Children's Health and the Environment in North America

A First Report on Available Indicators and Measures

Country Report: Mexico

Prepared by Mexico's Secretariat of Health

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Executive Summary

More than 40 percent of Mexico's total population in the year 2002 (nearly 44 million people) was under the age of 19 and the general mortality rate was five per 1,000 inhabitants. The birth rate per 1,000 inhabitants has declined from 45 in 1960 to 17 in 2000 and Mexico's life expectancy has increased progressively, jumping 25 years between 1950 and 2000.

As a result, Mexico's population has shifted demographically from a pyramidal outline whose broadest area corresponded to the child population (0–14 years old) to an elongated pyramid, the broad area of which encompasses both the child population and that of adults between 20 and 30 years of age. The infant mortality rate in the first year of life, per 1,000 inhabitants, decreased from 19.1 in 1998 to 16.78 in 2002.

Although there are various possible reasons for this demographic shift, rising levels of education among women in recent decades is surely a factor. The total female population with primary education has increased from 18.0 to 20.2 percent between 1970 and 2000. In the same period, the [percent of the] female population at all education levels has increased, with the greatest increase seen in post-secondary and higher education (4.9 to 26.3 percent). Data show that birth rates among women of reproductive age (from 15 to 44 years of age) decrease as education levels and age increase.

In addition, from 2000, national coverage with the triple viral vaccine (measles, mumps and rubella) has remained above 95 percent. Progress in the National Vaccination Program (*Programa Nacional de Vacunación*) since 1992, as well as its sustained increase, is reflected in the decreased rates of morbidity and mortality from diseases preventable by vaccination.

With the shift to a gradually aging population, the primary causes of death have changed radically as well, especially per age group. Transmissible diseases and reproduction-related problems, which had been the leading causes of death, were replaced by non-transmissible diseases and injury.

In 2002, the leading causes of death in the population under 19 were, in the first years of life, perinatal conditions, congenital malformations, influenza and pneumonia; and in adolescence, accidents, intestinal infections, intentional injuries and cancer. The main causes of morbidity for the same age groups in that year were acute respiratory infections, undefined intestinal infections, intestinal amoebiasis, and urinary tract infections.

Diarrheic illnesses persist as a serious problem among the child population. These diseases are transmitted by contaminated food and by drinking water. Data from 2003 indicate that 95 percent of drinking water is disinfected, although in that year, 17 percent of the population did not have water of appropriate bacteriological quality. Although national sewer system coverage and access to drinking water have increased significantly over the last 20 years, in 2000, one of every four inhabitants lacked sewer system access and one in ten lacked household potable water. In rural areas, the lack of access to both services continues to be a major problem.

Due to specific health service actions and educational and basic sanitation activities, cases of giardiasis and cholera have decreased in the various age groups. For example, there have been no cholera deaths since 1998.

Common infections and reproductive illnesses continue to cause significant harm to health in highly marginalized groups. There are states in southern Mexico in which the mortality rates from such causes are ten times higher than those of the more developed northern states. The same occurs with deaths from acute respiratory infections. These respiratory infections and asthma are most closely related with air pollution in rural and urban areas alike. Over the last ten years, ARI

deaths among children younger than five decreased by 60 percent, while morbidity from acute respiratory infections and asthma has increased.

Recent studies have looked at the health effects of exposure to outdoor air pollution. Some studies conducted in Mexico City show a close correlation between air pollution and lung disease, pulmonary aging processes and respiratory infections. Ground-level ozone and PM_{10} (particulate matter less than 10 micrometers in diameter [respirable particles]) are among the most worrisome air pollutants due to their potential health effects and the frequency with which their ambient levels exceed the air quality standards established to protect human health.

Indoor air pollution caused by wood or coal burning for cooking or heating represents a public health problem for children under five and women of reproductive age, especially in the country's marginalized areas. In the year 2000, 18 percent of Mexico's total population continued to use such methods for home heating.

Involuntary exposure to tobacco smoke is the cause of several illnesses, such as lung cancer and other respiratory diseases. Children exposed to tobacco smoke face a greater risk of disease, particularly in their early years, due to the immaturity of their immune systems. In 2002, there was a 36 percent national prevalence of passive smokers of 12 to 65 years of age, with the majority in urban areas. Mexico does not have the corresponding information on younger groups.

The primary source for environmental exposure to lead in Mexico is the manufacture of glazed ceramic pottery and its use in food preparation and storage. Several studies conducted among urban populations, especially with school-age children and women of reproductive age, point to a significant link between high concentrations of lead in blood and the use of glazed pottery for cooking and serving food and beverages.

Given the lack of a representative value of blood lead levels in the general population, but rather only isolated studies in industrial zones and certain pottery-making regions, two Mexican case studies are presented in this report. The first study refers to metallurgical activities in the northern region, while the second shows the impact of specific actions to reduce atmospheric lead emissions in Mexico City. Mexico's pollutant release and transfer register is in the process of being developed, and therefore the respective information is not currently available.

Mexico does not adequately record chemical poisoning. The Centralized Automated Epidemiological Oversight System (*Sistema Único Automatizado de Vigilancia Epidemiológica*) at the Secretariat of Health (*Secretaría de Salud*) records pesticide poisonings caused by occupational exposures, household accidents or suicide attempts among children under the age of 15. Poisonings of children under that age are mostly due to accidental causes. Significant under-recording is possible, which might have to due to problems in the reporting procedures. Notwithstanding the above, cases of pesticide poisoning decreased from 1998 to 2002.

Poverty remains a problem for Mexican society, however, as households with per capita income below that required to satisfy basic food needs represented 18.6 percent in the year 2000. For nearly half of all households (45.9 percent), per capita income was below that required to satisfy basic food needs plus basic health, education, clothing, footwear, housing and public transportation needs.

1 Introduction

General health conditions in Mexico have improved considerably over the last 50 years. This is clearly seen in life expectancy at birth. Between 1950 and 2000, the country added 25 years to this indicator. However, the respective differences among the states show the inequality prevailing in the country.

The differences found per region are an important fact to consider in understanding the Mexican situation. In the modern and industrialized northern region, the population is concentrated mostly in urban zones. The southern region is clearly traditional, unindustrialized and with a high indigenous population living in small, dispersed rural communities. This explains why the health indicators for the northern region are similar to those of developed countries, while the same indicators for the southern region are similar to those of developing countries with social and economic problems.

In 2002, there were 43,719,756 persons under 19 years of age in Mexico, representing just over 40 percent of the total population. The birth rate per 1,000 inhabitants has decreased from 45 in 1960 to 17 in 2000, while the child mortality rate in the first year of life decreased from 19.1 per 1,000 inhabitants in 1998 to 16.78 per 1,000 inhabitants in 2002. The leading causes of death also changed radically over the past 50 years. Transmissible diseases and congenital illnesses were displaced as the primary causes of death by non-transmissible diseases and injuries. In the same period, the percentage of deaths due to intestinal infections decreased by a factor of 14 (from 14.3 percent to 1 percent), while deaths from heart disease quadrupled (from 4 percent to 16 percent).

Another fact pointing to a clear epidemiological transition in the country is the changing pattern of causes of mortality among children under one year of age. Previously, infant deaths were concentrated in the postnatal period (between one month and one year of age), mostly caused by acute respiratory infections and diarrhea. Presently, infant deaths are concentrated in the first 28 days of life, due to perinatal causes and congenital anomalies requiring high-technology intervention.

Common infections and congenital events continue to cause major harm to health in highly marginalized groups. Over the last 10 years, deaths from diarrhea in children under five years of age have decreased by 85 percent. However, there are southern states with mortality rates from diarrhea above 40 per 100,000 inhabitants under five years of age, *i.e.*, five times higher than the rates found in the more developed northern states. The same is found with deaths from acute respiratory infections, another clear example of the persistently lower quality of life.

