MEXICO

A. Regulation on sources

Source of lead	Relevant legislation/regulation	Government agencies	Data source
1. Blood-lead levels	1. Official Mexican Norm NOM-199-SSA1-2000: levels of lead in blood and actions as criteria to protect the health of the exposed population in non-occupational ways. 2. Blood-lead levels in children, pregnant and breastfeeding women: 10 µg/dl. 3. Blood-lead levels for the rest of the population: 25 µg/dl.	a. Secretary of Health b. Secretary of Work and Social Provision c. Secretary of Social Development d. Mexican Institute of Social Security e. Institute of Health, Environment, and Work	1. Secretary of Health, Norma Oficial Mexicana NOM-199-SSA1-2000
2. Lead in air	1. Official Mexican Norm NOM-026-SSA1-1993: Environmental Health: Criteria to evaluate the quality of ambient air in respect to lead (Pb). Standard value for lead (Pb) concentration in ambient air, as a measure to protect the health of the population. 2. Lead concentration, as an atmospheric pollutant, should not go over the allowed limit of 1.5 µg/m^3	a. Secretary of Health	1. Secretary of Health, Norma Oficial Mexicana NOM-026-SSA1-1993
3. Lead compounds	1. Official Mexican Norm NOM-004-SSA1-2013: Environmental health. Limitations and sanitary specifications for the use of lead compounds. 2. Total Lead Concentration for lead in paint: 600 ppm.	a. Secretary of Health	1. Secretary of Health, Norma Oficial Mexicana NOM-004-SSA1-2013
4. Lead in animals	1. Official Mexican Norm NOM-010-Z00-1994: Determination of copper, lead, and cadmium in liver, muscle, and kidney of cattle, horses, pigs,	a. Secretary of Agriculture and Hydraulic Resources b. Secretary of Health	1. Secretary of Agriculture and Hydraulic Resources, Norma Oficial Mexicana NOM-010-Z00-1994

Source of lead	Relevant legislation/regulation	Government agencies	Data source
	sheep, and birds, by atomic absorption spectrometry.		
5. Lead in food and water	1. Official Mexican Norm NOM-117-SSA1-1994: Test method for the determination of cadmium, arsenic, lead, tin, copper, iron, zinc, and mercury in food, drinking water, and purified water, by atomic absorption spectrometry. 2. Official Mexican Norm NMX-AA-057-1981: Water analysis – lead determination – dithizone colorimetric method.	a. Secretary of Health b. Secretary of Health and Assistance; Secretary of Agriculture and Hydraulic Resources	1. Secretary of Health, Norma Oficial Mexicana NOM117-SSA1-1994 2. Secretary of Health and Assistance, Norma Oficial Mexicana NMX-AA-057-1981
	No other standards found at this time for lead.		

B. International Agreements

Agreement	Year Ratified
1. Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal	1991
2. Rotterdam Convention on the Prior Informed Consent Procedure for certain hazardous Chemicals and Pesticides in international trade	2005 (a)[1]
3. Minamata Convention on Mercury	2015
4. Stockholm Convention on Persistent Organic Pollutants	2003

C. Blood lead-level monitoring programs

Details	Data source

[1] Accession (a)

1. National level blood-lead level testing sponsored by the Secretary of Federal Health. Sample: boys and girls from ages 1 to 4 by capillary blood measurement. Findings: 22% of the population of the study have high concentrations of blood-lead levels, higher than the official norm 199-SSA1-2000 (at 5 micrograms of lead per deciliter of blood). 2. Scientific papers on blood-lead levels.	1. Reporte nacional de niveles de plomo en sangre y uso de barro vidriado en población infantil vulnerable 2. Refer to section E on scientific papers that perform blood-lead level sampling.

D. Inventory of toxic sites (Toxic Sites Identification Program (TSIP), Pure Earth)

Site	Province/Region	Details (all data comes from the TSIP website)
San Cristobal de las Casas Pottery, Chiapas	Chiapas	San Cristobal de las Casas (p. 185,917) is the capital of the municipality of the same name located at the central region of Chiapas. It has 10 pottery workshops that use lead-based glazes. The exposure pathway of lead is inhalation and ingestion for the artisans and their families, and food ingestion on lead based glazed pottery for the consumers.
Santa María Atzompa Pottery, Oaxaca	Oaxaca	Ceramists in Oaxaca use lead-based glazes. The long-term use of lead-based glazes can result in the deposition of lead-contaminated soil, dust and water, with highest concentrations in the immediate workshop areas.
Santa Maria Atzompa, Oaxaca	Oaxaca	A large amount of artisanal ceramicists and the use of lead in pottery glazes in Santa Maria Atzompa is contaminating the soil, air, food and water of the city with lead. High levels of lead have also been detected in the blood of several residents.
Acteopan Pottery, Puebla	Puebla	Acteopan (p. 2,914) is a small town in the west of Puebla. It has about 50 pottery artisans exposed to lead through direct contact and polluted soil that comes in contact through ingestion.
Ex-fabrica Basf Mexicana, Ex Hacienda El Hospital, Cuautla, Morelos	Morelos	The former facilities of BASF Mexicana, S.A. de C.V. are located in the Ex Hacienda El Hospital, in the municipality of Cuautla, Morelos. Established in 1973 through 1997, the facility was engaged in developing chemical pigments. The violation of certain obligations of the company led to heavy metal pollution. This pollution has resulted in negative health effects due to exposure from the hazardous waste, which is rich in lead, chromium, cadmium, nickel and molybdenum. More than 600,000 metric tons of the contaminated soil remains both on the leased premises and several nearby homes, affecting the health of more than 100 families in the community. There is also a shallow

