Salud Mental 2016;39(2):85-97
ISSN: 0185-3325
DOI: 10.17711/SM.0185-3325.2016.005

Contributions from 40 years of epidemiological research on inhalant use in Mexico

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Review article

ABSTRACT

Background

The study about the misuse of inhalant solvents started in Mexico during the 1970, although the interest in this subject decreased during some periods, its consumption continued among the young population, thus, it is relevant to update the state of the art on this matter.

Objective

Identify the state of knowledge on inhalant abuse, its consequences, prevention and the treatment alternatives in Mexico in the last four decades.

Method

We performed a bibliographical inquiry between August and September 2014 on the papers published between 1970 and 2014 about inhalant solvents consumption in Mexico. It integrated the publications included in the historical archive of the Epidemiological and Psychosocial Research Direction, Mental Health Journal, Medline, Elsevier and Scielo México.

Results

After revision, 83 out of 1083 papers fulfilled all the criteria that we considered for inclusion in the analysis. This body of work has been performed on different population segments: marginalized groups, juvenile gang members, children in street situation, adults and minors secluded in detention centers, sex workers, people seeking treatment, students, and the general population.

Discussion and conclusion

The various relevant aspects of the consumer population of inhalant solvents in Mexico were identified. Detection of this ample profile of individuals at risk could serve as the basis for the development of prevention and treatment programs to attend to the specific needs of these groups, since the programs currently in progress are scarce and some of them have not had follow up assessments or have not been evaluated at all.

Key words: Solvent inhalant, epidemiological studies.

RESUMEN

Antecedentes

El estudio del consumo de solventes inhalables en México se inició en la década de 1970 y a pesar de que por periodos ha disminuido el interés en el mismo, éste no ha desaparecido y debido a que el consumo prevalece entre la población joven, es relevante actualizar el estado del arte en la materia.

Objetivo

Identificar el estado del conocimiento sobre los solventes inhalables, las consecuencias, las alternativas de prevención y su tratamiento en las cuatro últimas décadas en México.

Método

Se realizó una búsqueda bibliográfica entre agosto y septiembre de 2014, de los artículos publicados entre 1970 y 2014 sobre el consumo de solventes inhalables en México. Se integraron publicaciones incluidas en el archivo histórico de la Dirección de Investigaciones Epidemiológicas y Psicosociales, en la revista SALUD MENTAL, Medline, Elsevier y Scielo México.

Resultados

Se identificaron 1083 artículos, 83 cumplieron con todos los criterios para ser incluidos en el análisis. Estos trabajos se realizaron en diferentes poblaciones: grupos marginales, integrantes de bandas juveniles, niños en situación de calle, adultos y menores recluidos en centros de detención, sexoservidoras, personas que acuden a solicitar tratamiento, estudiantes y población general.

Discusión y conclusión

Se identificaron diferentes aspectos relevantes de la población consumidora de solventes inhalables en nuestro país, así como acciones pendientes en materia de investigación, con lo que se pueden desarrollar programas de prevención y tratamiento que atiendan las necesidades específicas de estos grupos, ya que son pocos los programas existentes y algunos no han tenido seguimiento o evaluación.

Palabras clave: Solventes inhalables, estudios epidemiológicos.

Translation of the original version published in spanish in: Salud Mental 2016, Vol. 39 Issue No. 2.

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Received first version: October 14, 2015. Second version: November 25, 2015. Third version: February 15, 2016. Fourth versión: March 1st., 2016. Accepted: March 1st., 2016.

BACKGROUND

According to Worldwide Research about Youth[1] in 1990, 41 countries had epidemiological information about the consumption of inhalant solvents among individuals between the ages of 12 to 29 years, who reported an incidence of consumption between 5% and 20%.[1] While, a study about the incidence of consumption of alcohol, tobacco and drugs among students in Great Britain found that 0.5% of those interviewed stated that they consume inhalants,[2] a quantity similar to that found among Korean students (0.4%).[3] In Argentina, the prevalence of consumption of inhalants grew from 0.9% in 2001 to 4.5% in 2011.[4]

On the other hand, a look at international literature about the epidemiology of the consumption of some inhalant solvents indicated that this is a frequent practice among young people in countries like Brazil, Mexico, Paraguay, Chile, Colombia, Nicaragua, Spain, Canada, New Zealand and Australia.[5]

In Mexico, completed research has allowed an identification of a variety of behaviors of this phenomenon over the years; for example, in the decades of the 1970's and 1980's inhalants and marijuana were the main drugs consumed in our country, later on, toward the year 1997 they were substituted by cocaine which occupied first place among preferences in both cases, without including alcohol and tobacco.[6] These changes resulted in investigations and the number of publications about solvent inhalants being diminished considerably. However, it is known that the consumption of these products has not disappeared, even though in the year 2002 they descended to fourth place as drugs of preference.[7] This information emphasizes the importance of updating the state of the art in the subject through a review of original primary studies carried out in Mexico.[8-11]

The objective of this study was to identify the state of knowledge on inhalant abuse, its consequences, prevention and the treatment alternatives in Mexico in the last four decades. The intention of this review is: a) To identify areas of opportunity in epidemiological research about the consumption of inhalant solvents in Mexico, b) identify the challenges that researchers face in this area and c) propose lines of investigation to advance this area of knowledge.

METHOD

We performed a bibliographical inquiry between August and September 2014 on the papers published between 1970 and 2014 about inhalant solvents consumption in Mexico. Included was a search of the historical archives of the Office of Epidemiologic and Psychosocial Investigations (DIEPS) of the National Psychiatry Institute Ramon de la Fuente Muñiz (INPRFM) and of the journal Mental Health. These two databases were very important because many of

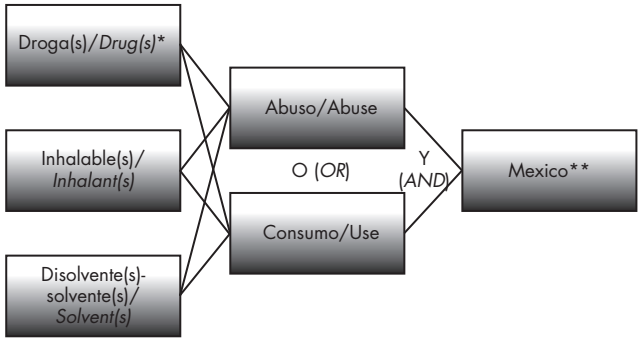

Figure 1. Combination of key words and boolean terms used in the information search.
* Only in case of national databases
** Only in case of international databases

the articles could not be found in electronic databases, or the complete text was not published, especially from publications during the decades of 1970's and 1980's. Also the databases of Medline, Elsevier and Scielo Mexico[12] were included. The search was carried out using different terminology, and combinations both in English and Spanish (figure 1).[13]

During the first phase of the revision process, the repeated publications were identified, the first base that was found was included and the rest were excluded in order not to increase the number of publications. Afterwards, the tit-

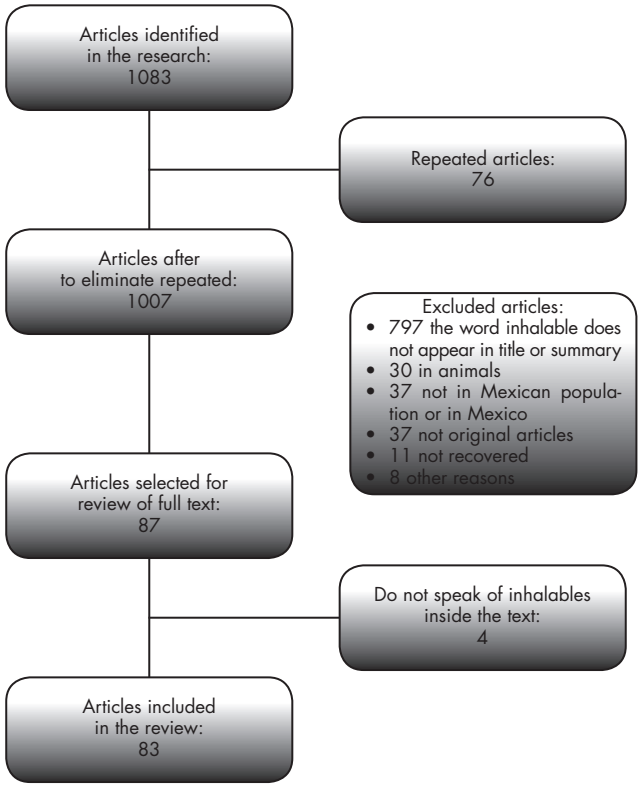

Figura 2. Flowchart of the systematical review.

les and summaries of each publication was reviewed with the object of verifying that they fulfill the following criteria of inclusion:

1) Original research articles and/or epidemiological reports published between 1970 and 2014.
2) Inclusion of some of the terminology used in the search of the title or in the summary.
3) Studies carried out with a Mexican population in Mexico.