Despite the major progress in health systems, the problems of poverty, social inequality, marginalization, the lack of services, and environmental air, water and soil pollution constitute important factors associated with a poor quality of life for a high percentage of the child population, primarily in the country's rural areas.

Air pollution is a generalized problem in Mexico's major metropolitan areas. However, current demographic growth, industrial concentration, greater numbers of vehicles, increased fuel consumption and inadequate urban mobility patterns have caused the problem to increase in other areas, such as medium-size cities.

Ground-level ozone and PM_{10} [airborne particles less than 10 microns in diameter] are air pollutants of concern given their potential health effects and the frequency with which they exceed the air quality standards for health protection. In the Mexico City Metropolitan Area, the ground-level ozone standard is exceeded during 80 percent of the year, while the air quality standard for PM_{10} is exceeded during 30 percent of the year in certain metropolitan areas.

Indoor air pollution caused by the burning of wood or charcoal used for cooking or heating constitutes a public health problem with repercussions for the population under five years of age and women of reproductive age, especially in the country's marginalized areas. In 1990, one of every three Mexicans (91 percent of rural inhabitants and 11 percent of urban inhabitants) used wood for cooking. In 1993, 25.6 million persons were estimated to use wood as household fuel, decreasing to 17.2 million inhabitants in 2000.

Since 1988, with the first National Addictions Survey (*Encuesta Nacional de Adicciones*, applied throughout the country for persons in urban areas between 12 and 65 years of age), Mexico has begun to have an epidemiological oversight of tobacco addiction. This national survey has been conducted every five years (with the last such survey in 2002), which has enabled a detailed observation of the epidemic's trends, which include stable use figures, a lower average starting age, increased use by minors, and increased use by women.

As regards passive smokers, Mexico does not have specific information for child groups. However, the national index of passive smokers in the urban population is 36.1 percent, while the index for the rural population is 26.2 percent. The greatest [regional] involuntary exposure to tobacco smoke is found in the northern region, with 31.9 percent.

In 2002, the prevalence of asthma in Mexican children under one year of age was 35 per 10,000 inhabitants, while the rate for children between one and four years of age was 63 and the rate for children between 5 and 14 years of age was 35. Inhabitants of the coastal states were found to have a higher number of cases, probably due to the relative environmental humidity or perhaps because these regions have greater usage of air conditioning systems. These systems are known to keep a considerable amount of dust and fungus, which can set off asthma attacks.

The main cause of environmental exposure to lead in Mexico derives from the manufacture of glazed pottery with lead oxide glazes and the use of these vessels in food preparation. Artisanal pottery making is carried on in 20 Mexican states by approximately five million potters, many of whom are members of indigenous groups. Most pottery workshops are family businesses, employing all family members between 7 and 70 years of age. Each person participates in some part of the pottery production process, using techniques inherited over the generations and employing no personal protection whatsoever. This activity constitutes the main source of exposure for the child population.

Mexico lacks data on representative blood lead levels in the general population. Mexican authorities have data from isolated studies undertaken in industrial areas and in certain pottery-making regions. In lieu of this, a case study is presented on lead poisoning in the population of children in a northern Mexican community, caused by a mining-metallurgical company. .

As regards pesticide poisoning, only partial information is available: in Mexico, only acute cases are reported, without identifying the type of pesticide involved. Cases of poisoning among children under 15 years of age dropped from 1,335 in 1999 to 672 in 2002. However, a ratio of 1:5 underreporting is estimated, *i.e.*, for every reported case there are five cases not reported.

At present, Mexico lacks pollutant release and transfer register data because up until the present time, such information requested of businesses has been voluntary. However, current legislation has been enacted that now requires businesses to report their pollutant releases and transfers.

The leading environmental and public health problems faced by Mexico include deficient basic sanitation and poor water quality (not to mention the insufficient availability of water for a numerous and growing human population).

In countries such as Mexico, diarrheic illnesses persist as a serious problem among the child population. These diseases, caused by bacteria, viruses and protozoan pathogens dispersed

through the fecal-oral route, may be transmitted in water used for various household activities, including personal hygiene, and from contact with contaminated recreational water.

In recent years, the principal emphasis in reducing mortality among children under five years of age has been on lowering the incidence of diarrheic illness. As a result, the rate of such illnesses in children under five years of age has decreased from 125.6 per 100,000 in 1990 to 20 in 2002.

Water purification oversight has been undertaken with the periodic and ongoing monitoring of free residual chlorine in the distribution network. Despite the increased availability of chlorinated water in the country, the rate of sewer system coverage is below the average for Latin America, the Caribbean or North America. National sewer system coverage has increased 27 percent in 20 years (from 49 percent to 76 percent, in accordance with the 1980 and 2000 censuses, respectively). The lack of access to such service is particularly notable in rural areas, however, especially in southeastern Mexico. Drinking water coverage is 95 percent in urban areas and 68 percent in rural zones.

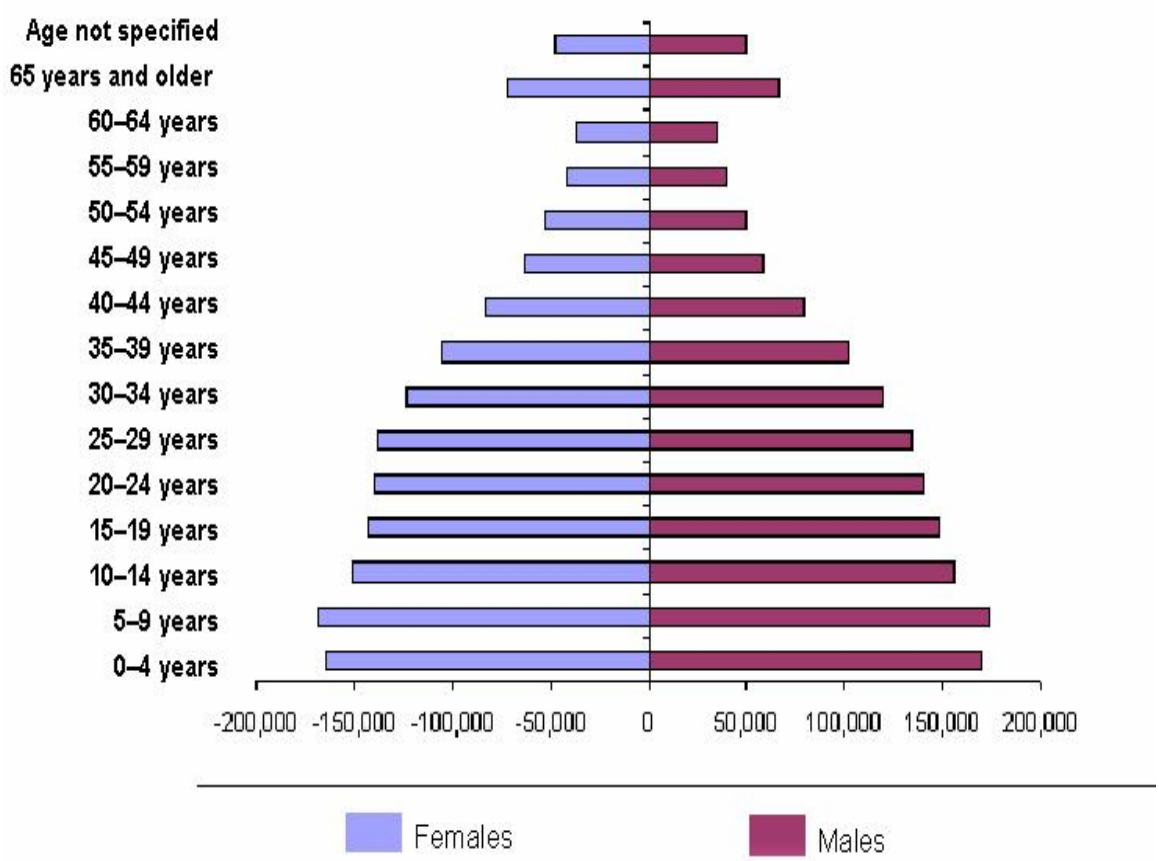
The presence of giardiasis has decreased in the different age groups, as have cases of cholera (from which no deaths have been reported since 1998). This is fundamentally due to specific actions in healthcare and other sectors, particularly education and basic sanitation.