Site	Province/Region	Details (all data comes from the TSIP website)
		aquifer in the area that comes into direct contact with the contaminated soil. A fish farm and two agricultural plots use this aquifer.
Tlayacapan Pottery, Morelos	Morelos	Tlayacapan is a touristic town in Morelos. It has a long tradition of pottery production. While most of the artisans do not use glaze, there are 40 artisans and their families exposed to lead based glazes. Exposure pathway is dust/soil ingestion and consumption of food cooked or stored in lead-based glaze pottery.
Barrio de la Luz Pottery, Puebla	Puebla	Barrio de la Luz is an old site of pottery production in downtown Puebla. There are 5 families that use the workshop which is polluted with lead that is still used for glazing. The exposure pathway of lead is inhalation and ingestion for the artisans and their families, and food ingestion on lead-based glazes for the consumers.
La Trinidad Pottery, Tenexyecac, Tlaxcala	Tlaxcala	Tenexyecac is an artisanal ceramics village near Puebla. Most of the ceramicists use lead-based glazes ("greta"). This activity causes lead contamination in soils around the workshop, as well as in air and food.
Almoloya Pottery, Hidalgo	Hidalgo	A small community of artisanal pottery makers in the city of Almoloya (about 200) use traditional lead-based glazes. They are reported to have high blood lead levels.
Tepeapulco Pottery, Hidalgo	Hidalgo	Tepeapulco (p. 14,151) is the capital of the municipality of the same name located SE Hidalgo. There are 5 pottery workshops that use lead-based glazes. The exposure pathway of lead is inhalation and ingestion for the artisans and their families, and food ingestion on lead based glazed pottery for the consumers.
Santa Cruz de Arriba Pottery, Texcoco, Estado de México	Mexico	Sta. Cruz de Arriba is a small town in the municipality of Texcoco, NE of the Valley of Mexico City. It has 15 artisan workshops that produce lead based glazed pottery. The exposure pathway is ingestion and inhalation of the glaze and food consumption from lead based glazed pottery.
Presa de Jales, Pachuca, Hidalgo	Hidalgo	On the site there are 14,333,492 tons of mining waste containing toxic metals that endanger the health of the nearby population. Due to regional winds reaching speeds of 65km/hr., it is likely that particulates from the mining wastes become suspended and further endanger the health of the nearby population. The main routes of exposure are inhalation and ingestion.
Presa de jales, Omitlán de Juárez, Hidalgo	Hidalgo	On this site there are 70.2 million cubic meters of toxic wastes that threaten the health of the community because of the likely inhalation of volatile particles and mobility of toxic waste. It is considered that due to the high volume of mine waste that are on this site and the proximity of these to the community, the entire population of 8,963 according to INEGI 2010, is at risk.

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Huasca Pottery, Hidalgo	Hidalgo	Huasca de Ocampo is an 16th Century Old Town which main activity is Tourism and Agriculture. Huasca is one of the 3 most important pottery communities in Hidalgo. The main exposure pathway is to the artisans through inhalation and ingestion. Consumers are also at risk of exposure.
Ojo de Agua (ULABs), Tepeji del Río, Hidalgo	Hidalgo	On February 2012, about 40 trucks dumped burned ULAB material by a ravine, across a dirt road from 5 houses. The material was partially removed on April. Ashes still remain. The pathway is: dust, ingestion and livestock.
Temascalcingo Pottery, Estado de México	Mexico	There are 5 communities in Temascalzingo that in all have 100 workshops that produce lead based glazed pottery. The main exposure pathway is ingestion and inhalation for artisans and their families and food ingestion for consumers that use the pottery for cooking and storing food.
Chapantongo Pottery, Hidalgo	Hidalgo	Chapantongo is a municipality in the state of Hidalgo, approximately 130 kilometers from Mexico City. The main economic activity involves glazed pottery production with 5 pottery producing communities. Most of the glaze used is lead based, creating an exposure pathway to producers and families (through ingestion, soil and ingestion) and to consumers.
San Ildefonso Pottery, Amealco, Querétaro	Queretaro	San Ildefonso (p. 2821) is located in a Valley south of Queretaro. There are about 40 workshops that produce lead-based glaze pottery. The main exposure pathway is direct contact and ingestion.
El Coñecito Pottery, Jacala, Hidalgo	Hidalgo	El Coñecito is a small rural town located in the middle of a Valley. At least one third of the population produces pottery. All of the production is lead-based glazed which causes severe health issues among its inhabitants. Inhalation/ingestion of lead containing particles is the main exposure pathway.
Capula Pottery, Michoacan	Michoacan	Ceramicists in the villages of Capula and Santa Fe de la Laguna use lead-based glazes. The lead leaches into food during food preparation. Long term use of the lead glazes could result in the deposition of lead-contaminated soil, dust and water.
Tonalá and Tlaquepaque Pottery, Jalisco	Jalisco	Tonalá and Talquepaque are two municipalities that form part of Guadalajara's metropolitan area. They are recognized and famous for its artisan production. Among its production, they have lead glazed pottery, which involves creating a pollution pathway to producers and consumers.
San Felipe Pottery, Guanajuato	Guanajuato	San Felipe Torres Mochas (p. 28,452) is the capital of San Felipe Municipality, at the North of Guanajuato. There are 40 pottery artisans that use lead base glazes. The exposure pathway is inhalation and ingestion for the artisans and food consumption for the users of the pottery.

Site	Province/Region	Details (all data comes from the TSIP website)
Ex-Gran Fundición Central Mexicana Aguascalientes	Aguascalientes	On this site, there is waste slag from previous smelting. As a result, these tailings and slags endanger the community near these residues through ingestion and inhalation of the volatile substances and heavy metals, such as lead.
Mina La Negra, Chalchihuites, Zacatecas	Zacatecas	Several mines operate in Chalchihuites. They are located at the entrance of the village and on the hills. The pathway of exposure to lead is through inhalation and ingestion given the tailings volatilization.
Peñoles Minesite, Lead Smelter, Torreon, Coahuila	Coahuila	This site, the fourth largest lead smelter in the world, has produced high blood lead levels in children from the surrounding community. Lead emissions carry in the air and are inhaled/ingested by nearby people. The lead is also deposited in surrounding soil where dermal contact may expose people. Emissions are not well-contained, exposing many children and adults living in the bordering residential areas. Slag piles covering approx. 5300 m sq. sit in the center of the metallurgical facility.
La Prieta Mine, Parral, Chihuahua	Chihuahua	La Prieta is an abandoned mine (1629-1974) with more than 7 million cubic meters of volatile tailings. The facility is used as a museum and for government offices. There might be 10,000 persons affected by the tailings and about 200 persons directly affected by lead and arsenic inside the premises.
Ex-Planta Industrial Minera México, San Guillermo Chihuahua	Chihuahua	On this site is openly exposed waste containing materials and toxic waste slag, threatening the community of San Guillermo due to ingestion and inhalation of these volatile particles.
Planta Ávalos (ASARCO), Chihuahua, Chihuahua	Chihuahua	The former plant Avalos Chihuahua, deposited the tailings and slag weathering products of cast metals such as Pb and As. Due to the exposure of these wastes, the population is affected by the volatility of the tailings and are absorbed by ingestion and inhalation.
Aceros Chihuahua S.A., Chihuahua, Chihuahua	Chihuahua	Former steel plant in Chihuahua, on this site rod was manufactured and contaminated with Cobalt-60. Due to the dispersion of radioactive material into the environment, people can be exposed to radiation. Pb, Cr and Cd also occurs in some site points according to the XRF analyzer.
Asarco Smelter, Anapra, Ciudad Juárez, Chihuahua	Chihuahua	High levels of lead and arsenic in soil in and around El Paso can be attributed to the Tucson-based Asarco Inc lead smelter in the border city.