The following are considered as criteria for exclusion in the publications:

1) Those dedicated to the consumption of drugs in general.
2) Theoretical, editorials or summaries.
3) Those with information gleaned from basic research about inhalants or carried out on animals.
4) Those studies done and reported with a Mexican population living in a foreign country.
5) Those that reported results of unintentional inhalation.

This selection process was headed by two evaluators who worked independently. Meetings were carried out to analyze the concordances and discrepancies in the selection to assure the pertinence of including each one of the articles under consideration.

Finally, a thorough review of the text of each article was completed to extract information about the authors, the year of publication, the objective, the study design, the characteristics of the sample and the results that were obtained (figure 2).

RESULTS

1083 articles were identified in the search; of those 76 were repeated in the different databases. Of the 1007 remaining publications, 920 were excluded for different reasons that are explained in figure 2. 87 articles were completely reviewed, of those, four did not have information about solvent inhalants in the contents, so for the analysis of information only 83 publications were included.

The analysis of the publications obtained showed that research about the use of drugs –including solvent inhalants– in our country, began around 1972 in the Mexican Center of Studies on Drug Dependence (CEMEF); since that time, diverse investigations have been carried out through different methodological approaches.[14-18]

The projects with an epidemiological focal point carried out in our country, with respect to the consumption of solvents has permitted the identification of the characteristics of consumption among populations considered to be high risk such as: marginal groups, the members of youth gangs, children living on the streets, adults and minors being held in detention centers, prostitutes, individuals that seek out treatment, students and the general population.[14,18-25]

Epidemiological studies

These have been carried out mainly in student populations in general, by way of a reporting system of information on drugs (SRID); all of which were carried out through systematic measurements that have been replicated periodically since the decade of the 1980's.

a) Surveys of student populations

These surveys have been completed mainly in Mexico City, along with some local studies in San Luis Potosi, Morelos, Guanajuato, and one national survey in 1991.

In this last study, a percentage of consumption was found among students that oscillated between 1.26% to 9.7%,[26] independent of the type of solvent consumed.[26-31] The principal documented consumption in this survey was thinner, Resistol 5000, sprays and other types of glues such as UHU or Duco. The main place from which these products were obtained was the home.[32,33]

In Mexico City the reported percentages of consumption at times during some points in life oscillated between 2% and 12.7%, presenting a significant statistical increase between 1989 and 1993.[7,15,34-43] In said period, inhalants occupied between the first and fourth places as a drug of preference, excluding alcohol and tobacco.[42,44] Of the students that reported consumption, 25.8% had one or more problems: (being arrested, being hospitalized, problems with their parents, and desires to abandon consumption).[38,45] The characteristics of the consumers of inhalants identified in this period were: 14 year old males, that had worked and lived in modest areas.[37,46,47] Less than 2% reported that their colleagues would consider it fine if they used inhalants even if they were using them only once or twice.34 Students appear to be more open to solvents because they were given to them (64%) or sold (40%).[43]

In the state of Morelos, percentages of consumption were found to be between 5.3% and 6.8%.[48,49] The percentage of students reporting problems related with consumption was 23.07%. In the city of Rio Verde, the percentage of consumption was 3.8% among males and 3% among females.[50] Finally, in Guanajuato, a consumption of 7% was discovered (table 1).[51]

b) Surveys in general population

These types of surveys were carried out in different areas of the Mexican Republic, and similarly as in the surveys of students, inhalants occupied the second place as drugs of preference (0.4% to 1.3%) excluding alcohol and tobacco.[16,52-54] In a study carried out among families with a member who is a consumer it was reported that 84.6% of its members were illiterate and in 38.8% of the families the father had problems with the consumption of alcohol.[55] The first person to offer a drug was a friend (41.18%) or another family member (7.95%) (table 1).[52,56,57]

Translation of the original version published in spanish in:
Salud Mental 2016, Vol. 39 Issue No. 2.

Table 1. Studies in students and general population

Student population				
Authors, year	Objective	Design/Type of study	Population and sample	Results
Castro, Valencia, 1979.[45]	Identify problems associated to the consumption of alcohol and drugs.	Probabilistic school sample.	4059 14 to 18-year-old students Mexico City and metropolitan areas 74 schools.	SL*: inhalants 5.4%, 25.8% with problems; LM** 28.0%, 71.0% with problems.
Castro, Valencia, 1979.[48]	Identify prevalence of drug use in students.	Simple random sampling, stratified by conglomerates.	483 students from 7 high schools in the state of Morelos.	SL*: marijuana 8.6%, inhalants 5.3%, tranquilizers 4.3%, LM**: marijuana 4.7%, inhalants 3.8%, tranquilizers 47.6%. Problems: marijuana 33.0%, inhalants 23.07%, tranquilizers 14.2%.
Castro, Valencia, 1980.[46]	Identify prevalence, affected groups and distribution of drug users.	Simple random two-stage sampling.	4059 middle school and high school students from Mexico City and the metropolitan area.	SL*; inhalants 5.4%, marijuana 3.8%, tranquilizers 3.1%, LM** inhalants 28.0%, marijuana 29.5%%, tranquilizers 27.0%. Inhalers: male, 14 years old, workers.
Castro, Maya, Aguilar, 1982.[47]	Identify prevalence, affected groups and distribution of drug users.	Stratified simple random sampling.	3408 students from 89 middle school and high school from Mexico City and the metropolitan area.	SL*: inhalants 4.4%, amphetamines 3.8%, marijuana 3.5%, LM**: inhalants 25.1%, amphetamines 30.2%, marijuana 27.1%.
Mas, Ramírez, 1985.[37]	Report drug consumption data students non-students.	Convenience random sampling.	43 students, 14 to 18 years old, and 43 young persons who had abandoned school one year earlier.	Students 2%, non-students 21%; second in preference among non-students and only drug students.
Castro, Rojas, García, De la Serna, 1986.[28]	Present data on drug use in student population.	Epidemiologic.	Students attending a treatment center from 1984 to 1986.	Marijuana 78.6%, inhalants 68.3%, pills 33.4%.
Castro, Rojas, De la Serna, 1988.[35]	Obtain an epidemiologic perspective of drug users.	Representative sample of high school students in Mexico City.	778 students.	SL*: Marijuana 5.8%, amphetamines 4.0%, inhalants 3.9%.
De la Serna, Castro, Rojas, García, 1991.[32]	Knowing the opinions and attitudes of teachers and parents about drug use in young persons.	School random sample Qualitative, discussion groups, located by informant method.	230 teachers and parents from 33 schools.	54.5% cement second most consumed drug, after marijuana, they are the most widely available among the young.
Medina-Mora et al, 1993.[33]	Present drug consumption prevalence in students around the country.	Conglomerated two-stage stratified sampling.	61,947 middle school and high school students.	Inhalants 3.5%, amphetamines 2.3% use: thinner, resistol 5000 (glue), sprays, UHU.
Rojas et al, 1993.[31]	Identify consumption and associated variables.	Conglomerated two-stage stratified sampling.	14,878 secondary school and high school students from six states.	Inhalant consumption Mexico City, Baja California Norte 5%, Jalisco 4.5%, Tamaulipas 2.5%, Chiapas and Oaxaca 3.08%.
Rojas et al, 1993.[30]	Make public prevalence of drug use among students.	Two-stage stratified by conglomerates sampling design.	17,680 students Baja California, Tamaulipas, Mexico City, Jalisco, Chiapas, and Oaxaca *vs.* 79,220 nationwide.	National: 7.8% inhalants. Baja California 9.7%, Tamaulipas 8.0%, Mexico City 9.0%, Jalisco 9.3%, Chiapas 4.8% and Oaxaca 7.3%.
Medina-Mora et al, 1994.[29]	Describe prevalence, relation demographic groups, distribution violent behavior students.	Conglomerated two-stage stratified sampling.	3,459 students from Mexico City.	Users/non-users: Couldn't go on 36.8-40.6%, think death 50.9-51.5%, family better without me 35.1-39.8%, think about killing myself 27.0-28.8%; total 58.2-61.7%.
Berenzon et al, 1996.[34]	Present prevalence of drug use, associated problems and affected subgroups.	Conglomerated two-stage stratified sampling.	12,240 students.	SL*: Inhalants 5.01%, marijuana 3.58%, cocaine 1.66%. Less than 2% peers would think use of marijuana, cocaine or inhalants fine.
Medina-Mora, Villatoro, Rojas, 1996.[26]	Compare state and nationwide data.	Conglomerated two-stage stratified sampling.	13,450 students Baja California, Sonora, Chihuahua, Coahuila, Nuevo Leon, Tamaulipas, and National 1993.	SL*: Baja California 5.06%, Sonora 2.58%, Chihuahua 2.69%, Coahuila 3.06%, Nuevo Leon 1.26%, and Tamaulipas 2.58%.
Rojas et al, 1998.[44]	Analyze in depth drug consumption trends in students.	Conglomerated two-stage stratified sampling.	Middle school and high school students Mexico City Metropolitan area, 1989: 3600; 1991: 3501; 1993: 10879.	Inhalants increase from 1989 to 1993, last year and LM** 1.98, 2.40, 0.04, 1.06, 1.05 preferred drug.
Villatoro et al, 1999.[27]	Present consumption prevalence, aspects of the social and school environment.	Conglomerated two-stage stratified sampling.	10,173 middle school and high school students from Mexico City and the metropolitan area.	Preferred drug: marijuana 4.98, inhalants 3.90, tranquilizers 3.24; inhalant consumption begins < 15 years.
Gutiérrez, Mora, Unikel, Villatoro, Medina-Mora, 2001.[36]	Study relation consumption, environment, risk eating behavior.	Conglomerated two-stage stratified sampling.	286 women 12 to 19 years old. 143 in risk for eating behavior and 143 without indicators.	With greater risk consumption, preferred drug tranquilizers (10.5 *vs.* 2.1), cocaine (8.4 *vs.* 2.1), inhalants (7.7 *vs.* 2.8).