1.1 Indicators of Children's Health in Mexico

1.1.1 Overview of Population Demographics

Mexico's total population in 2002 numbered 103,039,964, of whom 43.7 million were children of 19 years of age or less, representing 42.4 percent. Ten percent were children at or below 4 years of age, according to the 2000–2050 Mexican Population Projection (*Proyección de la población de México*) of the National Population Council (*Consejo Nacional de Población*—Conapo), released in 2002. Furthermore, from 1970, when it had an enlarged population pyramid in the area corresponding to the child population (0 to 14 years old), in 2000 Mexico became a nation with an enlarged population pyramid for both the child population and the population between 20 and 30 years of age (see Figure 1.1).

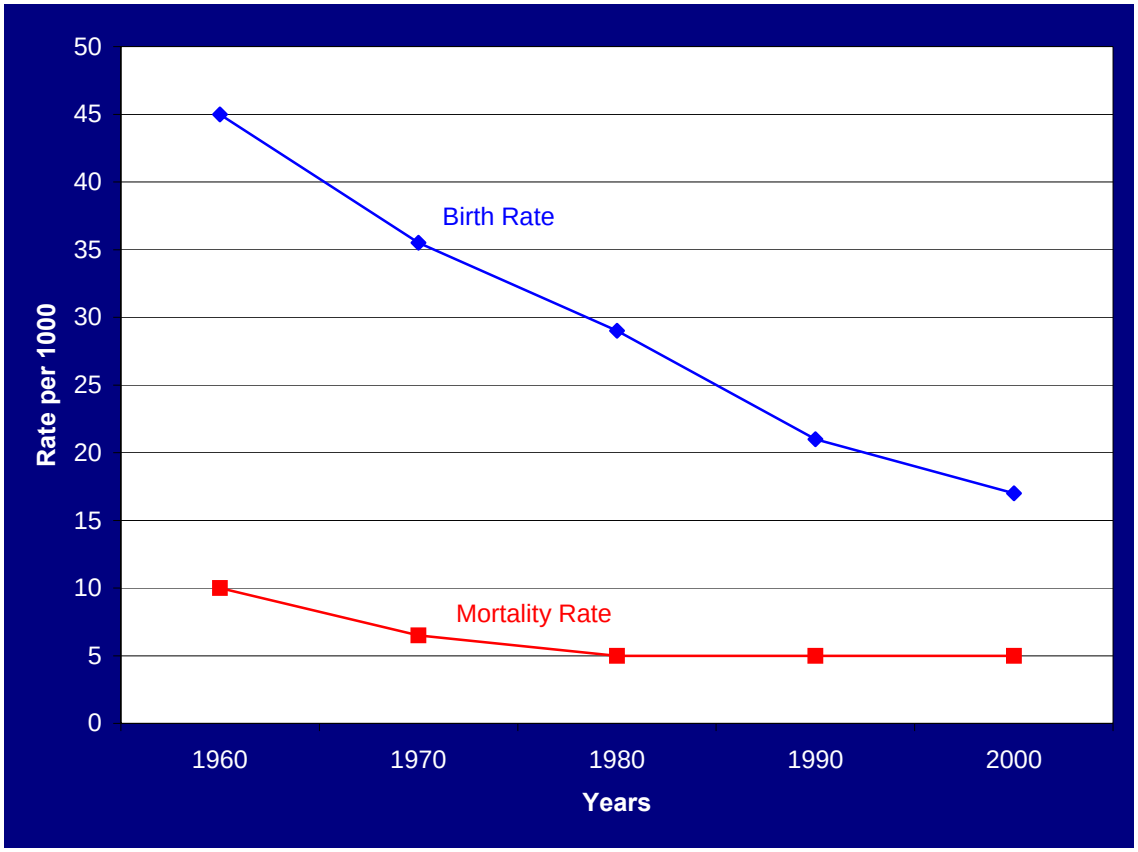
Figure 1.1: Population Pyramid of Mexico, 2000



Source: CIES, based on XII General Census of Population and Housing (*Censo General de Población y Vivienda XII, 2000)* INEGI 2000.

In Mexico, the birth rate in 1960 was 45 per 1,000 inhabitants, decreasing to 17 in 2000. The greatest decrease occurred in the decade from 1960 to 1970. The overall mortality rate decreased from 10 per 1,000 inhabitants to 5 in 2000 (see Figure 1.2).

Figure 1.2: Evolution of Birth and Mortality Rates in Mexico, 1960–2000



Source: Conapo.

In 2002, Mexico's life expectancy at birth was 74.62 years. The average life expectancy for women was 77.1, while men's' life expectancy was 72.1 years of age. Between 1950 and 2000, the country added 25 years to this indicator.

1.1.2 Child Mortality and Morbidity

The child mortality rate in the first year of life, per 1,000 inhabitants, decreased from 19.1 in 1998 to 16.78 in 2002. In 2002, the three main causes of death in children under one year of age were conditions originating in the perinatal stage; congenital malformations, deformities and chromosomal anomalies; and influenza and pneumonia. For the population between 1 and 4 years of age, the main causes of death were accidents; congenital malformations, deformities and chromosomal anomalies; and intestinal infectious diseases. In the case of the 5–9 and 10–14 age groups, the three main causes of death were accidents; cancer; and congenital malformations, deformities and chromosomal anomalies. Lastly, in the 15 to 19-year-old age group, the leading causes of death were accidents; intentional injuries; and cancer, in that order.

In 2002, the two main causes of morbidity in all population groups between 1 and 19 years of age were acute respiratory infections and undefined intestinal infections. The third cause of illness was intestinal amoebiasis for the population under four years of age, and acute urinary infection for the other age groups.

1.1.3 Socioeconomic Information and Other Determinants of Health

Maternal Education

Women's levels of education have increased substantially in recent decades. In 1970, women without education represented 35.0 percent of the overall female population; this percentage had decreased consistently to 11.8 percent by the year 2000. During the same period, the proportion of the female population that had completed primary education[1] increased from 18.0 percent to 20.2 percent. That which had completed secondary education[2] increased from only 2.2 percent to 18.5 percent in 2000, while the population with postsecondary[3] or bachelors degrees and other higher education[4] increased from 4.9 percent to 26.3 percent in the period.

According to the 1996 Mexican Fertility Survey (*Encuesta Mexicana de Fecundidad*), specific fertility rates per 1,000 women of reproductive age between 15 and 44 years old decreased as women's education rates and ages increased. The highest fertility rate among all age groups was found at the lowest education levels.

Poverty

As regards the food/poverty threshold (homes with per capita income below the requirements to satisfy basic food needs, equivalent to 15.4 and 20.9 pesos per day in rural and urban areas), in 2000, 18.6 percent of Mexican households and 24.2 percent of the total population had incomes below these levels.[5] The proportion of children lacking sufficient food, compared to the total number of children under 18 years of age, decreased from 32.7 percent in 2000 to 27.4 percent in 2003.

Lastly, the economic poverty threshold for 2000 (households with per capita income below the requirements to satisfy basic food needs and basic health, education, clothing, footwear, housing and public transportation needs) was calculated at 28.1 and 41.8 pesos per day per person in rural and urban areas, respectively. In the year 2000, 45.9 percent of Mexican households and 53.7 percent of the total population had incomes below these levels. In the same year, the proportion of children in economic poverty, compared to all children under 18 years of age, was 63.9 percent, with a minimal decrease to 62.7 percent for 2002.