E. Scientific papers on lead exposure (Please contact info@gahp.net for information on studies not in the public domain)

Topic	Authors	Year	Title	Abstract/ description
Blood lead levels	Pantic, Ivan; Tamayo-Ortiz, Marcela; Rosa-Parra, Antonio; Bautista-Arredondo, Luis; Wright, Robert; Peterson, Karen; Schnaas, Lourdes; Rothenberg, Stephen; Hu, Howard; Tellez-Rojo, Martha Maria	2018	Children's Blood Lead Concentrations from 1988 to 2015 in Mexico City: The Contribution of Lead in Air and Traditional Lead-Glazed Ceramics	**Abstract:** Despite the removal of lead from gasoline in 1997, elevated blood lead levels (BLLs) > 5 µg/dL are still detectable in children living in Mexico City. The use of lead-glazed ceramics may explain these persistent exposure levels. Mexico lacks a national surveillance program for BLL, but temporal trends can be derived from epidemiological studies. With this approach, we leveraged a series of birth cohorts to report BLL trends from 1987 to 2002 and expanded our analysis to 2015. Data were from 1–5-year-old children from five Mexico City cohorts followed between 1988 and 2015. BLLs are reported on 1963 children, who contributed 4975 BLLs. We estimated the trend of mean BLL, which decreased from 15.7 µg/dL in 1988, to 7.8 µg/dL in 1998 (a year after the total ban of lead in gasoline), to 1.96 µg/dL in 2015. The proportion of BLL ≥ 5 µg/dL decreased from 92% (1988–1998) to 8% (2008–2015). The use of lead-glazed ceramics was associated with an 11% increase in BLLs throughout the study period. Replacing lead-based glazes in traditional ceramics may be the key to further reducing exposure, but this presents challenges, as it involves a cultural tradition deeply rooted in Mexico. In addition, the creation of a rigorous, standardized, and on-going surveillance program of BLL is necessary for identifying vulnerable populations.
	Caravanos, Jack; Dowling, Russell; Tellez-Rojo, Martha Maria; Cantoral, Alejandra; Kobrosly, Roni; Estrada, Daniel; Orjuela, Manuela; Gualtero, Sandra; Ericson, Bret; Rivera, Anthony; Fuller, Richard	2014	Blood Lead Levels in Mexico and Pediatric Burden of Disease Implications	B**ackground:** Although there has been success in reducing lead exposure with the phase-out of leaded gasoline, exposure to lead in Mexico continues to threaten the health of millions, much of which is from lead-based glazes used in pottery that leaches into food. **Objectives:** An extensive historical review and analysis of available data on blood lead levels in Mexican populations was conducted. We used a calculated geometric mean to evaluate the effect of lead on the pediatric burden of disease. **Methods:** An extensive bibliographic search identified 83 published articles from 1978 to 2010 with blood lead level (BLL) data in Mexican populations representing 150 data points from more than 50,000 study

Topic	Authors	Year	Title	Abstract/ description
				participants. Values from these publications were categorized into various groupings. We then calculated the incidence of disease and disability-adjusted life-years resulting from these BLLs using the World Health Organization's burden of disease spreadsheets for mild mental retardation.
	Muñoz, Hilda; Romieu, Isabelle; Palazuelos, Eduardo; Mancilla-Sanchez, Thelma; Meneses-Gonzales, Fernando; Hernandez-Avila, Mauricio	2010	Blood Lead Level and Neurobehavioral Development among Children Living in Mexico City	**Abstract:** This cross-sectional study examined the association between blood lead levels and neuropsychological and behavioral development of 139 children (7–9 y of age) who attended school in the southwestern part of Mexico City. A trained psychologist administered an IQ test to 84% of the children, and teachers graded them for agility, socialization, expression, and knowledge. Parents also answered a questionnaire on demographic and socioeconomic variables. Anodic stripping voltammetry was used to determine blood lead levels. Regression models were used to determine the best predictors of IQ and teachers' rating scores. The mean blood lead level was 19.4 μg/dl (standard deviation [SD] = 7.6), with a geometric mean of 17.8 μg/dl (95% confidence interval [95% CI] = 16.5–19.1). Blood lead was the strongest predictor of full-scale IQ, and there was a significant negative trend between blood lead, full-scale IQ, and teachers' rating scores. In this study, children with higher levels of blood lead performed more poorly on psychometric tests and had poorer educational attainment than their counterparts. These results suggest an association between neuropsychological and behavioral impairment and lead exposure.
	Muñoz, Hilda; Romieu, Isabelle; Palazuelos, Meneses, Fernando; Hernandez-Avila, Mauricio	2010	Vehicular Traffic as a Determinant of Blood-lead Levels in Children: A Pilot Study in Mexico City	**Abstract:** The major determinants of blood-lead levels were studied in 90 children who attended an outpatient pediatric clinic in Mexico City. All children, who were from 1–10 y of age, were from homes for which socioeconomic status had been categorized as medium to high. Blood-lead levels ranged from 0.17 (standard deviation [SD] = 0.008) to 1.21 (SD = 0.06 μmol/l). The main determinant of blood-lead levels was place of residence. Children who lived on private streets (i.e., low-traffic areas) had a significantly lower blood-lead level than children who lived on large avenues and who resided close to main roads ($p = .0001$, $r2 = .27$). This observation documented high exposure levels among children who live in

Topic	Authors	Year	Title	Abstract/ description
				Mexico City and suggested that leaded fuel used in Mexico could play an important role in determining blood-lead levels in this population.
	Olaiz, G; Fortoul, T; Rojas, R; Doyer, M; Palazuelos, E; Tapia, C.	2010	Risk Factors for High Levels of Lead in Blood of Schoolchildren in Mexico City	**Abstract:** Risk factors associated with blood lead levels exceeding 15 µg/dl were analyzed in this report. This relatively high lead level was selected because, at the time the study commenced, it was considered to be a "safe" level. A total of 1 583 schoolchildren were studied. The students were from (a) two areas in Mexico City (Tlalnepantla and Xalostoc) that have had historically high concentrations of lead in air; and (b) three areas (Pedregal, Iztalpalapa, and Centra) with less impressive air lead levels. Parents were presented with a questionnaire that solicited information about lead risk factors. A bivariate analysis and a multilogistic analysis were conducted to identify associations and to identify the model that most accurately explains the variability of the sample. High blood lead concentrations were found in children who lived in Xalostoc and Tlalnepantla (16.1 and 17.0 µg/dl, respectively), and the lowest concentration (i.e., 10 µg/dl) was found in children from Iztapalapa. The strongest association was with area of residence, followed by education level of parents, cooking of meals in glazed pottery, and chewing or sucking of yellow or other colored pencils. A child's area of residence is the most significant risk factor that must be accounted for when any study of lead and blood lead concentrations is undertaken. Follow-up in similar populations should assist greatly in the evaluation of the impact of governmental actions on public health.
	Nahimira, D; Saldivar, L; Pustilnik, N; Carreon, G.J., Salinas, M.E.	2009	Lead in human blood and milk from nursing women living near a smelter in Mexico City	**Abstract:** Lead levels in breast milk and blood were determined in women living within a 200-m radius of 3 smelters in Mexico City. All samples were analyzed on a Perkin Elmer 460 atomic absorption spectrometer equipped with HCA 2200. The mean blood lead level was 45.88 µg/dl (SD 19.88 ng/dl), and the geometric mean of milk lead level was 2.47 µg/100 ml. The correlation coefficient of these two variables was 0.88. Using the mean value of lead found in breast milk, an infant of 5.5 kg would ingest 8.1 µg/kg/d in his diet. The daily permissible intake (DPI) established by the World Health Organization (WHO) in 1972 for an adult is 5.0 µg/kg/d.
	Tellez-Rojo, Martha; Bellinger,	2006	Longitudinal Associations	**Objective:** Increasing evidence suggests that 10 µg/dL, the current Centers for Disease Control and Prevention screening guideline for children's