Table 1. Continued

Authors, year	Objective	Design/Type of study	Population and sample	Results
Amador et al, 2002.[50]	Present prevalence of drug consumption in men and women.	Census of primary schools and secondary schools of the city of Rio Verde.	4703 secondary school students.	Men marijuana and inhalants 3.8%; women: tranquilizers 4.4%, inhalants 3%.
Saltijeral, González, Carreño, 2002.[39]	Know consumption relation in relatives and friends.	Census in two secondary school in downtown Mexico City.	Intentional sampling 936 students.	Inhalants 5.9%, cocaine 5.5%, marijuana 5.1%. In one school inhalant consumption 7.9%.
Villatoro et al, 2002.[7]	Present prevalence of drug consumption in students.	Conglomerated two-stage stratified sampling.	10,578 middle school and high school students from Mexico City.	Marijuana 5.8%, cocaine 5.2%, tranquilizers 4.8%, inhalants 4.3%.
Wagner et al, 2003.[43]	Estimate proportion of young persons with opportunity of use.	Combined approach qualitative and quantitative research.	23 in focal groups 768 survey.	They offer for free: marijuana 85%, cocaine 78%, inhalants 64%, or for sale: marijuana 49%, cocaine 49%, inhalants 40%.
Villatoro et al, 2005.[42]	Present results survey 2003 students.	Two-stage stratified sampling design.	10,659 students from Mexico City.	Marijuana 7.2%, inhalants 4.6%.
Ramos, González, Wagner, 2006.[38]	Identify association between victimizing and opportunities.	Cross-sectional survey.	767 students from two secondary school in downtown Mexico City.	Marijuana 19.0%, inhalants 12.7%, cocaine 7.7%, marijuana 26.3%, inhalants 17.1%, exposed violence.
Villatoro et al, 2009.[41]	Present results survey 2006.	Two-stage stratified by conglomerates design.	10,523 students from Mexico City.	Marijuana 8.8%, inhalants 6.7%, tranquilizers 4.9%.
Marsiglia et al, 2011.[51]	Explore relation use of drugs intention to migrate.	Cross-sectional study.	702 high school students from Guanajuato.	12% marijuana, 4% cocaine, 7% inhalant, intention to migrate predicts use of the three drugs.
Villatoro et al, 2011.[40]	Assess prevalence and usage trends.	Stratified by conglomerates sampling design.	22,980 middle school and high school students from Mexico City.	Marijuana 11.4%, inhalants 10.4%, cocaine 3.5%.
Pérez, 2012.[49]	Identify skills in consumers/non consumers.	Random sample.	425 high school students from the state of Morelos.	Inhalants, SL*: 6.8%, last year 3%, LM**: 1.9%, Marijuana SL*: 9.6%, last year 4.7%, LM**: 3% No consumers more empathy, planning and resisting pressure.
Villatoro et al, 2014.[15]	Know prevalence and usage trends.	Two-stage stratified sampling design.	26,503 middle school and high school students from Mexico City.	Mariguana 15.9%, inhalables 10.0%.
		General population		
Authors, year	Objective	Design/Type of study	Population and sample	Results
De la Garza, Mendiola, Rábago, 1980.[55]	Detect families with inhaler member and identify their psychosocial condition.	Epidemiological study.	Interviews to 525 families in a marginal neighborhood in the state of Nuevo Leon, February to May, 1997.	Illiteracy 84.6% with one member inhalant consumer 6.9%; parent alcoholism problems 38.8%.
Medina-Mora, Tapia, Rascón et al, 1989.[53]	Present prevalence of drug consumption in general population.	Multi-stage stratified sampling design.	12,557 12-65-year-old residents of urban areas with over 2500 inhabitants.	Drugs more widely used: marijuana 2.6%, tranquilizers 0.7%, inhalants 0.7%.
Medina-Mora, Tapia, Sepúlveda et al, 1989.[56]	Present prevalence of drug consumption in general population.	Multi-stage stratified sampling design.	12,557 12-65-year-old residents of urban areas with over 2500 inhabitants.	First person who offered: 41.2% friends, family 8%, street 19.5%, home 17.4% and job 15%.
Tapia, Medina-Mora, Sepúlveda, De la Fuente, Kumate, 1990.[57]	Present prevalence of drug consumption in general population.	Multi-stage stratified sampling design.	12,557 12-65-year-old residents of urban areas with over 2500 inhabitants.	First person who offered: 41.2% friends, family 8%, street 19.5%, home 17.4% and job 15%.
Medina-Mora et al, 2003.[52]	Describe drug consumption and risk factors.	Conglomerated stratified probability sampling design.	3,882 adolescents between 12 to 17 years old.	Nal men, women: marijuana (2.5% *vs.* 0.5%), inhalants (1.1% *vs.* 0.2%) cocaine (1.1% *vs.* 0.2%). Inhalants earlier use, street or park easier to get.
Rojas, Fleiz, Villatoro, Gutiérrez, Medina-Mora, 2009.[54]	Compare prevalence drug use. National Addiction Survey (ENA) 1998 survey cities 2005.	Multi-stage stratified probability sampling of Tijuana, Monterrey and Ciudad Juárez.	1019 inhabitants of Tijuana, 1078 from Ciudad Juarez and 1312 from Monterrey.	ENA preference marijuana, cocaine, tranquilizers; inhalants increase Tijuana, Juarez 1998-2005 over 100%.
Villatoro et al, 2012.[16]	Knowing current data of drug consumption derived from ENA 2011.	Conglomerated stratified probability sampling design.	3849 adolescents, 12400 adults.	Adolescents: marijuana 2.4%, inhalants 0.9%. Adults: marijuana 9.7%, cocaine 5.2%, *crack* 1.9%, inhalants 1.3%.

*Sometime in the life. **In the last month.

Translation of the original version published in spanish in:
Salud Mental 2016, Vol. 39 Issue No. 2.