Vaccination coverage

Rates of the vaccinations performed by the state health systems measure the immunization coverage among children less than one year old. The most important component in the basic vaccination plan for these children is the coverage attained with the triple viral vaccine (measles, mumps and rubella). Since 2000, national coverage rates with this vaccine have remained steady, at above 95 percent.

Sustained progress in the National Vaccination Program (*Programa Nacional de Vacunación*) since 1992 is reflected in the decreased rates of morbidity and mortality from diseases preventable by vaccination.

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[1] Primary: first official level of education, lasting six years. Education statistics come from http://biblioteca.itam.mx/docs/infogob02 on page 121.

[2] Secondary: second official level of education, lasting three years.

[3] Postsecondary: from the tenth through the thirteenth grades.

[4] Higher education: from the fourteenth grade and higher.

[5] With respect to the capability/poverty threshold (referring to households with per capita income below the requirements necessary to satisfy food needs in addition to the income required to assume education and health expenses), this level was calculated at 18.9 and 24.7 pesos per day per person in rural and urban areas, respectively, for 2000. In that year, 25.3% of households and 31.9% of the total Mexican population had incomes below these amounts. In that same year, the proportion of children under 18 years of age in capability poverty, with respect to the total number of children in the same age group, was 41.6%. By 2002, the proportion had decreased to 35.1%.

2 Asthma and Respiratory Disease

Air pollution is a widespread problem in the large metropolitan areas of Mexico. Due to ongoing demographic growth, industrial concentration, increasing numbers of motor vehicles, high fuel consumption, and inadequate urban mobility patterns, this problem is beginning to be felt in other areas, such as mid-sized cities.

In Mexico, standards exist for the following air pollutants: sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), total suspended particles (TSP), particles smaller than 10 microns in diameter (PM_{10}), and lead (Pb). These pollutants are called "criteria pollutants" and there is an air quality standard for each of them. The air quality standards establish the ambient pollutant concentrations that may not be exceeded more than once a year in the interests of guaranteeing adequate protection of public health.

In Mexico as in other countries, easy-to-understand pollution indicators have been developed. Mexico uses the Metropolitan Air Quality Indicator (*Indice Metropolitano de la Calidad del Aire*—Imeca), according to which the concentration set out in the air quality standard for each pollutant corresponds to an Imeca value of 100. The applicable air quality standards were published by the Secretariat of Health and are developed by it in coordination with the Secretariat of the Environment and Natural Resources (*Secretaría del Medio Ambiente y Recursos Naturales*—Semarnat), with the participation of academics, environmentalists, and industry representatives.

In general, air pollution in Mexico has declined considerably in urban areas in the last ten years, including in Mexico City. This is undoubtedly due to the implementation and monitoring of a series of measures to improve the environment by decreasing pollutant emissions, including:

- Switching from fuel oil to natural gas for a proportion of electricity production; the share of natural gas in the total primary energy supply rose to 21 percent, while the share of petroleum dropped to 62 percent.
- Seven large metropolitan areas have adopted local air quality management programs aiming to counter pollution from industry, the service and transportation sectors, as well as environmental recovery.
- Fuel quality improvement has been the cornerstone of these programs. The reduction of lead and sulfur content in motor vehicle fuels has helped to reduce certain mobile source emissions.
- A regional surcharge has been applied to gasoline with the objective of financing measures to improve the environment of the Valley of Mexico City Metropolitan Zone (MCMZ, *Zona Metropolitana del Valle de México*—ZMVM) and internalize environmental externalities.
- In addition, Mexican Official Standards have been established for CO, NO_x and motor vehicle hydrocarbon emissions.
- Vehicles with catalytic converters replaced after five years of operation, clean industrial facilities, and facilities using natural gas were exempted from the air quality contingency plans by recent regulations.
- The number of companies voluntarily carrying out environmental audits has grown constantly. Significant progress has been achieved on the implementation of the OECD recommendations concerning the Pollutant Release and Transfer Register.

2.1 Outdoor Air Pollution

Despite air quality improvement measures, exposure to air pollution continues to be a severe threat to public health.

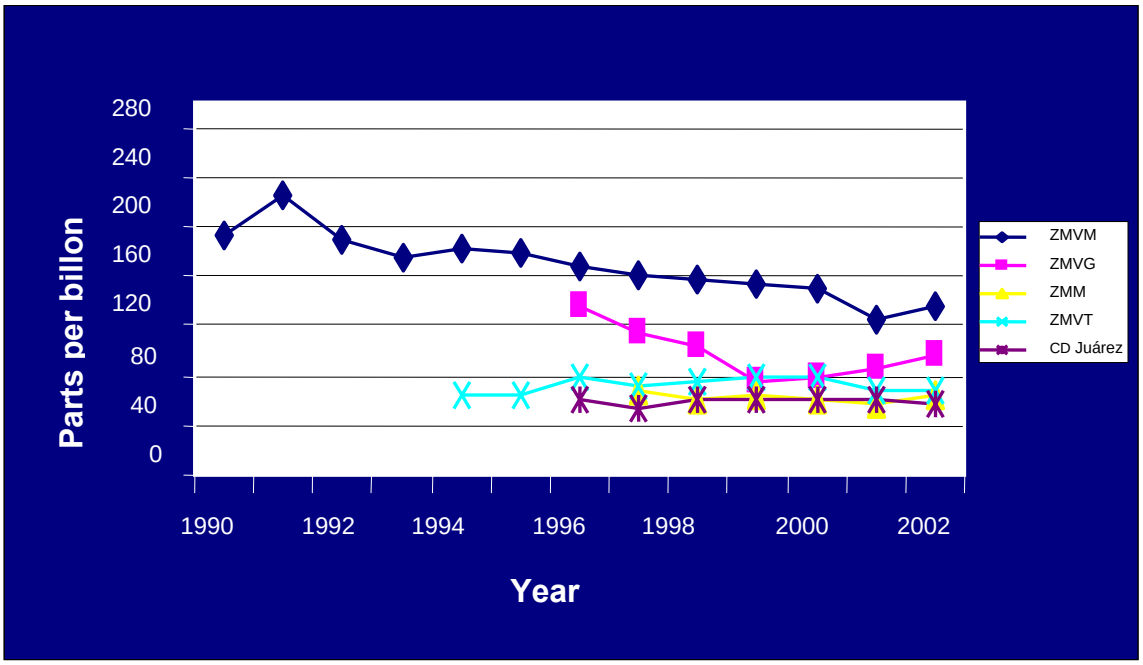
Figure 2.1 shows the peak levels of ground-level ozone for five major urban air monitoring zones. The Valley of Mexico City Metropolitan Zone (*Zona Metropolitana del Valle de México*—ZMVM) registered the highest levels during the whole reporting period. Lowest levels were reported by the metropolitan zones of Monterrey (ZMM) and Ciudad Juárez (CD Juárez).

Figure 2.2 shows the annual mean levels for PM_{10} in five major urban air monitoring zones. The highest levels were observed in ZMM and CD Juárez. The annual average Mexican norm for PM_{10} is 50 µg/m^3. [NORMA OFICIAL MEXICANA NOM-025-SSA1-1993. "SALUD AMBIENTAL. CRITERIO PARA EVALUAR LA CALIDAD DEL AIRE AMBIENTE, CON RESPECTO A LAS PARTICULAS MENORES DE 10 MICRAS (PM10). VALOR PERMISIBLE PARA LA CONCENTRACION DE PARTICULAS MENORES DE 10 MICRAS (PM10) EN EL AIRE AMBIENTE, COMO MEDIDA DE PROTECCION A LA SALUD DE LA POBLACION."]