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	David; Arroyo-Quiroz, Carmen; Lamadrid-Figueroa, Hector; Mercado-Garcia, Adriana; Schnaas, Lourdes; Wright, Roberto; Hernandez-Avila, Mauricio; Hu, Howard		Between Blood Lead Concentrations Lower Than 10 µg/dL and Neurobehavioral Development in Environmentally Exposed Children in Mexico City	blood lead level, should not be interpreted as a level at which adverse effects do not occur. Using data from a prospective study conducted in Mexico City, Mexico, we evaluated the dose-effect relationship between blood lead levels and neurodevelopment at 12 and 24 months of age. **Methods:** The study population consisted of 294 children whose blood lead levels at both 12 and 24 months of age were <10 µg/dL; blood lead levels were measured by graphite furnace atomic absorption spectroscopy; Bayley Scales of Infant Development II were administered at these ages. The outcomes of interest were the Mental Development Index and the Psychomotor Development Index. **Results:** Adjusting for covariates, children's blood lead levels at 24 months were significantly associated, in an inverse direction, with both Mental Development Index and Psychomotor Development Index scores at 24 months. Blood lead level at 12 months of age was not associated with concurrent Mental Development Index or Psychomotor Development Index scores or with Mental Development Index at 24 months of age but was significantly associated with Psychomotor Development Index score at 24 months. The relationships were not altered by adjustment for cord blood lead level or, in the analyses of 24-month Mental Development Index and Psychomotor Development Index scores, for the 12-month Mental Development Index and Psychomotor Development Index scores. For both Mental Development Index and Psychomotor Development Index at 24 months of age, the coefficients that were associated with concurrent blood lead level were significantly larger among children with blood lead levels <10 µg/dL than it was among children with levels >10 µg/dL. **Conclusions:** These analyses indicate that children's neurodevelopment is inversely related to their blood lead levels even in the range of <10 µg/dL. Our findings were consistent with a supralinear relationship between blood lead levels and neurobehavioral outcomes.

Topic	Authors	Year	Title	Abstract/ description
	Rothenberg, Stephen; Schnass, Lourdes; Perroni, Estela; Hernandez, Reyna; Karchmer, Samuel	1998	Secular Trend in Blood Lead Levels in a Cohort of Mexico City Children	**Abstract:** We determined the secular trend in blood lead levels in a cohort of 104 children born in Mexico City between 1987 and 1993. We grouped children by the calendar year in which they reached 6 mo of age and measured blood lead levels every 6 mo until they attained 36 mo of age. The overall geometric mean blood lead level was 9.6 µg/dl (range = 1.5–59.5 µg/dl). A repeated measures analysis of variance revealed a highly significant linear trend in blood lead level with year ($p < .001$); there was a maximum decrease of 7.6 µg/dl between 1989 and 1993. There was a highly significant quadratic age effect ($p < .001$); blood lead levels rose between 6 and 18 mo of age and decreased thereafter. There was a marginally significant interaction between age of the child and year. Family use of lead-glazed pottery significantly elevated blood lead levels ($p = .028$). The downward trend in blood lead levels during the time period of study corresponded to the reduction in various sources of lead exposure.
	Fernandez, Gustavo; Rojas Martinez, Rosalba; Fortoul, Teresa; Palazuelos, Eduardo	1997	High Blood Lead Levels in Ceramic Folk Art Workers in Michoacan, Mexico	**Abstract:** Ceramic folk art workers are at risk for developing lead intoxication. These workers live in small settlements, which often lack sanitation services, and these individuals work with ceramics in their homes. The study population comprised individuals of all ages from three rural communities in central Michoacan (Tzintzuntzan, Tzintzunzita, and Colonia Lazaro Cardenas). A survey questionnaire, which was provided to each individual, included questions about household characteristics, presence of a clay oven in the home, and use of lead oxide (“greta”) and other hazardous products. Venous blood samples were obtained from the workers. We found lead exposure to be reduced if the home floor was covered and if the house had been painted ≤1 y prior to study. Blood lead levels exceeded the maximum level permitted, but the levels were lower than those found in the 1970s, during which time study techniques for analyzing samples differed from those used in the present study. In addition, activity patterns of the populations differed during the two studies.
	Azcona-Cruz, Maria Isabel; Rothenberg,	1999	Lead-Glazed Ceramic Ware and Blood Lead Levels	**Abstract:** Although Mexico substantially reduced use of leaded gasoline during the 1990s, lead-glazed pottery remains a significant source of population exposure. Most previous studies of lead in nonoccupationally