Table 2. Studies with special populations and population who seek out services

Population who seek out services				
Authors, year	Objective	Design/Type of study	Population and sample	Results
Ortíz, Orozco, Romano, Sosa, Villatoro, 1989.[63]	Design and implement SRID.	Successive evaluations cross-sectional study.	608 subjects who were admitted in health and justice institutions.	Marijuana 63.6%, inhalants 57%, tranquilizers 9.2%.
Ortiz, 1989.[67]	Set drug consumption trends in a specific moment.	Cross-sectional study of 4 successive evaluations of SRID (1986, 1987-1, 1987-2, 1988-1).	1898 subjects who were admitted in health and justice institutions.	Marijuana 63.6%, 70.8%, 58.6%, 70.4%, inhalants 57%, 55.3%, 59.6%, 63.6%, tranquilizers 9.2%, 13.1%, 13.1%, 21.4%.
Ng, Alvear, 1993.[68]	Define a sociodemographic profile of abusers.	Non controlled retrospective study.	73 patient files treated in a toxicology center in Baja California.	Dextropropoxyphen was combined more frequently with benzodiazepines 38%, marijuana 15%, heroine 14%, cocaine 5%, inhalants 1%.
Ortíz, Rodríguez, Galván, Unikel, González, 1994.[69]	Analyze information of criminal behavior due to consumption of marijuana, inhalants and cocaine.	Descriptive cross-sectional study. Intentional probabilistic sample.	4031 admitted in health and justice institutions from November 1986 to November 1992.	Commit: robbery, wounds with sharp instruments, rape and murder Problems: economical, family, academic and health.
Ortíz et al, 1997.[66]	Present drug use trends (18 assessments SRID).	Descriptive cross-sectional study. Intentional probabilistic sample.	6869 admitted in health and justice institutions 1986 - 1992.	Stable pattern for marijuana and inhalants, cocaine noteworthy increase.
Ortíz, Soriano, Galván, 2004.[64]	Present drug use trends based on 33 assessments of SRID.	Descriptive cross-sectional study. Intentional probabilistic sample.	16,044 admitted in health and justice institutions from November 1986 to November 2002.	November 2002 90 cases, consumed cocaine 67.6%, marijuana 62.9% and inhalants 31.3%.
Ortíz, Soriano, Galván, 2004.[65]	Present use trends for cocaine, marijuana and inhalants (33 assessments SRID).	Descriptive cross-sectional study. Intentional probabilistic sample.	16,044 admitted in health and justice institutions from November 1986 to November 2002.	1988 to 1997 marijuana 63%, inhalants 48%. Cocaine first place and inhalants third.
Arellanez, Diaz, Wagner, Pérez, 2004.[62]	Analyze relation abuse and drug dependence in young persons.	*Ex post facto* transversal and cases and control design.	116 drug abusers, 102 dependents, 379 controls 10 to 18 years of age.	SL**: Marijuana 37.9 *vs.* 76.5%, inhalants 71.6% *vs.* 76.5%.
Galván, Ortíz, Soriano, Casanova 2005.[59]	Present drug consumption trends in Mexico City.	Descriptive cross-sectional study. Intentional probabilistic sample.	16,377 admitted in health and justice institutions 1986- 2003.	Marijuana and inhalants highest consumption until 1997, from then on, inhalants downward trend.
Ortíz, Soriano, Meza, Martínez, Galván, 2006.[61]	Present differences men, women, demographic profile, associated problems and trends.	Descriptive cross-sectional study. Intentional probabilistic sample.	8241 admitted in health and justice institutions 1999 to 2004.	Women more inhalants, men cocaine, marijuana last measurement: inhalants men 37.4% and women 30.3%.
Ortíz et al, 2007.[17]	Present synthesis of relevant results of consumption in Mexico City collected by SRID from 1987 to 2005.	Descriptive cross-sectional study. Intentional probabilistic sample.	19,350 admitted in health and justice institutions 1987 to 2005.	Last report third drug of preference, starting substance at earlier ages, greater consumption in persons younger than 19 years of age.
Castillo, Gutiérrez, 2008.[58]	Determine demographic differences, factors associated to treatment requiring and drug consumption.	Cross-section exploratory design. Intentional non probabilistic sample.	754 first time drug users Youth Integration Centers (CIJ) in the metropolitan area of Mexico City.	SL**: marijuana 30.4%, cocaine 17.0%, inhalants 15.4%. Starting drug: marijuana 43.5%, inhalants 14.8%, cocaine 11.8%.
Ortiz, Meza, Martínez, 2014.[60]	Present epidemiologic information showing *poppers* as emerging drug in Mexico City.	Descriptive cross-sectional study. Intentional probabilistic sample.	108 *popper* consumers.	17.6% started consumption 12-14 years of age. From 1988 to 2000 consumption 0.5%, in 2001 3.4%, from that year on, it has fluctuated but not disappeared.
Special populations				
Authors, year	Objective	Design/Type of study	Population and sample	Results
Medina-Mora, Ortiz, Caudillo, López, 1982.[14]	Present drug consumption prevalence in a group of minors.	Epidemiological study.	66 minors, 6 to 18 years old, underemployed in the streets in Southern Mexico City.	27% consumed inhalants SL**: 22% everyday, average consumption: 41/2 years.
López, Medina-Mora, Ortiz, 1984.[70]	Study perception and attitude of the community towards drug consumption.	Qualitative exploratory study, informant method.	30 housewives, 36 factory workers and 39 students.	Between 27.5 and 37.5 know consumers, 90% reject consumption.
Lara, Figueroa, 1990.[71]	Offer a general perspective of the marginal family.	Qualitative intensive search of cases.	30 mothers with a gang child and 30 mothers with no gang child.	11% of the gang children consumed inhalants, 8% marijuana, 10% other.
Tapia, Cravioto, de la Rosa, Vélez, 1995.[74]	Examine the relation between risk factors and solvent consumption.	Correlational cross-sectional study.	626 juvenile offenders from Mexico City.	58% reported use of various drugs and 23% inhalant abuse Risk factors: being male, low socioeconomic level.

Table 2. Continued

Authors, year	Objective	Design/Type of study	Population and sample	Results
Gutiérrez, Vega, 1995.[73]	Describe the social context into which the use of inhalants occurs among the so-called children the streets.	Ethnographic study. Theoretical sampling.	76 boys and girls who live in the streets, outdoors or in half ruined buildings in Mexico City.	Experienced police violence, detentions, beatings, threats, robbery, torture and rape. Consumed to deal with victimizing, to forget hunger, to avoid boredom.
Lara, Medina-Mora, Romero, Dominguez, 1998.[22]	Consider in depth the subjective appreciation on the context of psychosexual, social and family relations.	Ethnographic approach, informant method.	2 solvent users with opposite characteristics (in the extremes).	Started pressure, one-parent family, knows consumption, student Other lives both parents, works, multiuser, sells drugs, family does not know.
Lara, Romero, Dallal, Stern, Molina, 1998.[23]	Understand subjective perception of consumers of inhalant solvents.	Ethnographic study with focused interviews.	23 persons in contact with solvent consumers.	Consumption is serious, increasing, family problems, males. Adequate knowledge.
Vega, Gutiérrez, 1998.[25]	Knowing how they perceive willing inhalation of hydrocarbons, sexual practices, pregnancy, delivery, self-attention and institutional support.	Qualitative by means of focal groups and in-depth interviews.	10 girls, 15-22 years of age who were or had been pregnant, 5 in couple, 2 first pregnancy 4 pregnant at the time of the study.	Started inhalant consumption at arriving at the street community Have sexual intercourse with no protection All consumed during pregnancy.
Domínguez, Romero, Paul, 2000.[72]	Gather the opinion of a group of street children about their self-concept and drug consumption.	Psychosocial observational method, in-depth semi-structured exploration interviews.	10 street children from Mexico City.	Cement most widely used, marijuana second, they are just like any other human being, contemptuous expressions, provokes feeling of worthlessness.
Aguilera, Romero, Domínguez, Lara, 2004.[19]	Describe relation between adolescence and aspects of sexuality in a group of users of inhalant solvents.	Qualitative in-depth interviews.	Eight women and ten men, 13-18 years of age; schooling, second grade of secondary school to senior high school.	Starting with thinner, active or toluene Consumption makes it difficult expressions of affection, pleasure, contact with feelings, practicing in search of defining gender and sexual orientation.
Castillo, Caufield, Gómez, 2005.[68]	Identify the proportion of drug consumption in working women.	Correlational descriptive design. Stratified probability sampling.	669 women who reported having some kind of job at the time of the study.	Alcohol and tobacco consumption, tranquilizers 5.0%, marijuana 0.4%, inhalants 0.1%.
Loza et al, 2010.[70]	Examine differences among sex workers who had an early onset in this work and those with later onset.	Epidemiological study.	920 Sex workers interviewed in Tijuana (N=474) and Ciudad Juarez (N=446).	Starting before 18 years old, higher probability of using inhalants. (21.1-9.6%, p=.002), sex work to get alcohol (36.7-18.4%, p<.001), child abuse (42.2-18.7%, p<.0001).
Morris et al, 2011.[71]	Determine prevalence of consumption of heavenly water.	Descriptive, cross-sectional.	623 sex workers use injected drugs (307 Tijuana and 316 Ciudad Juarez).	SL*: heavenly water 26%, median age first time: 16 years of age, firs usage substance 10%.
Goldenberg et al, 2012.[69]	Examining environmental characteristics, background of sex work, drug consumption and start sexual work as a minor.	Epidemiological cross-sectional study.	624 Sex workers interviewed in Tijuana and Ciudad Juarez.	Use SL**: inhalants, marker of early onset in sex work, if they are the first drug consumed.
Gigengack, 2014.[13]	Understand willful use of inhalants with the intention of intoxication.	Longitudinal ethnographic study.	Street children, informers, family, adults that are members of the gang.	Complex culture of inhalation, configuring shared perspectives and unshakable practices shaped by social exclusion.

* Reporting System of Information on Drugs. ** Sometime in the life.

c) Surveys in populations who seek out services

In these surveys, it was discovered that solvents occupied the second place as a drug of preference, excluding alcohol and tobacco, reported percentages above 50%. This tendency was maintained until 1997, a year in which a downward inclination in the consumption of solvents was observed.[58-61] Among this population the most commonly consumed substances were thinner, glue and "*activo*".* [62-67] In another study it was found that dextropropoxyphene was combined with inhalants in 1% of the cases.[68] The consumers of inhalants were more likely to become involved in punishable behaviors such as: robbery, physical assault, wounds inflicted by sharp instruments, fights, rapes and murder (table 2).[69]

d) Studies among special populations

These populations, which include: marginal groups, members of youth gangs, children living on the streets, adults and minors being held at detention centers, and prostitutes, are considered to be at a high risk for the consumption of solvent inhalants.