Suspended particles are a significant concern, with 30 percent of the days per year in exceedance days of the PM_{10} standard in certain metropolitan areas; the other pollutant of particular concern is ground-level ozone, for which exceedance is 80 percent in the ZMVM.

Given the number and percentage of air quality exceedance days indicated in national monitoring systems' monthly reports, air pollution continues to be a serious problem in both the ZMVM and the Guadalajara Metropolitan Zone (*Zona Metropolitana de Guadalajara*—ZMG), while in the Toluca Valley Metropolitan Zone (*Zona Metropolitana del Valle de Toluca*—ZMVT) and the Monterrey Metropolitan Zone (*Zona Metropolitana de Monterrey*—ZMM) the problem is less severe. The situation in Mexicali is also worrisome as regards PM_{10} and CO levels (see Figure 2.3).

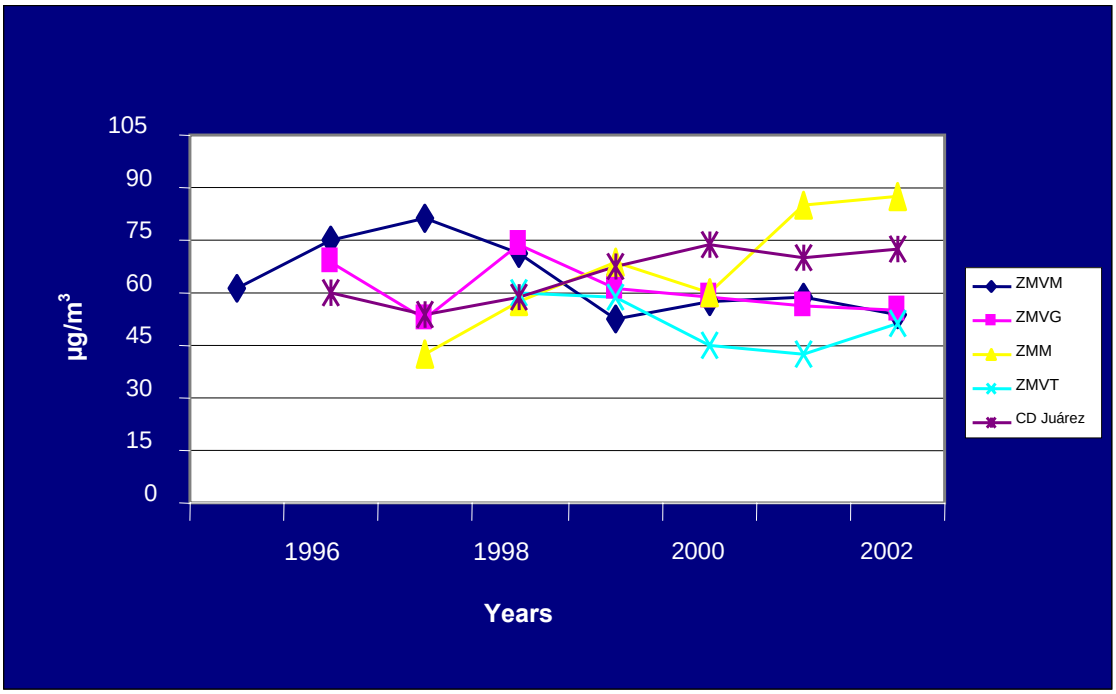
Figure 2.1: Peak Levels of Ground-level Ozone for Five Mexican Urban Air Monitoring Zones, 1990–2002



Source: *Segundo almanaque de datos y tendencias de la calidad del aire en seis ciudades Mexicanas.* (Second Almanac of Data and Air Quality Trends in Six Mexican Cities) *Secretaría del Medio Ambiente y Recursos Naturales* (Semarnat). *Instituto Nacional de Ecología* (INE). 2004 <http://www.ine.gob.mx/publicaciones/descarga.html?cv_pub=419>.

Note: ZMVM = Valley of Mexico City Metropolitan Zone, ZMVG = Valley of Guadalajara Metropolitan Zone, ZMM = Monterrey Metropolitan Zone, ZMVT = Valley of Toluca Metropolitan Zone, CD Juárez = Ciudad Juárez

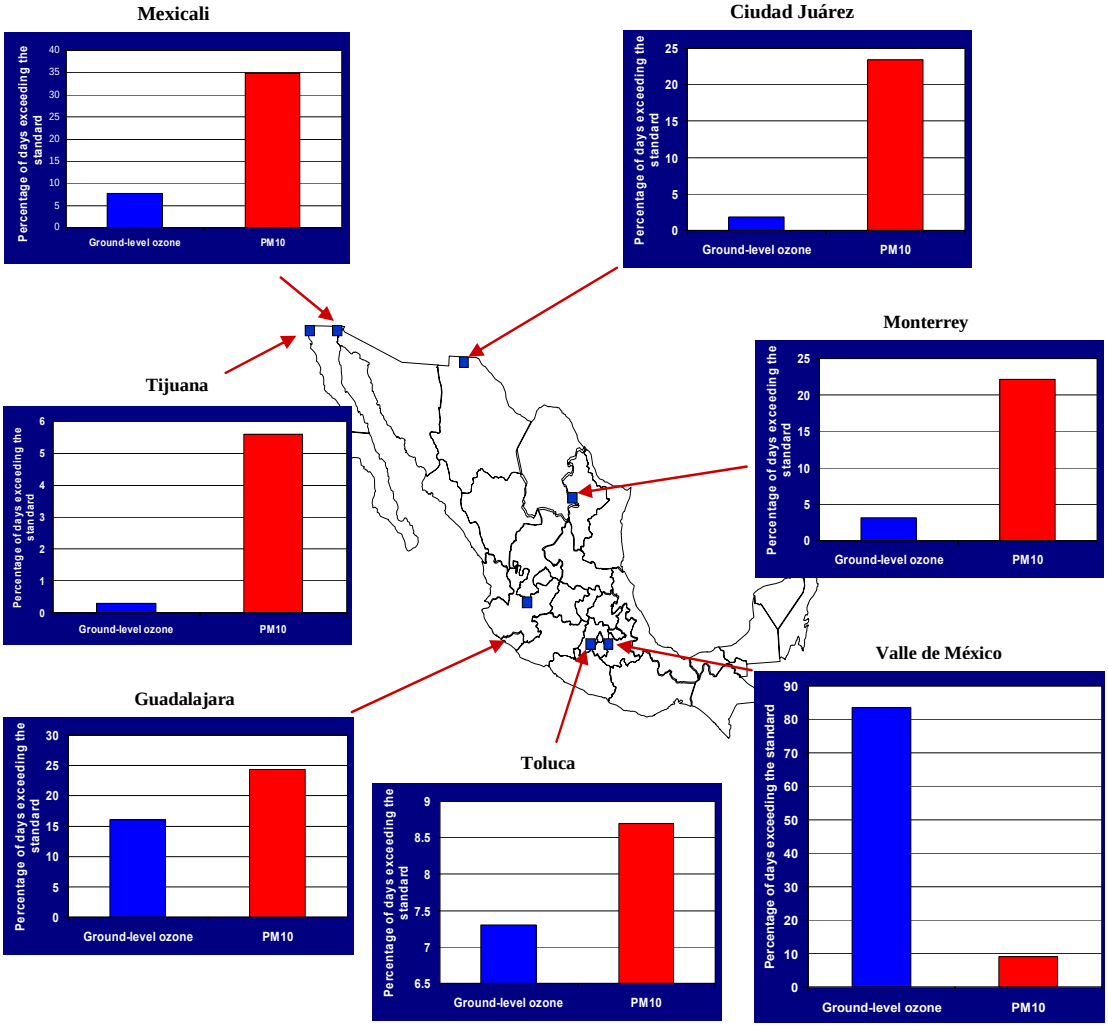
Figure 2.2: Annual Mean Levels of Particulate Matter (PM_{10}) for Five Mexican Urban Air Monitoring Zones, 1995–2002



Source: *Segundo almanaque de datos y tendencias de la calidad del aire en seis ciudades Mexicanas. Secretaría del Medio Ambiente y Recursos Naturales* (Semarnat). *Instituto Nacional de Ecología* (INE). 2004 <http://www.ine.gob.mx/publicaciones/descarga.html?cv_pub=419>.