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	Stephen; Schnaas, Lourdes; Zamora-Muñoz; Romero-Placeres; Manuel		of Children in the City of Oaxaca, Mexico	exposed groups in Mexico have been conducted in the Mexico City metropolitan area. Oaxaca, a poor southern state of Mexico, has a centuries-old tradition of use of low temperature lead-glazed ceramic ware manufactured mainly by small family businesses. We measured blood lead levels in 220 8–10-y-old children (i.e., not from pottery-making families) who were students in the innercity of Oaxaca and in the mothers of all children. The geometric mean blood lead level of the children was 10.5 µmlg/dl (+7.0/–4.3 µmlg/dl standard deviation; range = 1.3–35.5 µmlg/dl). The corresponding mean value for the mothers was 13.4 (+9.0/–5.4 µmlg/dl standard deviation; range = 2.8–45.3 µmlg/dl). We used cutoffs that were greater than or equal to 10 µmlg/dl, 20 µmlg/dl, and 30 µmlg/dl, and we determined that 54.9%, 10.3%, and 3.0% of the children were at or above the respective criteria. We accounted for 25.2% of the variance in blood lead levels of the children, using maternal responses to a questionnaire that assessed possible lead sources in a linear multiple-regression model. The most important factors related to lead levels were family use of lead-glazed pottery, use of animal fat in cooking, and family income. The addition of maternal blood lead level to the model increased accounted variance in blood lead to 48.0%. In logistic-regression modeling of children's blood lead levels, we used a cutoff of greater than or equal to 10 µmlg/dl, and we found that use of lead-glazed pottery was the most important of all questionnaire items that were predictive of blood lead levels (odds ratio = 2.98). In Oaxaca, as is the case elsewhere in Mexico, lead-glazed ceramic ware remains a significant risk factor for elevated blood lead levels in children.
	Farias, P; Borja-Aburto, V; Rios, C; Hertz-Picciotto, I; Rojas-Lopez, M; Chavez-Ayala, R	1996	Blood lead levels in pregnant women of high and low socioeconomic status in Mexico City.	**Abstract:** This study examined the determinants of blood lead (BPb) in 513 pregnant women in Mexico City: 311 from public hospital prenatal clinics, representing primarily women of low socioeconomic status (SES), and 202 from private hospitals, primarily women of high SES. Overall, BPb levels ranged from 1.38 to 29 micrograms/dl, with geometric means of 6.7 and 11.12 micrograms/dl for women from private and public hospitals, respectively. The crude geometric means difference obtained by t-test was 4.42 ($p < 0.001$). BPb was measured from January 1994 to August 1995 and showed higher levels during fall and winter and lower levels during spring and summer. The main BPb determinants were the use of lead-

Topic	Authors	Year	Title	Abstract/ description
				glazed ceramics in women from public hospitals and season of the year in women from private hospitals. Consumption of tortillas (corn bread rich in calcium) decreased BPb levels in the lower SES group, but the relationship was not statistically significant ($p > 0.05$). Consumption of milk products significantly ($p < 0.05$) reduced BPb levels in the higher SES group. In 112 women whose diets were deficient in calcium, taking calcium supplements lowered their blood lead levels about 7 micrograms/dl. A predictive model fitted to these data, using the strongest predictors plus gestational age, showed a difference of 14 micrograms/dl between the best and worst scenarios in women from public hospitals. Avoiding use of lead-glazed ceramics, consuming diets rich in calcium, and, if needed, taking calcium supplements, would be expected to result in substantial lowering of BPb, especially in pregnant women of low socioeconomic status.
	Romieu, I; Carreon, T; Lopez, L; Palazuelos, E; Rios, C; Manuel, Y; Hernandez Avila, M	1995	Environmental urban lead exposure and blood lead levels in children of Mexico City	**Abstract:** Lead contamination is now a leading public health problem in Mexico. However, there are few data on the lead content of various environmental sources, and little is known about the contribution of these sources to the total lead exposure in the population of children residing in Mexico City. We conducted a cross-sectional study in a random sample of 200 children younger than 5 years of age who lived in one of two areas of Mexico City. Environmental samples of floor, window, and street dust, paint, soil, water, and glazed ceramics were obtained from the participants' households, as well as blood samples and dirt from the hands of the children. Blood lead levels ranged from 1 to 31 micrograms/dl with a mean of 9.9 micrograms/dl (SD 5.8 micrograms/dl). Forty-four percent of the children 18 months of age or older had blood lead levels exceeding 10 micrograms/dl. The lead content of environmental samples was low, except in glazed ceramic. The major predictors of blood lead levels were the lead content of the glazed ceramics used to prepare children's food, exposure to airborne lead due to vehicular emission, and the lead content of the dirt from the children's hands. We conclude that the major sources of lead exposure in Mexico City could be controlled by adequate public health programs to reinforce the use of unleaded gasoline and to encourage production and use of unleaded cookware instead of lead-glazed ceramics.

Topic	Authors	Year	Title	Abstract/ description
Lead concentrations	Hernandez, J; Jimenez, M; Belmont; R; Ledesma, C; Baez, A	2004	Lead levels in primary teeth of children living in Mexico City	**Objective:** The aim of this study was to discover the lead concentration in primary teeth extracted in the peripheral clinics of the Faculty of Dentistry, UNAM (Mexico City). **Design:** One hundred healthy primary teeth were collected from 2 to 13-year-old children (52 girls and 48 boys). Sixty-six were maxillary teeth and 34 were mandibular teeth. Lead concentrations were measured by Graphite Furnace Atomic Absorption Spectrophotometry. **Results:** Our results indicate that lead concentration in the 10–13-year-old group (7·7 μg/g−1) was higher than in the other groups. Geometric mean lead concentration was higher in girls than in boys (7·3 μg/g−1 and 6·3 μg/g−1, respectively). Maxillary teeth had higher lead concentrations than mandibular teeth and primary canines showed the highest mean lead concentration followed by incisors and molars. Teeth from children living in the south-east area (which according to the Mexico City's Pollution Center data is the more polluted area), presented the highest lead concentration but no statistically significant difference was found among teeth from the different areas. **Conclusions:** Our results suggest that age, gender and place of residence are not related to the lead concentration in human primary teeth. This fact seems to indicate the ubiquitous presence of lead in the whole atmosphere of Mexico City and suggests that zones of residence do not appear to influence tooth lead concentration.
Lead battery	Valdez, H	1997	Lead battery markets and recycling in Mexico and South America	**Abstract:** A review is presented of the automotive markets in Latin America and their dependence on the lead produced in the region. It is found that Latin America markets have still a long way to go to reach acceptable stabilization and maturity. Environmental aspects are a very sensitive area and business strategies must be redirected towards saving the pollution problems that are inherently associated with the processing of lead.