In marginal communities, a perception of a high availability of solvents was identified, as well as the perception that the consumers were primarily males who began consuming at an early age. Additionally, it was found that the members of the consumer's family did not recognize the magnitude of the problem, even though they all accepted that they were acquainted with consumers in their homes or in the community. However, an attitude of rejection toward consumption was observed as well as a perception that the institutions that offered help are difficult to gain access to.[22,23,70]

In studies with adolescents who belong to gangs it was observed that the age at which they began consuming ranged from 9 to 15 years old and that inhalants (thinner, active ingredients or toluene) were, for the majority, the gateway drugs.[19,71]

Studies carried out with "children who live on the streets" have led to the identification of the existence of a culture of inhalation that surrounds them and leads to social exclusion.[18] Regardless of the stigmas that have characterized them over time, the children have reported that it is clear to them that this only serves to label them in a negative manner, however they considered themselves to be like any other human being and commented that they were not affected by what others thought of them. On the other hand, one of the stigmas that surround them is in conflict because studies have reported a relatively low percentage in the consumption of inhalants (27% to 28%). Several studies have referred to the consequences that the children have reported as a result of living and working on the streets such as the probability of sexual abuse, the drinking of the inhalants, a cessation of eating, a heightened incidence of accidents, police brutality and fights with friends.[72,73]

In reference to the reasons for consumption they mentioned serious adversities in life, mistreatment or sexual abuse, violence at the hands of police due to belonging to a group of consumers, as well as a lack of prevention programs.[21]

In studies involving girls living on the streets, it was revealed that they had initiated the consumption of inhalants when they entered the street community. They had sexual relations without protection, and continued consuming during pregnancy even though they were aware that the unborn child could be affected.[25]

A survey carried out among adolescents in conflict with the law revealed that 23% reported inhalant abuse. Gender, a low social economic level and job status were the principal risk factors associated with the abuse of inhalants.[74]

The female population has reported tranquilizers as the main drug of preference (5.0%) marijuana (0.4%) and inhalants (0.1%).[75] Studies carried out with prostitutes revealed that the women who initiated a career in sex at an early age (under 18 years) were more likely to use inhalants (21.1%) and to have been sexually abused as minors (42.2%).[76,77] Other studies reported that 26% had used "heavenly water"* at some time and 10% of those individuals said that this was the first substance they had used (table 2).[78]

e) Research about the consequences related to the consumption of inhalant solvents

The effects of solvents of abuse should be understood as a complex mechanism of action that involves various neurotransmission systems[79] and is associated with a multiplicity of negative effects that have been studied within Mexican population. In one group of addicts to thinner, it was found that, in the posturographic registers, the sensory organization, and the somatosensory quotients (visual and vestibular) revealed significant inferior values.[80] A possible alteration of the auditory pathway has been documented,[81] differences in the average of the frequency peak of the electroencephalogram (EEG) in electrode regions P3 and P4.[82,83] In addition, the sensibility of optokynetic nystagmus as an indicator of early abuse of solvents,[84] brain damage, a low intellectual quotient (IQ), a deficit in the formation of concepts, abstraction, attention, the ability to follow sequences, analysis and synthesis;[85,86] insomnia, ultradian alteration;[87] hallucinations, illusions, changes in visual somatic, auditory and ultradian alteration;[20,49] as well as severe metabolic acidosis and renal tubular acidosis.[88] During the necropsy of a man who had consumed for 12 years cerebral atrophy, diffuse cerebellar atrophy and giant axonopathy, both central and peripheral were observed. The corpus callosum

* Synonymous of inhalant.

* It is a kind of glue used by shoemakers mainly in the northern part of the country and in the State of Guanajuato.

was atrophied as a consequence of the loss of neurons in the neocortex,[89] and there was also an increase in the rate of chromosome anomalies and the frequency of the sister chromatid exchange.[90,91]

On the other hand, Ortiz and Caudillo (1985),[91] carried out a cognitive evaluation at a center for social readjustment with children who had lived on the streets and had inhaled solvents. The mean intellectual quotient (IQ) was 77. They revealed diminishing passive and receptive memory, failures in the formation of concepts, abstraction and a low capacity in judgment, analysis, and synthesis. However, the authors do not directly attribute these problems directly to the use of inhalants, because they could be the result of family, educational and social short-falls or even the effects of institutionalization. Other studies have revealed poor outcomes in school and the presence of unlawful behavior (table 3).[92]

f) Evaluation of treatments for consumers of solvent inhalants

The development and evaluation of psychological and/or multidisciplinary interventions for attention to consumers of inhalants is an area of special interest; however, national literature on the topic is scarce.

One of the first projects to be completed in this area had as its primary objective to evaluate the program called "the teaching family" in a group of 22 institutionalized children who were consumers of inhalant solvents, aged 9 to 13 years old. The final evaluation registered a reduction of 28% in the frequency and quantity of consumption.[93]

In the field of pharmacology, it has been demonstrated that carbamazepine helps to reduce the severity of hallucinations that are a consequence of the consumption of inhalants in 48.3% and haloperidol in 52.7% of the cases.[94] Mata and Echeverria (1985)[94] carried out a study to evaluate the effectiveness of three types of treatments with patients sent by institutions of social assistance that were principally consumers of inhalants (97%). They found that combined treatment helped to reduce consumption in a greater percentage (from 100% to 16.7%).

Derived from studies carried out in children who live and work on the streets was the development of a program to reduce damage called "Llévatela suave" ("Take it Easy"). The program consisted in labeling the containers of inhalable products with information regarding the consequences of consumption; however there is no information available regarding the effects of the intervention[21] (table 3).

DISCUSSION AND CONCLUSION

Some of the most relevant contributions that psychosocial research has made in the field of knowledge have been identified, related to the consumption of inhalant solvents in our country; for example, that these substances have remained as one of the principal drugs of consumption for the past 40 years. Another relevant contribution of the studies is that they have helped identify the groups at greatest risk of consuming these substances such as: marginal groups, members of youth gangs, children who live or work on the streets, adults and minors retained in detention centers and prostitutes among others.[14,18-25]

Also notable is that males under the age of 14 constituted the group at greatest risk, especially those who had worked and had come from a low social-economic level and whose head of the household had a low level of education, and had at least one family member who is a consumer, those who are located in an area of high substance availability and who have friends who are consumers.[37,46,47]

The findings allow the design of a general profile of the individual at risk which is essential for the development of prevention programs and treatment that address the specific needs of potential consumers and of those who have already initiated their consumption. This gains major importance due to the fact that there are only a few programs in existence, and of these, very few have received adequate follow-up and, even less, have been evaluated to learn their levels of efficiency and effectiveness.

It is necessary to widen the basic research regarding inhalant solvents among the Mexican population, since multiple negative consequences have been identified in the organism. Even if the findings are not considered overwhelming, they should be taken into consideration for the development of specific therapeutic programs designed to work against, or diminish the negative impact on the quality of life of consumers.

The present work has limitations derived from the methodology employed. The criteria of inclusion to limit the search and the review of the bibliography were strictly followed. However, it is possible that publications that could broaden the information with respect to the subject may have been left out, which highlights the importance that researchers publish the findings of their studies in an international context through high impact professional journals, as well as making use of indicators (keywords, titles, summaries, among others) that permit easy localization and recuperation of the information in available databases.

Actions remain to be completed such as the implementation of new models of intervention to support users in the reduction of consumption, by emphasizing specific necessities, and the social risks that they may be exposed to. The evaluation of the efficiency and effectiveness of said programs should be done with scientific rigor that permits the broadening of attention options that are presently available to this population.

On the other hand, it is important to carry out studies which document the effects of public policies that seek to limit the availability of these types of substances in a systematic manner to have a full understanding of their reach.

Translation of the original version published in spanish in:
Salud Mental 2016, Vol. 39 Issue No. 2.

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Salud Mental 2016, Vol. 39 Issue No. 2.