Note: ZMVM = Valley of Mexico City Metropolitan Zone, ZMVG = Valley of Guadalajara Metropolitan Zone, ZMM = Monterrey Metropolitan Zone, ZMVT = Valley of Toluca Metropolitan Zone, CD Juárez = Ciudad Juárez

Figure 2.3: Metropolitan Areas in Mexico with Air Quality Programs Including Air Monitoring, 1999–2002*



Source: *Segundo almanaque de datos y tendencias de la calidad del aire en seis ciudades Mexicanas. Secretaria del Medio Ambiente y Recursos Naturales* (Semarnat). *Instituto Nacional de Ecología* (INE). 2004 <http://www.ine.gob.mx/publicaciones/descarga.html?cv_pub=419>.

Note: *4-year arithmetic mean; but for Mexicali and Tijuana, 3-year arithmetic mean, 1997–99. Percentages of days in violation of the standards are calculated from the Imeca values.

Key Observations:

- Given the number and percentage of air quality exceedance days indicated in the national monitoring systems' monthly reports, air pollution continues to be a serious problem in both the Mexico Valley Metropolitan Zone and the Guadalajara Metropolitan Zone.
- Peak levels of ground-level ozone have decreased since 1990; however, the Mexican standard of 110 ppb has been violated in almost all years in the Mexico City Metropolitan Zone (with exceedance rates of over 80 percent). Guadalajara has reported violations for

1996 and 1997. Monterrey, Toluca and Ciudad Juárez have not reported any exceedances of the standard in the period from 1990 to 2002 (Figure 2.1).

- Suspended particles are a significant concern in a number of metropolitan zones, with greater than 30 percent of days in exceedance for PM_{10} in Mexicali and greater than 20 percent in Guadalajara, Ciudad Juárez and Monterrey.
- The situation in Mexicali is also worrisome with regard to PM_{10} and carbon monoxide levels.
- The annual mean levels for PM_{10} exceeded the Mexican mean annual standard of 50 micrograms per cubic meter in Guadalajara, Mexico City, and Ciudad Juárez in most years in the reporting period (1995 to 2002) (Figure 2.2).
- The Mexican daily maximum standard of 150 micrograms per cubic meter for suspended particles (PM_{10}) was exceeded on 20 percent or more days in the reporting period (1999–2002) in Mexicali, Guadalajara, Ciudad Juárez and Monterrey. In Mexicali, exceedances occurred on approximately 35 percent of the days (Figure 2.3). [Note: In September 2005, regulations were published lowering the daily maximum standard for PM_{10} to 120 $\mu g/m^3$ (NOM-026-SSA1-1993).]
- The standard for ground-level ozone was exceeded in the Valley of Mexico City Metropolitan Zone on more than 80 percent of the days during the reported period (Figure 2.3).
- Although most of the metropolitan zones did not exceed the standard for carbon monoxide (11.00 ppm for a moving 8-hour daily average, not to be exceeded more than once per year [see NOM-021-SSA1-1993, “Salud Ambiental. Criterio para evaluar la calidad del aire ambiente con respecto al monoxido de carbono (CO) en el aire ambiente, como medida de protección a la salud de la población”]), in Mexicali, it was exceeded on 19 percent of the days (data not shown).

A National Air Quality Information System (*Sistema Nacional de Información de Calidad del Aire*—Sinaica) was established in the second half of 2002, based upon various antecedent air monitoring programs in Mexican metropolitan zones. Presently, 23 cities have permanent air monitoring systems, including the major urban areas (Mexico City, Guadalajara, Monterrey, and Toluca) and some cities along the northern border (Ciudad Juárez, Tijuana, and Mexicali).

2.2 Indoor Air Pollution

Use of Biomass

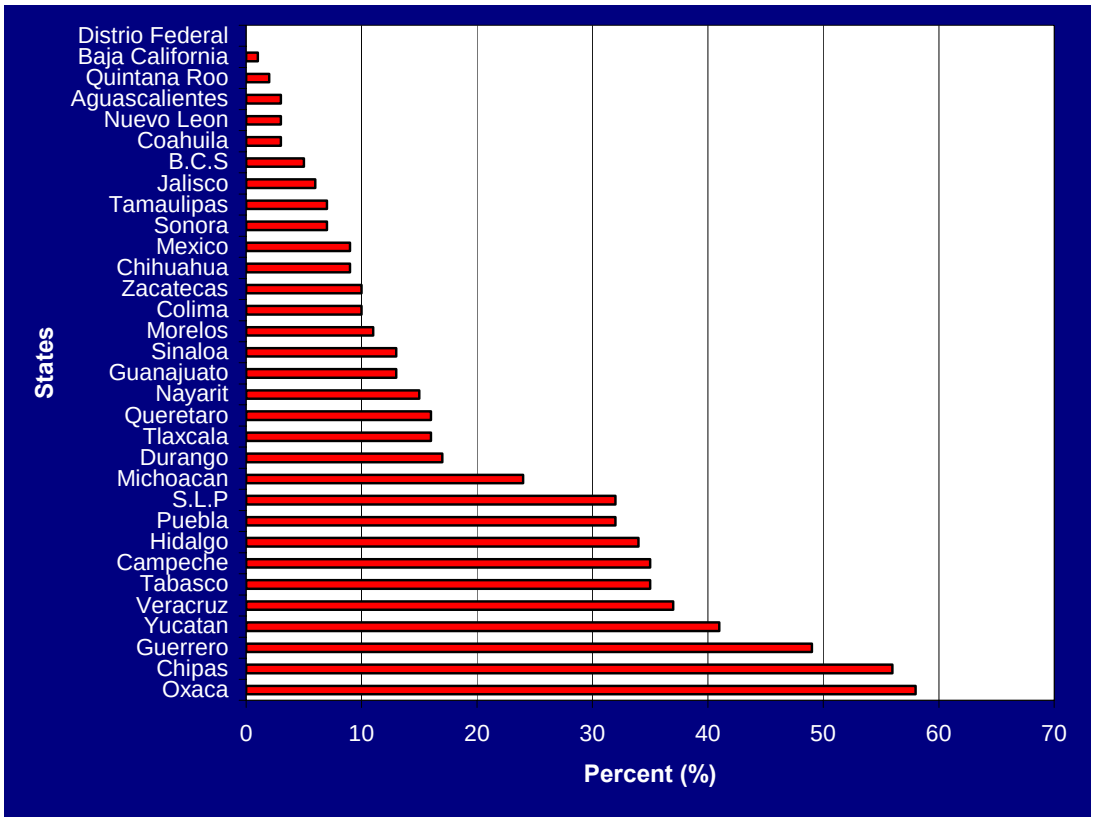
Indoor air pollution in homes caused by the burning of firewood or charcoal for cooking is a public health problem with impacts on children under five and reproductive-age women. The number of annual deaths in developing countries associated with domestic biomass combustion is estimated at 1,849,000.

In 1990, one in three Mexicans used firewood for cooking, including 91 percent of rural residents and 11 percent of urban residents. It is estimated that 25.6 million people used this fuel in their homes in 1993 and that by 2000 this number had declined to 17,256,471.[6]

Because of this, the Federal Commission for Protection Against Sanitary Risks (*Comisión Federal Para la Protection Contra Riesgos Sanitarios*—Cofepris) initiated a project in 2004 to decrease indoor exposure to biomass smoke. This is intended to promote technological improvements in indoor emission control, reinforce community participation, promote inter-institutional and cross-sector participation, and communicate risks to the population.