Topic	Authors	Year	Title	Abstract/ description
Lead exposure	Meza-Montenegro, Maria; Valenzuela, Ana; Balderas-Cortes, J; Yañez, Leticia; Gutierrez, Maria; Cuevas, Alberto; Gandolfi, Jay	2013	Exposure Assessment of Organochlorine Pesticides, Arsenic, and Lead in Children From the Major Agricultural Areas in Sonora, Mexico	Abstract: There is a lack of information of exposure to organochlorine pesticides (OCP) and some metals, such as lead (Pb) and arsenic (As), both of which were used as arsenicals pesticides, in children living in the major agricultural areas of Mexico. The objective of this study was to assess the exposure of children to different OCP, As, and Pb in the Yaqui and Mayo valleys of Sonora to generate population baseline levels of these toxins. A cross-sectional study was undertaken in 165 children (age 6–12 years old) from 10 communities from both valleys during 2009. Blood samples were analyzed for OCP and Pb and first morning void urine for inorganic As (InAs). All of the blood samples had detectable levels of dichlorodiphenyltrichloroethylene (p,p'-DDE) ranging from 0.25 to 10.3 µg/L. However lindane, dichlorodiphenyltrichloroethane (p,p'-DDT), aldrin, and endosulfan were detected in far less of the population (36.4, 23.6, 9.1, and 3 %, respectively). Methoxychlor and endrin were not found in any sample. The average value of Pb in this population was 3.2 µg Pb/dL (range 0.17–9.0) with 8.5 % of the samples having levels <5.0 µg Pb/dL. Urinary As levels ranged from 5.4 to 199 µg As/L with an average value of 31.0 µg As/L. Levels > 50 µg/L were observed in 12.7 % of the samples. Our results show that is important to start a risk-reduction program to decrease exposure to these toxins in Mexican communities. In addition, the results can be used to establish the baseline levels of exposure to these toxins in this agricultural region and may be used as a reference point for regulatory agencies.
	Afeiche, Myriam; Peterson, Karen; Sanchez, Brisa; Cantonwine, David; Lamadrid-Figueroa, Hector; Schnass, Lourdes; Ettinger, Adrienne; Hernandez-Avila, Mauricio; Hu, Howard; Tellez-Rojo, Martha	2011	Prenatal Lead Exposure and Weight of 0- to 5-Year-Old Children in Mexico City	**Background:** Cumulative prenatal lead exposure, as measured by maternal bone lead burden, has been associated with smaller weight of offspring at birth and 1 month of age, but no study has examined whether this effect persists into early childhood. **Objective:** We investigated the association of perinatal maternal bone lead, a biomarker of cumulative prenatal lead exposure, with children's attained weight over time from birth to 5 years of age. **Methods:** Children were weighed at birth and at several intervals up until 60 months. Maternal tibia and patella lead were measured at 1 month postpartum using in vivo K-shell X-ray fluorescence. We used varying

Topic	Authors	Year	Title	Abstract/ description
				coefficient models with random effects to assess the association of maternal bone lead with weight trajectories of 522 boys and 477 girls born between 1994 and 2005 in Mexico City. **Results:** After controlling for breast-feeding duration, maternal anthropometry, and sociodemographic characteristics, a 1-SD increase in maternal patella lead (micrograms per gram) was associated with a 130.9-g decrease in weight [95% confidence interval (CI), –227.4 to –34.4 g] among females and a 13.0-g nonsignificant increase in weight among males (95% CI, –73.7 to 99.9 g) at 5 years of age. These associations were similar after controlling for concurrent blood lead levels between birth and 5 years. **Conclusions:** Maternal bone lead was associated with lower weight over time among female but not male children up to 5 years of age. Given that the association was evident for patellar but not tibial lead levels, and was limited to females, results need to be confirmed in other studies.
	Vargas Garcia, G; Rubio Andrade, M; Del Razo, L, Borja Aburto, V; Vera Aguilar, E; Cebrian, M	2010	Lead Exposure in Children Living in a Smelter Community in Region Lagunera, Mexico	**Abstract:** Industrial growth has created the potential for environmental problems in Mexico, since attention to environmental controls and urban planning has lagged behind the pace of industrialization. The aim of this cross-sectional study was to assess lead exposure in children aged 6-9 yr attending 3 primary schools and living in the vicinity of the largest smelter complex in Mexico. One of the schools is located 650 m distant from a smelter complex that includes a lead smelter (close school); the second is located 1750 m away from the complex and at the side of a heavy traffic road (intermediate school) in Torreón, Coahuila. The third school is located in Gómez Palacio, Durango, 8100 m away from the smelter complex and distant from heavy vehicular traffic or industrial areas (remote school). Lead was measured in air, soil, dust, and well water. Lead in blood (PbB) was determined in 394 children attending the above-mentioned schools. Determinations were performed by atomic absorption spectrometry. Diet, socioeconomic status, hygienic habits, and other variables were assessed by questionnaire. Median (range) PbB values were 7.8 µg/dl (3.54-29.61) in the remote school, 21.8 µg/dl (8.37-52.08) in the intermediate school and 27.6 µg/dl (7.37-58.53) in children

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				attending the close school. The percentage of children with PbB >15 µg/dl was 6.8%, 84.9%, and 92.1% respectively. In this order, the geometric means (range) of Pb concentrations in air were 2.5 µg/m^3 (1.1-7.5), 5.8 µg/m^3 (4.3-8.5), and 6.1 µg/m^3 (1.6-14.9). The Pb concentrations in dust from playgrounds areas in the intermediate and close school settings ranged from 1457 to 4162.5 mg/kg. Pb concentrations in drinking water were less than 5 µg/L. Soil and dust ingestion and inhalation appear to be the main routes of exposure. Our results indicate that environmental contamination has resulted in an increased body burden of Pb, suggesting that children living in the vicinity of the smelter complex are at high risk for adverse effects of lead.
	Carrizales, Leticia; Razo, Israel; Tellez-Hernandez, Jesus; Torres-Nerio, Rocio; Torres, Arturo; Batres, Lilia; Cubillas, Ana-Cristina; Biaz-Barriga, Fernando	2006	Exposure to arsenic and lead of children living near a copper-smelter in San Luis Potosi, Mexico: Importance of soil contamination for exposure of children	**Abstract:** The objective of this study was to assess the levels of soil contamination and child exposure in areas next to a primary smelter (arsenic–copper metallurgical) located in the community of Morales in San Luis Potosi, Mexico. In Morales, 90% of the soil samples studied in this work were above 400 mg/kg of lead, and above 100 mg/kg of arsenic, which are guidelines recommended by the United States Environmental Protection Agency (EPA). Bioaccessibility of these metals was studied in vitro in 10 soil samples; the median values of bioaccessibility obtained in these samples were 46.5% and 32.5% for arsenic and lead. Since the concentrations of arsenic and lead in soil were above normal values, and taking into account the bioaccessibility results, exposure to these metals was evaluated in children. Regarding lead, children aged 3–6 years had the highest mean blood lead levels; furthermore, 90% of them had concentrations above 10 µg/dl (CDC's action level). Total urinary arsenic was higher in children aged 8–9 yr; however, the percentage of children with concentrations above 50 µg/g creatinine (CDC's action level) or 100 µg/g creatinine (World Health Organization [WHO] action level) was similar among different age groups. Using the EPAs integrated exposure uptake biokinetic model for lead in children (IEUBK), we estimated that 87% of the total lead in blood is obtained from the soil/dust pathway. The exposure dose to arsenic, estimated for the children living in Morales using Monte Carlo analysis and the arsenic concentrations found in soil, was above the EPA's reference dose. With all these results, it is evident that studies are needed in order to identify adverse health effects in