Table 3. Research of effects and assessment of treatments for inhalant solvent consumption

Effects of inhalant solvents				
Authors, year	Objective	Design/Type of study	Population and sample	Results
Escobar, Aruffo, 1980.[82]	Report clinical and neuropathological findings of the necropsy of a consumer of thinner and glue.	Case study.	Male Mexican 27 years addicted for 12 years to inhalants neurological and behavioral damage.	Necropsy: cerebral and cerebellar atrophy, giant axonopathy, both central and peripheral; corpus callosum atrophic secondary loss of neurons neocortex.
Ortiz, 1982.[79]	Identify cognitional effects associated to consumption of solvent inhalants.	Cases and controls.	155 minors 8-18 years of age southern Mexico City.	51.6% consumed, brain damage, low IQ*, concept formation deficit, abstraction, attention, sequence follow-up, analysis and synthesis.
Ortiz, Caudillo, 1985.[85]	Assess cognitional alterations associated to chronic use of inhalant substances.	Cases and controls experimental study.	11 minors, inhalers and 9 non inhalers from a social rehabilitation center.	Usuarios deterioro: atención, memoria, concentración, manejo de símbolos, alteraciones afásicas, mejor rendimiento en ejecución que verbales. CI* usuarios 77, no usuarios 83.
Salamanca et al, 1987.[83]	Define whether inhalant consumption is associated to chromosomic anomalies.	Cases and controls.	35 children (33 boys and 2 girls) chronic consumers of inhalants.	More chromosomic anomalies, greater frequency of sister chromatid exchange in consumers ($p<0.001$).
Ortiz, Sosa, Caudillo, 1988.[78]	Report results of cognitive functioning from two assessments with one year difference.	Cases and controls, intensive search of cases.	28 men 15 chronic users of inhalants and 13 non-users.	Users diminished consumption, both groups improved results in intelligence and neuropsychology.
Salamanca et al, 1989.[84]	Define chromosomic effects by acute intoxication of organic solvents.	Cases and controls.	15 children from the Minor Reformatory Council of Mexico City.	Frequency of chromosomic abnormalities greater in consumers than in non-consumers ($p<.001$).
Sosa, Ortiz, Caudillo, 1989.[76]	Report results of cognitive functioning obtained from two assessments.	Cases and controls intensive search of cases.	28 hombres 15 usuarios crónicos de inhalables y 13 no usuarios.	One year follow up, users less consumption, non-users started experimental consumption, both better results in intelligence and neuropsychological.
Lope, Poblano, Martínez, Falcón, 1996.[74]	Find auditory damage by means of evoked replies in subjects with chronic inhalation of solvents.	Comparative cases and controls.	34 subjects exposed to the substance, 5-10 years and 30 controls with same age.	Possible alteration of auditory pathway in subjects with addiction to inhalants.
Poblano et al, 2000.[77]	Study anomalies of optokynetic nystagmus induced by inhalant consumption.	Cases and controls.	25 patients exposed to thinner 5 to 20 years, 4 weeks withdrawal and 25 controls.	Confirms the sensitivity of optokynetic nystagmus as early marker of solvent abuse.
Ishiwara, Poblano, Pineda, Ortega, 2002.[73]	Describe posturographic alteration in a group of inhalant abusers.	Cases and controls.	28 men and 2 women from toxicology center and 30 controls, with no addiction, paired by age and gender.	Posturographic records with sensory organization of somatosensory quotients, visual and vestibular inferior values, correlation time exposure and vestibular quotient, differences groups: visual and vestibular.
Martínez et al, 2002.[80]	Experimental study on psychotropic effects of solvents on the circadian function sleep-wake and electrical brain activity during sleep.	Cases and controls.	Control group 24 healthy subjects, 4 women and 20 men, cases 24 inhalers multi-consumers 5 women and 19 men.	17 subjects with insomnia, 2 abnormal sleep, insomnia in the beginning of the night 5 subjects. 6 suffered insomnia due to ultradian alteration and 5 instability of sleep and moderate motor restlessness.
Lara, Galindo, Romero, Salvador, Domínguez, 2003.[19]	Assess neuropsychological state in adolescents consuming inhalants by means of Rey Complex Figure (RCF).	Qualitative study. Convenience and snowball.	Ten men and four women, students, and eight women from treatment and community service centers.	Use of RCF screening to study neuropsychological alterations in inhaler adolescents, from regulatory data of Mexican population.
Páez, López, Cruz, 2003.[72]	Present solvent action mechanisms on the molecular level.			Effects must be understood as an action mechanism involving various neurotransmission systems.
Poblano, Flores, Arteaga, Flores, Elías, Pineda, 2006.[75]	Study whether thinner abuse provokes slowing, disorganizations and asymmetry of the cortex electrical activity.	Cases and controls.	22 cases of chronic intoxication with thinner and 22 controls, same age ranking according to gender.	Meaningful differences in the average of the peak of frequency (PoF) of the electroencephalogram (EEG) in electrode regions P3 and P4 with lower values in group cases.

Table 3. Continued

Authors, year	Objective	Design/Type of study	Population and sample	Results
Cruz, Domínguez, 2011.[15]	Record hallucinatory experiences in students who inhale solvents and toluene-based glues.	Qualitative by semi structured interviews.	10 men and 7 women, 13-18 years, students, lived with family, regular use of inhalants.	Alucinaciones e ilusiones incluyendo cambios de color, visual, somática, auditiva, y táctiles, grupales moduladas por el ambiente.
Cámara, González, Rodríguez, González, 2012.[81]	Identify clinical and metabolic disorders associated with toluene intoxication.	Case studies.	22 emergency patients from 2006 to 2012 with clinical and metabolic disorders due to inhaling toluene.	Debilidad asociada a hipocalcemia severa, diagnóstico principal. Acidosis metabólica severa en 20 pacientes, acidosis tubular renal en cinco pacientes.
Assessment of treatments				
Authors, year	Objective	Design/Type of study	Population and sample	Results
Ayala, Quiroga, Mata, Chism, 1981.[86]	Assess treatment effectiveness.	Type of study and design o1 - X – O2.	22 children, 9-13 years of age, solvent consumers from an orphanage.	Consumption 4-30 days a month, 1 to 13 liters, 11 with pathological EEG Consumption diminished to 28% and 32% follow-up.
Mata, Echeverría, 1985.[87]	Assess effectiveness degree of three treatment alternatives in drug consumption.	*Quasi* experimental study 3 experimental groups and 1 control.	60 drug consumers who asked for treatment for their consumption.	97% inhalant, combined treatment group reduced consumption the most (100%-16%), long term tx (100% to 30%), short term tx (100%-45.5%) and control group (100%-76.9%).
Hernández, Ortega, Jasso, Hasfura, Kranzler, 1998.[88]	Compare efficiency of carbamazepine and haloperidol in handling hallucinatory symptoms by dependence to inhalants.	Experimental study.	40 patients from a psychiatric unit for inhalant dependency treatment.	Both groups improved, reduction of symptom severity 48.3% with carbamazepine and 52.7% with haloperidol.
Gutiérrez, Vega, 1999.[16]	Describe Llévatela suave (Take it easy) program.	Descriptive.	Program based on systematic research of street children needs.	"Llévatela suave" program is described as well as the causes why girls and boys inhale, risks they run.

* Intellectual Quotient.

Epidemiologic research of the subject should continue in a manner that identifies the appearance of solvents of abuse, ways in which they are used, risk factors and above all, the protection factors that allow the strengthening of preventive programs, and treatments to combat the problem.

Funding

None

Conflict of interest

Authors hereby declare to have no conflict of interest whatsoever.

Acknowledgements

To Dr. Francisco Juárez García for his support on preparing this article.

REFERENCES

1. **United Nations. World youth report 2003: The global situation of young people. Viena; United Nations Department of Economic and Social Affairs; 2004.**
2. **Puryer J, Wignall R. Tobacco, Alcohol and drugs use among dental undergraduates at one UK University in 2015. Dent J 2016;4(1):2 doi:10.3390/dj4010002.**
3. **Park S, Kim Y. Prevalence, correlates, and associated psychological problems of substance use in Korean adolescents. BMC public health 2016;16(1):1. doi: 10.1186/s12889-016-2731-8.**
4. **Alderete E, Gregorich SE, Monteban M, Kaplan CP et al. Effect of appreciation for Indigenous cultures and exposure to racial insults on alcohol and drug use initiation among multiethnic Argentinean youth. Prev Med 2016;85(5):60-68. doi:10.1016/j.ypmed.2015.12.017**
5. **Medina-Mora ME, Real T. Epidemiology of inhalant use. Curr Opin Psychiatry 2008;21(3):247-51. doi: 10.1097/YCO.0b013e3282fc9875**
6. **Natera G. México. En: United Nations International Drug Control Programme Global Workshop on Drug Information Systems (ed.). Austria: Activities, Methods and Future Opportunities; 2002.**
7. **Villatoro J, Medina-Mora ME, Rojano C, Fleiz C et al. ¿Ha cambiado el consumo de drogas de los estudiantes? Resultados de la encuesta de estudiantes. Medición otoño del 2000. Salud Mentl 2002;25(1):43-54.**
8. **Magarey JM. Elements of a systematic review. Int J Nurs Pract 2001;7(6):376-382.**
9. **Newell R, Burnard P. Research for evidence-based practice. New Jersey: Wiley Blackwell; 2006.**
10. **Urra E, Barría RM. La revisión sistemática y su relación con la práctica basada en la evidencia en salud. Revista Latino-Americana Enfermagem [Internet]. 2010 jul.-ago. (Access date: Sep. 7, 2015); 18(4):[08 pantallas]. Available at: http://www.scielo.br/pdf/rlae/v18n4/es_23.pdf.**
11. **Evans D, Pearson A. Systematic reviews: gatekeepers of nursing knowledge. J Clin Nurs 2001;10(5):593-599.**
12. **Higgins J, Green S (eds.). Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0. The Cochrane Collaboration, 2011. Available from www.cochrane-handbook.org.**
13. **Whittemore R. Combining evidence in nursing research: methods and implications. Nurs Res 2005;54(1):56-62.**
14. **Medina-Mora ME, Ortíz A, Caudillo C, López S. Inhalación deliberada de solventes en un grupo de menores mexicanos. Salud Ment 1982;5(1):77-81.**
15. **Villatoro J, Mendoza MA, Moreno M, Oliva N et al. Tendencias del uso de drogas en la Ciudad de México: Encuesta de estudiantes, octubre 2012. Salud Ment 2014;37(5):423-435.**

Translation of the original version published in spanish in:
Salud Mental 2016, Vol. 39 Issue No. 2.

