	1.25±2.9 (402)	1.34±2.1 (444) [b]	1.46 (13)	0.68±1.3 (73) [b]
7th grade	0.94±1.7 (158) [a]	2.12±4.0 (141)			
8th grade	0.98±1.8 (132)	2.03±3.8 (147)			
9th grade	1.44±1.9 (140) [b]	1.91±3.7 (118)			
Has failed a school year	1.91±2.6 (34) [a]			2.11 (18)	
Has not failed a school year	1.04±1.7 (395) [b]			1.75 (12)	
Lives with both parents	1.07±1.8 (258)			1.85 (20)	
Lives with one parent	1.21±1.9 (161)			2.20 (10)	

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Table 5.

Odds ratios (OR) from logistic regression for the probability of having any kind of criminal behavior[1] among secondary school students in the City of Chihuahua, Mexico, 2020.

Variable	Category	OR (95% CI)	
		Crude	Adjusted[2]
Sex	Female	1.00	1.00
	Male	1.42 (0.97-2.09)	1.47 (0.95-2.29)
School performance, tercile[1]	Highest	1.00	1.00
	Intermediate	0.91 (0.54-1.53)	0.80 (0.42-1.52)
	Lowest	2.81 (1.45-5.43)	3.52 (1.63-7.59)
Type of school	Public, regular	1.00	1.00
	Private, high-income	1.15 (0.65-2.02)	1.84 (0.94-3.59)
	Private, middle-income	0.96 (0.46-1.99)	1.74 (0.73-4.09)
	Public, technic/TV-secondary	2.14 (1.16-3.94)	2.90 (1.40-6.02)
School grade	7th	1.00	1.00
	8th	0.83 (0.51-1.36)	0.79 (0.46-1.36)
	9th	2.05 (1.29-3.26)	2.39 (1.43-3.99)
School's ENLACE result	Good or excellent	1.00	-
	Fair or failed	1.54 (1.01-2.35)	
Has failed a school year	Never	1.00	1.00
	At least once	2.42 (1.17-4.98)	2.18 (0.97-4.92)
Reported family problems	No, none	1.00	1.00
	Yes, few	1.81 (1.19-2.76)	1.77 (1.10-2.83)
	Yes, some/many	3.13 (1.70-5.75)	3.05 (1.55-6.02)
Most common free-time activity	Meeting with family	1.00	1.00
	Playing sports	1.64 (0.92-2.99)	1.77 (0.91-3.43)
	Social networking	3.02 (1.69-5.37)	3.07 (1.63-5.79)
	TV & playing videogames	3.29 (1.76-6.15)	2.90 (1.45-5.77)
	Hanging out with friends	2.77 (1.33-5.76)	3.59 (1.57-8.23)

[1] Based on the AC-Questionnaire, n=431; responses with 0=251 (59.2%), responses between 1 (min)-11(max)=180 (41.8%). [2] Significant or marginally significant variables remained in the final adjusted model (Nakelkerke=0.23; H-L Chi^2 p = .57)

vs. 1.04); having no family problems resulted in significantly lower antisocial and criminal means compared with those reporting few, some or many; and meeting with the family as the most frequent free time activity also resulted in lower antisocial and criminal mean scores compared with other activities such as social

networking, watching TV/playing videogames, and hanging out with friends. For family situation and having a job, no statistical differences were seen in either domain.

The mean scores for the students' antisocial and criminal behaviors by school characteristics are presented in Table 3. Statistical differences were seen across some variables: public schools in general had lower mean scores compared with private schools (5.52 vs. 6.61); when further stratified, high-income private schools had the highest mean score for antisocial behavior (7.44), followed by tele-secondaries (7.06); yet, for criminal behavior, most schools had a relatively low mean score close to 1.00, except for the public-technical (1.71) and tele-secondaries (2.31); the schools' performance percentile, as well as the schools' results in the PLANEA and ENLACE tests tended to showed higher scores for students coming from schools that failed the evaluation or that were in the lowest percentiles, especially for the criminal behavior. The ratio student:personnel showed no clear trend for either domain.