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				children living in Morales; nevertheless, it is more important to develop a risk reduction program as soon as possible.
	Hernandez, Isidra; Mendoza, Laura; Rojas, Rosalba; Gonzales, Carlos; Hulme, Jennifer; Olaiz, Gustavo	2003	Factors associated with lead exposure in Oaxaca, Mexico	**Abstract:** Lead intoxication risks were studied in a community of ceramic folk art workers in Oaxaca, a southern state of Mexico, where the manufacture of low-temperature lead ceramic ware is a family tradition and often the only source of income. Variables such as household characteristics, occupation, and lead exposure risk factors were explored. Study participants' mean blood lead concentration was 43.8 μg/dl (range=8.4–99.6 μg/dl), which is over the WHO guideline of 40 μg/dl for removing workers from exposure and is the concentration over which renal damage is accelerated. Best predictors for high blood lead concentrations by multivariable regression analysis were occupation (P<0.0001), gender (P=0.0002), and the use of glazed stoneware (P<0.0001). This model explained 18% of blood lead variation among the study group. Exposure appears to be primarily associated with antiquated pottery manufacturing techniques and the high degree of contamination prevailing at the production sites, which in most cases are their living quarters. This consequently affects the lead levels of the entire community.
	Hibbert, Robin; Bai, Zhipeng; Navia, Jaime; Kammen, Daniel; Zhang, Junfeng	1999	High lead exposures resulting from pottery production in a village in Michoacán State, Mexico	**Abstract:** This paper reports findings from a screening study conducted to examine potential lead (Pb) exposures in residents of a Mexican village where Pb oxide continues to be used in ceramic pottery production. Extremely high Pb concentrations were measured in personal and indoor air samples, household surface dust samples, and household soil samples. Personal air Pb concentrations for workers performing pottery firing and glazing were up to 454 µg/m 3. Results from indoor air samples indicate that airborne Pb concentrations were lower during nonglazing period compared to the glazing period. Soil Pb concentrations measured in 17 homes ranged from 0.39 to 19.8 mg/g. Dust Pb loading on surfaces of household items, hands, and clothes of a worker ranged from 172 to 33 060 µg/ft 2. Pb content as high as 2.4 µg/g was found in a bean stew cooked in a pot made in the village. Based on these Pb concentrations measured in multiple media and data adapted for exposure contact rates,

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				we have made rough estimates of Pb exposures via inhalation, soil/dust ingestion, and food ingestion. Estimated total daily Pb intake, on average, is 4.0 mg for adults and 3.4 mg for children living in the village. In the total daily intake, a greatest fraction may be contributed by food ingestion and another significant fraction may come from soil/dust ingestion for the children. Although the sample size is small, these measurements indicate a very significant public health problem for the village residents and a large number of other similar communities in Mexico. (It was estimated that there are approximately 1.5 million glaze potters.) The Pb exposure is implicated in a number of pervasive health problems in the region and is the cause for national and international attention. Several recommended solutions to this problem range from personal protection and behavioral changes to introduction of alternative glazes.
	Romieu, I; Palazuelos, E; Hernandez Avila, M; Rios, C; Muñoz, I; Jimenez, C; Gahero, G	1994	Sources of lead exposure in Mexico City	**Abstract:** Many countries, including Mexico, are facing a largely unrecognized epidemic of low-level lead poisoning. Mexico is the sixth largest lead-producing country in the world, and 40% of its production is used locally in different industrial processes that cause lead contamination of the environment. The major sources and pathways of lead exposure among the Mexican population are gasoline emissions, lead-glazed ceramics, leaded paint, and lead in canned foods and beverages. In this paper we present evidence for the presence of lead in different environmental media and its impact on blood lead levels of the Mexican population. Although during the last few years important measures have been implemented to decrease lead exposure, our findings suggest that lead poisoning is still an important problem in Mexico. There is an urgent need for regulatory policies that implement stricter control to protect the Mexican population. There is also a need to develop adequate programs to reduce the lead burden and the associated health effects in the population that has been chronically exposed.
	Jimenez, C; Romieu, I; Palazuelos, E; Muñoz, I; Cortes,	1993	Environmental exposure factors and the concentrations of blood lead in	**Abstract:** Risk factors that contribute to high blood lead concentrations were determined in 113 infants, aged 3 to 7 years old, that attended pediatric consultation at the American British Cowdray Hospital (ABC) from May 1991 to October 1992. The range of blood lead concentrations was 4 to 45 micrograms/dl, with an average value of 15.6 micrograms/dl

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	M; Rivero, A; Catalan, J		Mexico City children	(DE = 7.0), and a geometric mean of 14.2 micrograms/dl (IC 95% = 11.9-16.5). Seventy six percent of the children presented blood lead concentrations of over 10 micrograms/dl. The main predictors of blood lead levels were the use of glazed pottery for cooking rice (ANOVA, p = 0.0000) and the storage of food in glazed pottery (t-test, p = 0.005). There was a significant association between the use of glazed pottery for cooking rice and blood lead concentrations (tendency p = 0.000). The attributable risk of this population due to the use of glazed pottery was 81 per cent. This study sustains the need to develop and enforce public health policies for programs of lead poisoning prevention.
Lead and dietary determinants	Hernandez-Avila, M; Gonzalez, T; Palazuelos, E; Romieu, I; Aro, A; Fishbein, E; Peterson, K; Hu, H	1996	Dietary and environmental determinants of blood and bone lead levels in lactating postpartum women living in Mexico City.	**Abstract:** Despite the recent declines in environmental lead exposure in the United States and Mexico, the potential for delayed toxicity from bone lead stores remains a significant public health concern. Some evidence indicates that mobilization of lead from bone may be markedly enhanced during the increased bone turnover of pregnancy and lactation, resulting in lead exposure to the fetus and the breast-fed infant. We conducted a cross-sectional investigation of the interrelationships between environmental, dietary, and lifestyle histories, blood lead levels, and bone lead levels among 98 recently postpartum women living in Mexico City. Lead levels in the patella (representing trabecular bone) and tibia (representing cortical bone) were measured by K X-ray fluorescence (KXRF). Multivariate linear regression models showed that significant predictors of higher blood lead included a history of preparing or storing food in lead-glazed ceramic ware, lower milk consumption, and higher levels of lead in patella bone. A 34 micrograms/g increase in patella lead (from the medians of the lowest to the highest quartiles) was associated with an increase in blood lead of 2.4 micrograms/dl. Given the measurement error associated with KXRF and the extrapolation of lead burden from a single bone site, this contribution probably represents an underestimate of the influence of trabecular bone on blood lead. Significant predictors of bone lead in multivariate models included years living in Mexico City, lower consumption of high calcium content foods, and nonuse of calcium supplements for the patella and years living in Mexico City, older age, and lower calcium intake for tibia bone. Low