Figures 2.4 to 2.6, below, illustrate exposure to biomass smoke by percent of population in the various states of Mexico.

Figure 2.4: Percentage of Mexico's General Population Exposed to Biomass Smoke, by Region, 2000



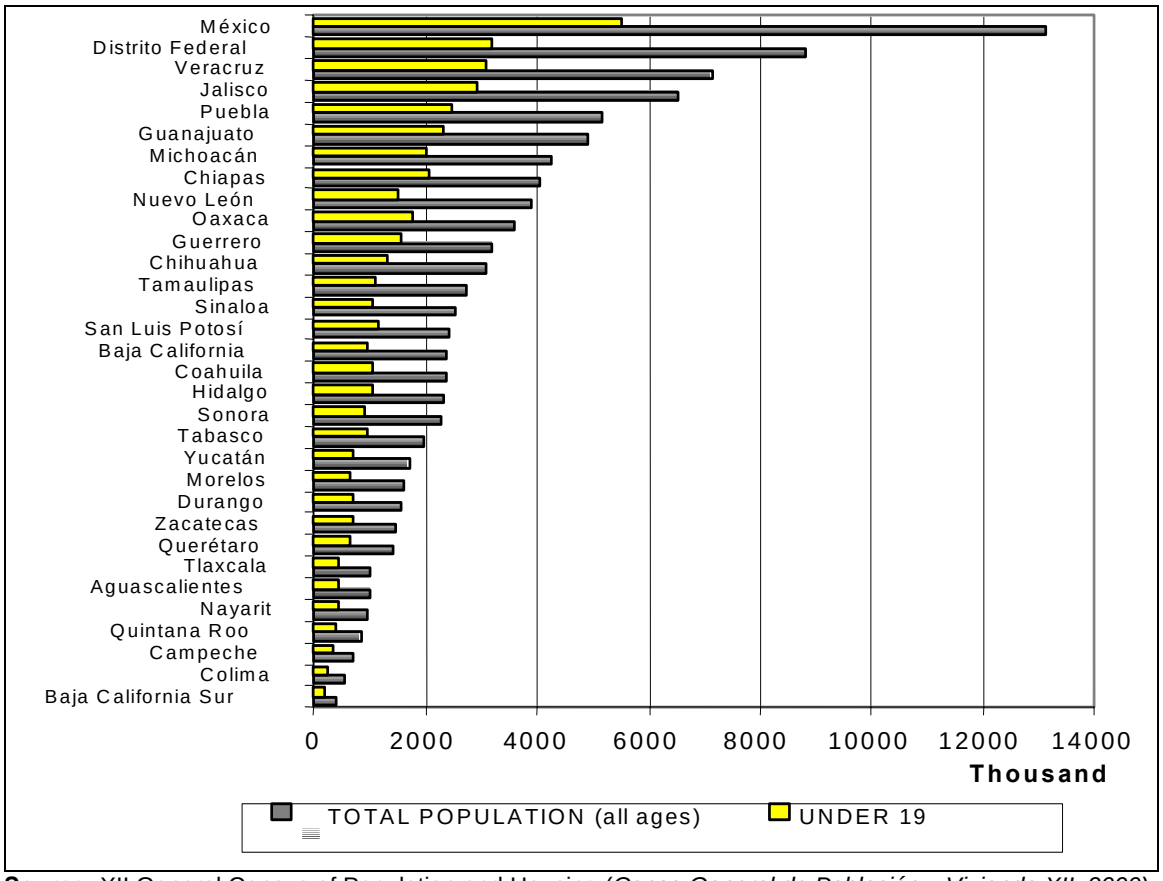
Source: *Diagnóstico Nacional de Salud Ambiental y Ocupacional 2002. Dirección General de Salud Ambiental*

[6] Masera et al. 2003.

Key Observations

- In 1990, one in three Mexicans used firewood/charcoal for cooking, including 91 percent of rural population and 11 percent of those living in urban areas. In 1993 25.6 million people used this fuel in their homes and by 2000 this number had declined to 17.3 million.
- Among the states with the highest use of firewood are Oaxaca and Chiapas, where it is estimated that 50–60 percent of the population uses this type of fuel. The general pattern is that a higher proportion of people are exposed to firewood and charcoal in the southern part of the country. These are largely rural states with some of the poorest populations; thus, exposure to firewood-related pollutants is more prevalent here.

Figure 2.5: Population Under the Age of 19 Exposed to Biomass Smoke, by State, Mexico, 2000

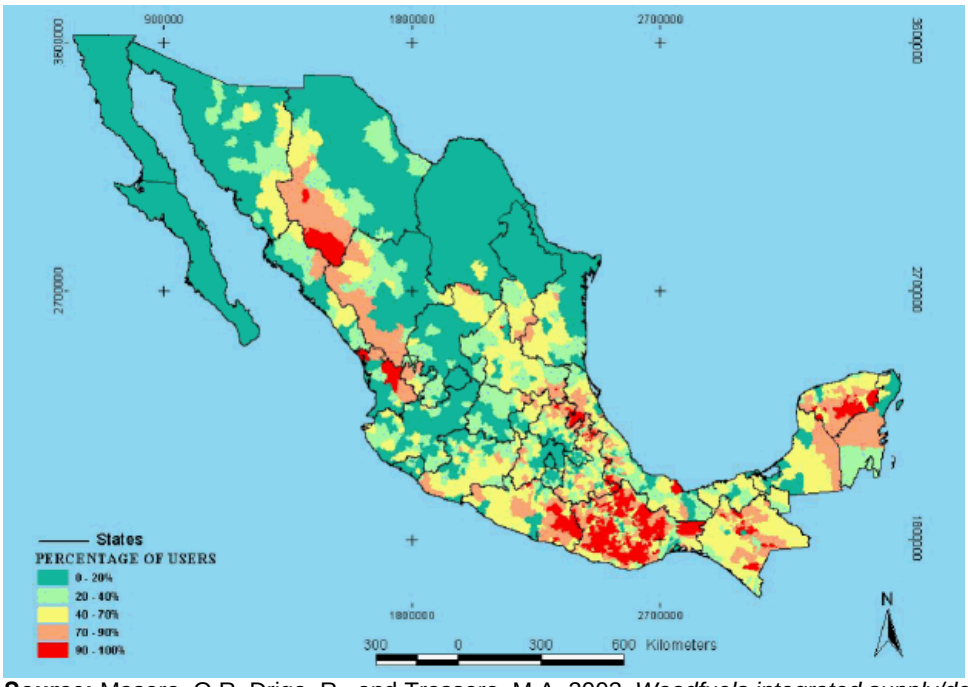


Source: XII General Census of Population and Housing (*Censo General de Población y Vivienda XII, 2000)* INEGI 2000.

Key Observations

- The graph shows the percentage of the total population that is under the age of 19 and that may potentially be exposed to pollutants from biomass fuel usage. This age group corresponds to 43 percent of the Mexican population, with the highest proportion in the country's southern region.

Figure 2.6: Percentage of Fuel Wood Users, at the Municipal Level, in Mexico, 2000



Source: Masera, O.R, Drigo, R., and Trossero, M.A. 2003. *Woodfuels integrated supply/demand overview mapping. Universidad Autónoma de México,* FAO-EC Partnership Programme. Food and Agriculture Organization of the United Nations, p. 23.

Key Observations

- The heaviest biomass fuel usage by household is in southern and north central Mexico, where utilization may approach 90 to 100 percent in some locales. These are largely rural states with some of the poorest populations.