16. Villatoro J, Medina-Mora ME, Fleiz C, Moreno M et al. El consumo de drogas en México: Resultados de la Encuesta Nacional de Adicciones, 2011. Salud Mentl 2012;35(6):447-457.
17. Ortíz A, Martínez R, Meza D, Soriano A et al. Uso de drogas en la Ciudad de México: Sistema de Reporte de Información en Drogas (SRID). Salud Ment 2007;30(4):41-46.
18. Gigengack R. The chemo and the mona: Inhalants, devotion and street youth in Mexico City. Int J Drug Policy 2014;25:61-70.
19. Aguilera RM, Romero M, Domínguez MJ, Lara MA. Primeras experiencia sexuales en adolescentes inhaladores de solventes: ¿De la genitalidad al erotismo? Salud Ment 2004;27(1):60-72.
20. Cruz S, Domínguez M. Misusing volatile substances for their hallucinatory effects: A qualitative pilot study with Mexican teenagers and a pharmacological discussion of their hallucinations. Subst Use Misuse 2011;46(S1):84-94.
21. Gutiérrez R, Vega L. Informe preliminar de un programa para disminuir los daños asociados con la inhalación de tolueno en los "niños de la calle". Salud Ment 1999;22(Especial): 75-78.
22. Lara MA, Medina-Mora ME, Romero M, Domínguez MJ. Un estudio cualitativo sobre el consumo de solventes inhalables en estudiantes. Psiquiatría Pública 1998;10(6):59-67.
23. Lara MA, Romero M, Dallal C, Stern R et al. Percepción que tiene una comunidad sobre el uso de solventes inhalables. Salud Ment 1998;21(2):19-28.
24. Lara MA, Galindo G, Romero M, Salvador J et al. La Figura Compleja de Rey en adolescentes que consumen solventes inhalables. Salud Ment 2003;26(6):17-26.
25. Vega L, Gutiérrez R. La inhalación deliberada de hidrocarburos aromáticos durante el embarazo de adolescentes consideradas como "de la calle". Salud Ment 1998;21(2):1-9.
26. Villatoro J, Medina-Mora ME, Cardiel H, Fleiz C et al. La situación del consumo de sustancias entre estudiantes de la ciudad de México. Medición otoño de 1997. Salud Mental 1999;22(2):18-30.
27. Medina-Mora ME, Villatoro J, Rojas E. Drug use among students in Mexico's northern border states. En: Community Epidemiology Work Group (eds.). Epidemiologic trends in drug abuse. Rockville, Maryland: National Institute on Drug Abuse press; Vol II: diciembre 1996; pp.367-379.
28. Castro ME, Rojas E, García G, De la Serna J. Epidemiología del uso de drogas en la población estudiantil. Tendencias en los últimos 10 años. Salud Ment 1986;9(4):80-86.
29. Medina-Mora ME, López K, Villatoro J, Juárez F et al. La relación entre la ideación suicida y el abuso de sustancias. Resultados de una encuesta en la población estudiantil. Anales. Reseña de la IX Reunión de Investigación. México: Instituto Nacional de Psiquiatría Ramón de la Fuente Muñiz; 1994.
30. Rojas E, Galván J, Carreño S, Villatoro J et al. Prevalencia de consumo de drogas en población escolar. Salud Ment 1993;16(4):1-7.
31. Rojas E, Medina-Mora ME, Galván J, Juárez F et al. Prevalencia del consumo de drogas en la población escolar. Salud Ment 1993;16(4):1-7.
32. De la Serna J, Castro ME, Rojas E, García G. Opinión de los padres y maestros sobre el uso de drogas en los jóvenes. Revista Mexicana Psicología 1991;8(1-2):57-63.
33. Medina-Mora ME, Rojas E, Juárez F, Berenzon S et al. Consumo de sustancias con efectos psicotrópicos en la población estudiantil de enseñanza media y media superior de la República Mexicana. Salud Ment 1993;16(3):2-8.
34. Berenzon S, Medina-Mora ME, Carreño S, Juárez F et al. Las tendencias del consumo de sustancias psicoactivas en los estudiantes de enseñanza media y media superior del Distrito Federal, 1993. Salud Mentl 1996;19(1):1-5.
35. Castro ME, Rojas E, De la Serna J. Estudio epidemiológico sobre el uso de drogas y problemas asociados entre la población estudiantil que asiste a los colegios de bachilleres. Salud Ment 1988;11(1):35-47.
36. Gutiérrez RA, Mora J, Unikel C, Villatoro J et al. El consumo de drogas en una muestra de mujeres estudiantes que presentan conductas alimentarias de riesgo. Salud Ment 2001;24(6):55-61.
37. Mas C, Ramírez ME. Consumo de alcohol y drogas en una población de jóvenes estudiantes y no estudiantes. Salud Ment 1985;8(4):71-73.
38. Ramos L, Gonzalez C, Wagner F. Violent victimization and drug involvement among Mexican middle school students. Addiction 2006;101(6):850-856.
39. Saltijeral MT, González C, Carreño S. Predictores del uso de sustancias adictivas en estudiantes de dos secundarias del Centro Histórico. En: AMEPSO (ed). La Psicología Social en México, México: Ed. AMEPSO; 2002.
40. Villatoro J, Gaytán F, Moreno M, Gutiérrez M et al. Tendencias del uso de drogas en la Ciudad de México: Encuesta de Estudiantes del 2009. Salud Ment 2011;34(2):81-94.
41. Villatoro J, Gutiérrez M, Quiroz N, Moreno M et al. Encuesta de estudiantes de la Ciudad de México 2006. Prevalencias y evolución del consumo de drogas. Salud Ment 2009;32(4):287-297.
42. Villatoro J, Medina-Mora ME, Hernández M, Fleiz C et al. La Encuesta de Estudiantes de Nivel Medio y Medio Superior de la Ciudad de México: noviembre 2003. Prevalencias y evolución del consumo de drogas. Salud Ment 2005;28(1):38-51.
43. Wagner F, González C, Aguilera R, Ramos L et al. Oportunidades de exposición al uso de drogas entre estudiantes de secundaria de la Ciudad de México. Salud Ment 2003;26(2):22-32.
44. Rojas E, Medina-Mora ME, Villatoro J, Juárez F et al. Evolución del consumo de drogas entre estudiantes del Distrito Federal. Salud Ment 1998;21(1):37-42.
45. Castro ME, Valencia M. Estudio sobre el uso de drogas y problemas asociados en una muestra de estudiantes del estado de Morelos. Salud Ment 1979;2(3):2-8.
46. Castro ME, Valencia M. Consumo de drogas en la población estudiantil de la Ciudad de México y su área metropolitana: subgrupos afectados y distribución de los usuarios. Boletín Estupefacientes 1980;32(4):33-42.
47. Castro ME, Maya M, Aguilar MA. Consumo de sustancias tóxicas y tabaco entre la población estudiantil de 14 a 18 años. Salud Pública México 1982;24(5):565-574.
48. Castro ME, Valencia M. Problemas asociados al uso de drogas y alcohol en jóvenes estudiantes. Salud Pública México 1979;21(5):559-567.
49. Pérez C. Habilidades para la vida y consumo de drogas en adolescentes escolarizados mexicanos. Adicciones 2012;24(2):153-160.
50. Amador JA, Díaz M, Ibarra G, López MY et al. El consumo de drogas en la ciudad de Río Verde, SLP. Resultados preliminares de las encuestas de estudiantes. En: SPPS, INPRFM, CIJ, IMSS, SCT, ISSSTE, PEMEX (eds). Observatorio mexicano en tabaco, alcohol y otras drogas. México: Ed. CONADIC; 2002.
51. Marsiglia F, Kulis S, Hoffman S, Calderón C et al. Migration intentions and illicit substance use among youth in central Mexico. Subst Use Misuse 2011;46(13):1619-1627.
52. Medina-Mora ME, Cravioto P, Villatoro J, Fleiz C et al. Consumo de drogas entre adolescentes. Resultados de la Encuesta Nacional de Adicciones, 1998. Salud Pública México 2003;45(Suplemento I):S16-S25.
53. Medina-Mora ME, Tapia R, Rascón ML, Solache G et al. Situación epidemiológica del abuso de drogas en México. Bol Oficina Sanit Panam 1989;107(6):475-484.
54. Rojas E, Fleiz C, Villatoro J, Gutiérrez ML et al. Tendencias del consumo de drogas de 1998 a 2005 en tres ciudades de la zona norte de México: Ciudad Juárez, Monterrey y Tijuana. Salud Ment 2009;32(1):13-19.
55. De la Garza F, Mendiola I, Rábago S. Perfil del inhalador. Estudio epidemiológico del uso de inhalantes en una población marginal. Salud Ment 1980;3(4):4-12.
56. Medina-Mora ME, Tapia R, Sepúlveda J, Otero B et al. Extensión del consumo de drogas en México: Encuesta Nacional de Adicciones. Resultados nacionales. Salud Ment 1989;12(2):7-12.