Mean score comparisons between the students from Chihuahua and other relevant populations (Gaeta & Galvanovskis, 2011; Pérez-Fuentes et al., 2014; Uribe-Rodríguez et al., 2016; Sánchez-Velasco et al., 2018) that used the same ACB questionnaire are presented in . Pertinent comparisons were not straightforward, as school grades across populations varied (Chihuahua 7-9, Colombia 6-11, Almería 7-10, Tlalnepantla 7-9, and Puebla 7-12). Except for Colombia, where the mean score was similar to that of the students from Chihuahua (5.48 vs. 5.70), the means for antisocial behavior in the other populations were notably higher ranging from 9.30 in Almería to 11.14 in Puebla. For criminal behavior the mean score in Chihuahua was lower (1.12) compared with all other populations ranging from 1.75 in Colombia to 2.20 in Almería. Men had consistently higher antisocial mean scores across all populations compared; yet, for criminal behavior the mean score gap was narrower in Chihuahua (men 1.35, women 0.89) compared with the other surveys, but especially with Colombia (men 5.16, women 1.25). Higher school grades were associated with higher mean scores in both domains in Chihuahua (antisocial: 7th 4.97, 8th 5.39, and 9th 7.05; criminal: 7th 0.94, 8th 0.98, and 9th 1.44), but only for antisocial in Colombia (antisocial: 7th 4.15, 8th 4.77, and 9th 6.11; criminal: 7th 2.12, 8th 2.03, and 9th 1.91), the only available comparison population for this variable. Having failed a school year was related to higher mean scores for both domains in Chihuahua and Tlalnepantla, though means were notably higher in the latter. Living with both parents showed small differences in both domains for both, Chihuahua and Tlalnepantla.

Table 5 presents crude and adjusted odds for the probability of having any kind of criminal behavior. Results showed the following relevant adjusted estimates (OR; 95% CI): being male versus female (1.47; 0.95-2.29); being in the lowest tercile of school performance versus the highest (3.52; 1.63-7.59); attending a technical or tele-secondary public schools compared with regular public schools (2.90; 1.40-6.02); being in the 9th versus the 7th grade (2.39; 1.43-3.99); having failed at least one school year compared with not having failed any (2.18; 0.97-4.92); reporting family problems versus having none (few 1.77; 1.10-2.83 and some/many 3.05; 1.55-6.02); and watching TV and playing videogames (2.90; 1.45-5.77), social networking (3.07; 1.63-5.79), and hanging out with friends (3.59; 1.57-8.23) versus meeting with the family, as the most common free-time activity.

Discussion

This survey aimed at estimating the prevalence of antisocial and criminal behaviors of secondary school students in the city of Chihuahua, and to explore associated factors.

The overall mean score (scale 0-20) for antisocial and criminal behaviors was 5.78 and 1.12 points, respectively. These means can be directly compared with the samples from Tlalnepantla 9.89 and 1.96 (grades 7-9, n = 30) (Sánchez-Velasco et al., 2018), Puebla 11.14 and 2.01 (grades 7-12, n = 150) (Gaeta & Galvanovskis, 2011), Colombia 5.48 and 1.75 (grades 6-11, n = 770) (Uribe-Rodríguez et al., 2016), and Almería 9.30 and 2.20 (grades 7-10, n = 885) (Uribe-Rodríguez et al., 2016). Thus, students from Chihuahua had the lowest mean in both domains. For antisocial behavior, Colombian students had

relatively similar mean scores, but for criminal behaviors, all compared populations had notably higher means.

The results revealed the most prevalent antisocial and criminal behaviors reported by students in both public and private schools. The findings can be directly compared with those from the Colombian study conducted in a sample of 770 students aged 10-19 years from five public schools located in five cities (Uribe-Rodriguez et al., 2016), where the prevalence of antisocial and criminal behaviors ranged 13.3-40.2 % (Chihuahua 13.0-67.5 %) and 3.9-15.2% (Chihuahua 1.4-17.2%), respectively. The four most frequent antisocial behaviors in Colombia (vs. Chihuahua) included "swearing/insulting with violence/discrimination" (40.2 % vs. 36.2 %), "eating when not allowed at class, job, public place" (39 % vs. 67.5 %), "arriving late to school or meeting" (37.3 % vs. 51.7 %), and "knocking at someone house's door and run away" (36.6 % vs. 49.9 %), with these four being in the list of the six most prevalent antisocial behaviors reported in Chihuahua. For criminal behaviors, the three most common in Colombia (vs. Chihuahua) included "carrying a weapon in case of fight" (15.2 % vs. 7.4 %), "spending more money on games/gambling" (14.5 % vs. 17.2 %), and "entering a forbidden place or buying illegal drinks" (13.2 % vs. 6.3 %), with two of these behaviors being in the list of the six more frequent criminal behaviors reported in Chihuahua. The relative similarity of results between both surveys point to similar biological, psychological, and cultural predictors between these Latin-American settings, as it has been suggested previously (De Ribera et al., 2019).