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				consumption of milk and cheese, as compared to the highest consumption category (every day), was associated with an increase in tibia bone lead of 9.7 micrograms Pb/g bone mineral. The findings of this cross-sectional study suggest that patella bone is a significant contributor to blood lead during lactation and that consumption of high calcium content foods may protect against the accumulation of lead in bone.
Lead in candy	Tamayo, Marcela; Tellez, Marth; Hu, Howard; Hernandez-Avila, Mauricio; Wright, Robert; Amarasiriwardena, Chitra; Lupoli, Nicola; Mercado, Adriana; Pantic, Ivan; Lamadrid, Hector	2016	Lead in candy consumed and blood lead levels of children living in Mexico City	**Background:** Recent studies have shown that lead exposure continues to pose a health risk in Mexico. Children are a vulnerable population for lead effects and Mexican candy has been found to be a source of exposure in children. There are no previous studies that estimates lead concentrations in candy that children living in Mexico City consume and its association with their blood lead level. **Objectives:** To evaluate whether there is an association between reported recent consumption of candies identified to have lead, and blood lead levels among children in Mexico City. **Methods:** A subsample of 171 children ages 2–6 years old, from the Early Life Exposure in Mexico to Environmental Toxicants (ELEMENT) cohort study was assessed between June 2006 and July 2007. The candy reported most frequently were analyzed for lead using ICP-MS. The total weekly intake of lead through the consumption of candy in the previous week was calculated. Capillary blood lead levels (BLL) were measured using LeadCare (anodic stripping voltammetry). **Results**: Lead concentrations ≥0.1 ppm, the FDA permitted level (range: 0.13–0.7 ppm) were found in 6 samples out of 138 samples from 44 different brands of candy. Median BLL in children was 4.5 µg/dl. After adjusting for child's sex, age, BMI, maternal education & occupation, milk consumption, sucking the candy wrapper, use of lead-glazed pottery, child exposure behavior, living near a lead exposure site and use of folk remedies, an increase of 1 µg of lead ingested through candy per week was associated with 3% change (95% CI: 0.1%, 5.2%) in BLL. **Conclusions:** Although lead concentrations in candy were mostly below the FDA permitted level, high lead concentrations were detected in 4% of

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				the candy samples and 12% of brands analyzed. Although candy intake was modestly associated with children's BLL, lead should not be found in consumer products, especially in candy that children can consume due to the well documented long-lasting effect of lead exposure.
Lead in dietary supplements	Garcia, Leticia; Leyva-Perez, Johanna, Jara-Marini, Martin	2007	Content and daily intake of copper, zinc, lead, cadmium, and mercury from dietary supplements in Mexico	**Abstract:** This study investigates the presence of Cu, Zn, Cd, Pb, and Hg in 24 dietary supplements purchased in different health stores across the city of Hermosillo, located in the northwest of Mexico. Analysis of metals was done by microwave digestion and atomic absorption spectroscopy. The most abundant elements in dietary supplements were Cu (<0.19–137.85 μg/g) and Zn (<2.83–4785.71 μg/g), followed by Pb (<0.003–66.32 μg/g), Cd (<0.001–2.90 μg/g), and Hg (<0.24–0.85 μg/g). The estimated daily intakes of metals were below those recommended by WHO and the Institute of Medicine, showing that little risk from heavy metals is associated with the consumption of the dietary supplements analyzed. However, some products presented more than 10% of the tolerable daily intake of Pb, indicating that production processes should be improved.
Lead in saliva	Gonzales, M; Banderas, J.A.; Baez, A.; Belmont, R.	1997	Salivary lead and cadmium in a young population residing in Mexico City	**Abstract:** Mexico City has a very high pollution index. Based on the view 'that salivary monitoring can be extended to environmental pollutants', we performed this study in order to determine not only the concentrations of lead and cadmium in human saliva, but also to establish their possible association with some socio-demographic factors. One hundred dental students from the National Autonomous University of Mexico living in Mexico City participated m the study. Stimulated human whole saliva samples were analyzed by atomic absorption spectroscopy. From this study it can be concluded that saliva has potential as a technique for monitoring ambient pollutants recent exposure, since circulating levels of certain polluting chemicals can be transported into salivary glands and secretions.
Lead in schoolchildren	Farias, Paulina; Álamo-Hernández, Urinda; Mancilla-Sánchez, Leonardo;	2014	Lead in School Children from Morelos, Mexico: Levels, Sources and	**Background:** Lead is a pervasive pollutant, associated at low levels to many adverse health effects. **Objective:** To investigate lead levels, exposure pathways and intervention possibilities in school children from Alpuyeca, in Morelos, Mexico.

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	Sangrador, José Luis; Carrizales-Yaez, Leticia; Riojas-Rodriguez, Horacio		Feasible Interventions	**Methods:** Blood lead concentrations (BPb) were measured in 226 children in 2011. Exposure pathways were assessed through a questionnaire, lead measurements in different environmental matrices and spatial aggregation analysis of lead concentrations. **Results:** BPb ranged from 1.5 to 36.5 µg/dL, with a mean (SD) of 7.23 (4.9) µg/dL. Sixty-four and 18% of the children had BPb > 5 µg/dL and > 10 µg/dL, respectively. The use of lead glazed ceramics was reported in almost half of the households; it was the main BPb determinant and it was associated with an increased risk of having BPb > 5 g/dL by 2.7 times (p = 0.001). Environmental samples were within US EPA's lead recommended limits, and blood lead levels were randomly distributed in the community. **Conclusions:** Lead remains a public health problem in Alpuyeca, Mexico. Unlike other local pollutants, lead exposure prevention can be achieved inexpensively and in a short term. Interventions should make mothers aware of lead's health effects and empower them to safeguard their children's health by avoiding the culturally ingrained use of lead glazed pottery.

F. Blood testing in National Health Surveys

National Health Survey	Non-Communicable Diseases Risk-Factors Surveillance	Source
Purpose	To establish general mechanisms and procedures that allow the generation, availability, access and use of accurate, timely, pertinent, relevant and cost-effective information complementary to that of information systems, which requires to be collected through surveys and that is necessary for the planning, monitoring, and evaluation of health	Encuesta Nacional de Salud y Nutrición de Medio Camino (National Health Survey and Nutrition), Final Report, Mexican Government

	policies, strategies, programs, and activities in different spheres and levels of public administration.	
Sample size	9,474 households; random 29,795 individuals of the following age groups: 5-11 (school age), 12-19 (teenagers), 20+ (adults)	
Blood sample testing	Blood taken to determine different parameters of interest and study the magnitude, distribution and trends of overweight and obesity, high blood pressure and diabetes.	
Latest round	2016	
Next round	2021	