57. Tapia R, Medina-Mora ME, Sepúlveda J, De la Fuente R et al. La Encuesta Nacional de Adicciones. Salud Pública México 1990;32(5):507-522.
58. Castillo P, Gutiérrez A. Consumo de drogas en mujeres asistentes a centros de tratamiento especializado en la Ciudad de México. Salud Ment 2008;31(5):351-359.
59. Galván J, Ortíz A, Soriano A, Casanova L. Tendencias del uso de drogas en la Ciudad de México (1986-2003). Sistema de Reporte de Información en Drogas. Salud Ment 2005;28(3):51-59.
60. Ortiz A, Meza D, Martínez R. Poppers, una droga emergente. Resultados del Sistema de Reporte de Información en Drogas. Salud Ment 2014;37(3):225-231.
61. Ortíz A, Soriano A, Meza D, Martínez R et al. Uso de sustancias entre hombres y mujeres, semejanzas y diferencias. Resultados del Sistema de Reporte de Información en Drogas. Salud Ment 2006;29(5):32-37.
62. Arellanez J, Diaz D, Wagner F, Pérez V. Factores psicosociales asociados con el abuso y la dependencia de drogas entre adolescentes: análisis bivariados de un estudio de casos y controles. Salud Ment 2004;27(3):54-64.
63. Ortíz A, Orozco C, Romano M, Sosa R et al. El desarrollo del sistema de información sobre drogas y las tendencias del consumo en el área metropolitana. Salud Ment 1989;12(2):35-41.
64. Ortíz A, Soriano A, Galván J. Resultados del Sistema de Información en Drogas. En: CONADIC (ed.). Observatorio mexicano en tabaco, alcohol y otras drogas 2003. México: CONADIC; 2004.
65. Ortíz A, Soriano A, Galván J. Tendencias del consumo de cocaína, mariguana e inhalables. Sistema de Reporte de Información en Drogas. En: CONADIC (ed.). Observatorio mexicano en tabaco, alcohol y otras drogas 2003. México: CONADIC; 2004.
66. Ortíz A, Unikel C, Flores JC, Soriano A et al. Trends of drug use in Mexico City from 1987 to 1995. The Information Reporting System on Drugs. En: NIDA (ed.). Epidemiologic Trends in Drug Abuse. Community Epidemiology Work Group: Volume II: Proceedings. Rockville, Maryland: NIDA; diciembre 1996; pp.380-392.
67. Ortíz A. Desarrollo del Sistema de Registro de Información sobre Drogas en México. Bol Oficina Sanit Panam 1989;107(6): 523-530.
68. Ng B, Alvear M. Dextropropoxyphene addiction- A drug of primary abuse. Am J Drug Alcohol Abuse 1993;19(2):153-158. doi: 10.3109/00952999309002676.
69. Ortíz A, Rodríguez E, Galván J, Unikel C et al. Uso de drogas y conducta delictiva en la población captada por el sistema de reporte de información en drogas. Anales. Reseña de la IX Reunión de Investigación. México: Instituto Mexicano de Psiquiatría; 1994; pp.55-60.
70. López S, Medina-Mora ME, Ortíz A. Percepción y actitudes hacia el consumo de sustancias de abuso a través del método de informantes. Salud Ment 1984;7(2):69-79.
71. Lara MA, Figueroa ML. Familias con hijos en bandas juveniles. Revista Mexicana Psicología 1990;7(1-2):37-43.
72. Dominguez M, Romero M, Paul G. Los "niños callejeros". Una visión de sí mismos vinculada al uso de las drogas. Salud Ment 2000;23(3):20-28.
73. Tapia R, Cravioto P, De la Rosa B, Vélez C. Risk factors for inhalant abuse in juvenile offenders: the case of Mexico. Addiction 1995;90(1):43-49.
74. Castillo M, Caufield C, Gómez MV. Consumo de drogas y violencia laboral en mujeres trabajadoras de Monterrey, NL, México. Revista Latinoamericana Enfermería 2005;13(especial):1155-1163.
75. Goldenberg S, Rangel G, Vera A, Patterson T et al. Exploring the impact of underage sex work among female sex workers in two Mexico-US border cities. AIDS Behav 2012;16(4):969-981.
76. Loza O, Strathdee S, Lozada R, Staines H et al. Correlates of early versus later initiation into sex work in two Mexico-U.S. border cities. J Adolesc Health 2010;46(1):37-44.
77. Morris MD, Case P, Roberton AM, Lozada R et al. Prevalence and correlates of 'agua celeste' use among female sex workers who inject drugs in Ciudad Juarez, Mexico. Drug Alcohol Depend 2011;117(2-3):219-225.
78. Páez N, López C, Cruz S. Avances recientes en la investigación de los mecanismos celulares de acción de los solventes de abuso. Salud Ment 2003;26(5):43-50.
79. Ishiwara K, Poblano A, Pineda G, Ortega P. Alteraciones posturográficas en adictos al tiner. Rev Neurol 2002;35:625-627.
80. Lope M, Poblano A, Manuel J, Falcón H. Auditory evoked potentials in addicts to organic solvent inhalation. Rev Invest Clin 1996;48(5):369-372.
81. Poblano A, Flores B, Arteaga C, Flores T et al. Thinner abuse alters peak of frequency of EEG spectra analyses. Arq Neuropsiquiatr 2006;64(4):937-940.
82. Sosa R, Ortíz A, Caudillo C. Patrón de consumo de solventes y daño neuropsicológico asociado a su uso. Salud Pública México 1989;31(5):634-641.
83. Poblano A, Ishiwara K, Ortega P, Mora L et al. Thinner abuse alters optokinetic nystagmus parameters. Arch Med Re 2000;31(2):182-185.
84. Ortíz A, Sosa R, Caudillo C. Estudio de seguimiento de usuarios y no usuarios de sustancias inhalables en población abierta: comparación de sus rendimientos cognitivos. Psiquiatría 1988;4(2):165-178.
85. Ortíz A. El consumo de inhalantes en México. Variables psicosociales asociadas y consecuencias de su uso. I Reunión sobre Investigación y Enseñanza. México: Instituto Mexicano de Psiquiatría; 1982; pp.77-82.
86. Martínez A, Luna G, Calvo JM, Valdés A et al. Análisis espectral (3D) electroencefalográfico de los efectos de la inhalación de compuestos orgánicos volátiles industriales sobre el sueño y la atención en el humano. Salud Ment 2002;25(4):56-67.
87. Cámara CR, González EI, Rodríguez R, González JG. Clinical presentation and management in acute toluene intoxication: a case series. Inhal Toxicol 2012;24(7):434-438. doi:10.3109/08958378.2012.684364.
88. Escobar A, Aruffo C. Chronic thinner intoxication: clinic-pathologic report of a human case. J Neurol Neurosurg Psychiatry 1980;43(11):986-994.
89. Salamanca F, Moreta G, Palma V, García T et al. Cytogenetic study in children chronically habituated to inhalation of volatile substances. Am J Med Gene 1987;27(2):391-397. DOI:10.1002/ajmg.1320270217.
90. Salamanca F, Palma V, Navarrete C, Garcia T et al. Chromosome abnormalities and sister chromatid exchanges in children with acute intoxication due to inhalation of volatile substances. Arch Environ Health 1989;44(1):49-53. DOI:10.1080/00039896.1989.9935872.
91. Ortíz A, Caudillo C. Alteraciones cognitivas en menores usuarios crónicos de sustancias inhalables. Informe de un estudio experimental. Salud Pública México 1985;27(4):286-290.
92. Ayala H, Quiroga H, Mata A, Chism K. La familia enseñante. Evaluación del modelo en México en términos de reincidencia en su aplicación a una muestra de niños inhaladores de solventes industriales. Salud Ment 1981;4(1):11-15.
93. Hernández C, Ortega H, Jasso A, Hasfura C et al. Treatment of inhalant-induced psychotic disorder with carbamazepine versus haloperidol. Psychiatr Serv 1998;49(6):812-815.
94. Mata A, Echeverría L. Rehabilitación de niños y jóvenes farmacodependientes a través de un programa comunitario de consulta externa. Salud Ment 1985;8(3):73-80.

Translation of the original version published in spanish in: Salud Mental 2016, Vol. 39 Issue No. 2.