Men had slightly higher antisocial and criminal mean scores compared with women, consistent with the reported in the literature (Archer, 2004; Burt et al., 2018; Moffitt, 2018). In multivariate analysis, men also had a higher adjusted ORs for the report of any criminal behavior compared with women, but statistical significance was marginal. For antisocial behaviors, recent school-based data indicates that the etiology varies by sex with genetic influences being stronger in girls and environmental influences in boys (Burt et al., 2018). There is also evidence showing that men are more prone towards physical violence than women from early childhood to adulthood, and that antisocial behavior in males is stronger during the adolescent period, which can persist throughout life or be limited to adolescence (Moffitt, 2018). The fact that the differences observed were relatively small could relate to the students' age, in the early adolescence, when such behaviors have not yet peaked (Mahoney & Stattin, 2000). The sex differences observed also match those from the national (Gaeta & Galvanovskis, 2011; Sánchez-Velasco et al., 2018) and international (Perez-Fuentes et al., 2014; Uribe-Rodríguez et al., 2016) populations compared; however, the sex gap was relatively narrower in Chihuahua, especially when compared with Colombia (Uribe-Rodriguez et al., 2016) for both antisocial (Chihuahua: men 6.01, women 5.52; Colombia: men 5.75, women 2.33) and criminal (Chihuahua: men 1.35, women 0.89; Colombia: men 5.16, women 1.25) behaviors. More research is needed to understand these differentials.

An increase in mean scores for antisocial and criminal behaviors by school grade, a proxy for age, was observed. Students in the 9th grade, aged around 16 years old, showed the highest risk. This finding was replicated in regression analysis, where students from the 9th grade had 2.39 times higher chance of reporting a criminal behavior compared with those from the 7th grade. Age progression has been studied in association with antisocial and criminal behaviors (Dishion & Patterson, 2015; Teymoori et al., 2018; Tieskens et al., 2018; Tremblay et al., 2004; Van Goozen et al., 2022). Research shows that the first deviant behaviors (e.g., physical aggression against others) begin at an early age (Calkins & Keane, 2009; Teymoori et al., 2018; Tremblay et al., 2005). Then, during the schooling stage, children begin to take risks associated with antisocial behaviors (Tieskens et al., 2018). Later, antisocial, and criminal activities increase during adolescence, and in most cases decline as individuals enter adulthood forming the inverted u-shaped age-crime curve (Moffitt, 2018; Monahan et al., 2009). However, there is a group of adolescents who will display persisting antisocial behaviors (Moffitt, 2018), some of whom show deficits in psychosocial maturity (e.g., impulse control and suppression of aggression) (Monahan et al., 2009). The school grade trend seen in Chihuahua was similar to the reported in Colombia (the only available population for direct comparisons) for antisocial behavior, but not for criminal behavior, where Colombian students showed notably higher and stable mean scores (Uribe-

Rodriguez et al., 2016). With the data at hand is difficult to know whether this is related to differences in maturation timing or to other environmental factors.

Compared with public schools, students from private institutions (especially of high-income) had a slightly higher mean score for antisocial behavior, but the opposite was true for criminal behavior, as it has been previously observed (DeAngelis & Wolf, 2019; Shakeel & DeAngelis, 2018); in fact, mean scores for criminal behavior were highest among students from technic and tele-secondaries, which are considered of lower quality. These schools also had nearly three times significantly higher adjusted odds for the report of any criminal behavior compared with general public schools in multivariate analyses. Technic schools provide personalized education with the double purpose of bringing students to the next educational level and to provide them with technical skills to get a job in case they cannot continue studying; tele-secondaries provide education to students living in marginalized areas. Therefore, students from these schools are usually of low socioeconomic status and more vulnerable to various conditions.

The ratio of school personnel to students was used as a proxy for personalized care (i.e., teachers addressing students' misbehavior and promoting positive youth socialization). The hypothesis was that schools with lower teacher-to-student ratios would have lower risks of criminal behaviors (Arum & LaFree, 2008); however, the results of this survey showed no clear trends in either domain.

The reported association between schools' performance and criminality (Petrocelli & Petrocelli, 2005) was the basis for using the ENLACE and PLANEA tests. ENLACE showed higher differentials for antisocial and criminal behaviors for schools that failed the test. In regression analyses, it was also observed that the lowest tercile in school performance was associated with 3.5 higher adjusted OR for reporting any kind of criminal behavior compared with the highest tercile. These results go in line with the inverse relationship reported between test scores and crime (Petrocelli & Petrocelli, 2005), including in Mexico (Orraca-Romano, 2018). Evidence shows that neighborhood's violent crime is associated with a 3 % difference in test scores in school tests, with those students living on high-crime streets scoring an additional 1 % lower than neighbors of safer streets (O'Brien et al., 2021).

At individual level, having failed an academic year was associated with higher mean scores for both antisocial and criminal behaviors in this survey, reaching statistical significance in the latter. Failing a year was also associated with 2.18 times higher chance of reporting any criminal behavior compared with not having failed. A study from Mexico using aggregated data reported an association between grade failure rate and a rise in homicide rates in the areas where the schools are located (Orraca-Romano, 2018). These results highlight the vulnerability of students who have failed previous years and point to importance of targeting preventive efforts to these adolescents.

Family problems was associated with statistically higher mean scores for both domains, but most importantly, reporting family problems showed a clear trend in the adjusted ORs for any criminal behavior as reported problems increased. A study with adolescents looking at distal (parents' disposition), contextual (family characteristics), and proximal (parent-child interaction) factors revealed that proximal factors were significant predictors for antisocial behaviors, while distal and contextual factors seemed to play a more indirect role (Deković et al., 2003). For criminal behaviors, lack of parental control during adolescence appears to have a positive association with delinquency both concurrently and longitudinally into young adulthood (Harris-McKoy & Cui, 2013). As observed in this survey, in the study from Tlalnepantla the mean score for criminal behavior was noticeable higher among students living with only one parent compared with both parents (Sánchez-Velasco et al., 2018) pointing to the stability of the family as a relevant factor to be considered.

In terms of free-time activities, it was found that meeting with the family was protective for both antisocial and criminal behaviors compared with the other activities asked. Students hanging out with friends, social networking, and watching TV and/or playing videogames had nearly three times higher chance of having a criminal

behavior compared with meeting with the family. Previous studies have shown that participation of adolescents in highly structure leisure activities was linked to lower levels of antisocial behaviors compared with those engaged in less structured activities (Mahoney & Stattin, 2000). There is also evidence from a systematic review that adolescents who spend most of their time watching TV are at greater risk of violent behaviors (Keikha et al., 2020). It is then important to consider using structured leisure activities when planning and implementing prevention strategies for students at risk.

Various methodological limitations ought to be taken into account when contextualizing the results of this study: The first limitation relates to the instrument used, namely, the adapted Mexican version (Seisdedos-Cubero & Sánchez-Escobedo, 2001) of the ABC questionnaire (Seisdedos-Cubero, 1995), which precludes comparisons with other surveys conducted in other Mexican and Latin-American settings, and in other regions of the world. This tool was used because normative behavior varies across cultures, nationalities, and locations, as psychological constructs are dependent on the cultural context in which tests are used (Graham et al., 2016). Since this instrument was design for a Hispanic population, and later adapted to the Mexican context, it was then possible to establish rather "direct" comparisons with surveys from Mexican, Latin-American, and Hispanic populations that used the same instrument. The second limitation concerns the partial number of factors assessed. The individual and school variables measured and tested were selected from a relatively large list of factors reported in the literature, based on the potential accuracy of the responses obtained; this was data that students themselves and school authorities could provide directly and free of information bias. The third study limitation relates to the relatively high non-response rate (32.6 %), which led to lower sample power and to a potential selection bias. While statistical power decreased, it should not be considered a major issue given the relatively small margin of error used initially (3.5 %) to compute the original sample, along with the additional 10 % estimated for possible non-response; thus, the final sample resulted in a still acceptable margin of error below 5 %, which is quite standard for this kind of surveys. In contrast, the non-response rate could indeed introduce selection bias. However, it is important to stress that this was not the result of students' or parents' reluctance to participate, but to the schools' unwillingness to take part. Most non-participating schools were private and of high-income. The main reason given was the school parents' associations' refusal to participate. As to the potential direction of the bias, one could think that the overall mean score for antisocial behavior would be somewhat underestimated, as students from the high-income private schools had higher mean scores for these behaviors. Conversely, the mean score for criminal behavior would be overestimated, as students from these schools had the lowest mean score.

In conclusion, results portrait a comparatively mild scenario in terms of antisocial and criminal behaviors in secondary school students from Chihuahua City. However, specific risk groups are identified, such as students from technical schools and tele-secondaries, students who had failed previous years, those with family problems, and 9th-graders, to which preventive programs could be targeted and implemented.

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