Smoking Rates

Mexico does not have specific information on passive smoker statistics in the population under 12, where "passive smoker" or "involuntary smoker" is defined as any person not classified as an active smoker who is exposed to tobacco smoke (smokers in a given environment) at home, in the classroom and/or at the workplace. However, the National Addictions Survey (*Encuesta Nacional de Adicciones*—ENA-2002) finds that there are around 48 million Mexicans in this situation.

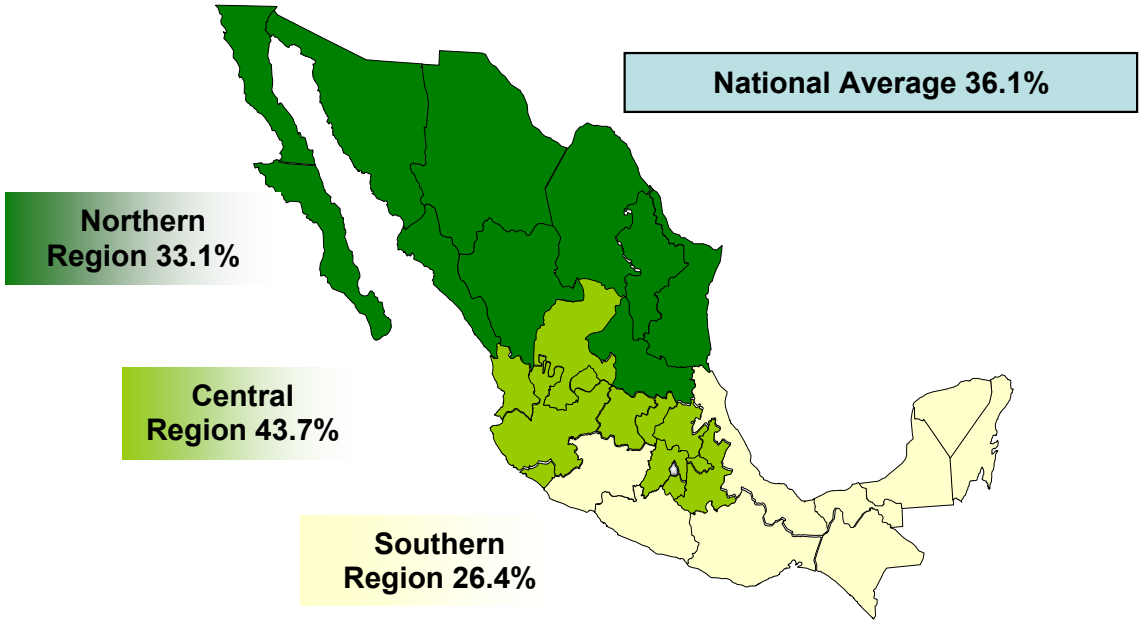
Since 1998, the Secretariat of Health has been conducting the same survey every five years, creating a major repository of information on the subject. The National Addictions Survey (ENA-2002) is the first survey conducted by the National Institute of Statistics, Geography and Information (*Instituto Nacional de Estadística, Geografía e Informática*—INEGI), although it does have an earlier background study entitled "Drugs and Users," published in 1976.

According to data in the Anti-Tobacco Program prepared by the National Council Against Addictions (*Consejo Nacional contra las Adicciones*), there are approximately 13 million smokers in Mexico, 24.6 percent of whom are women and 75.4 percent are men.[7]

As regards passive smokers, 36.1 percent of the urban population is included in this category, with the highest percentage in the central region (43.7 percent) (Fig. 2.7 shows only information from urban areas).

The highest involuntary exposure to tobacco smoke among the rural population (Figure 2.8) was found in interviewees' homes in the northern region (31.9 percent).

Figure 2.7: Prevalence of Passive Smoking in Urban Populations (Ages 12 to 65) in Mexico, 2002



Source: ENA 2002, National Council Against Addictions (*Consejo Nacional Contra las Adicciones*—Conadic), National Institute of Pediatrics (*Instituto Nacional de Pediatría*—INP), General Bureau of Epidemiology (*Dirección General de Epidemiología*—DGE), National Institute of Statistics, Geography and Information (*Instituto Nacional de Estadística, Geografía e Informática*—INEGI)

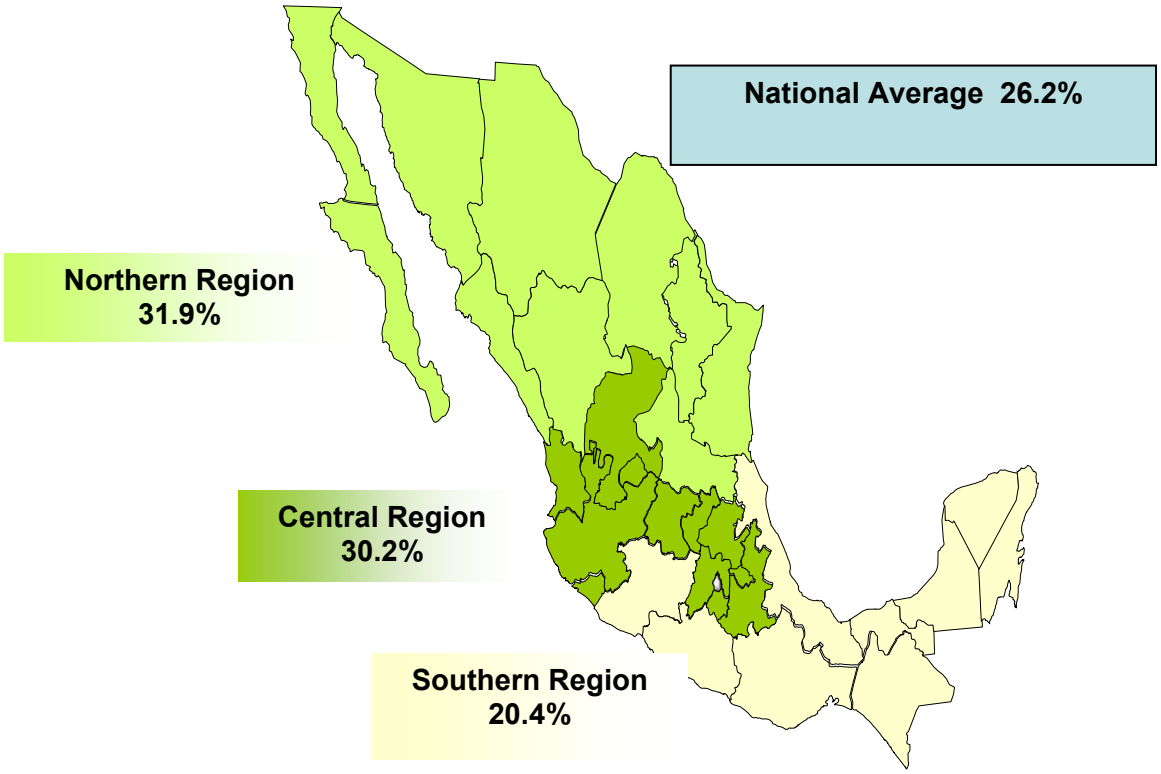
Key Observations

- With regards to age, young persons (12 to 17 years old) represented 19 percent of the total sample smoking population (urban and rural) and the rest of the sample smoking population was distributed among groups ranging from 18 to 65 years of age. The distribution of the rural population was similar, with 46 percent corresponding to men and 54 percent to women, and with 22 percent being adolescents and the rest the adult population.

With regards to passive smokers, Mexico does not have specific information on children. There is a 36.1 percent national prevalence of passive smokers in the urban population, with the highest percentage in the central region (43.7 percent).

[7] Data taken from http://www.conadic.gob.mx/doctos/ena2002/ENA02-O.pdf, consulted in October 2005.

Figure 2.8: Prevalence of Passive Smoking in Rural Populations (Ages 12 to 65) in Mexico, 2002

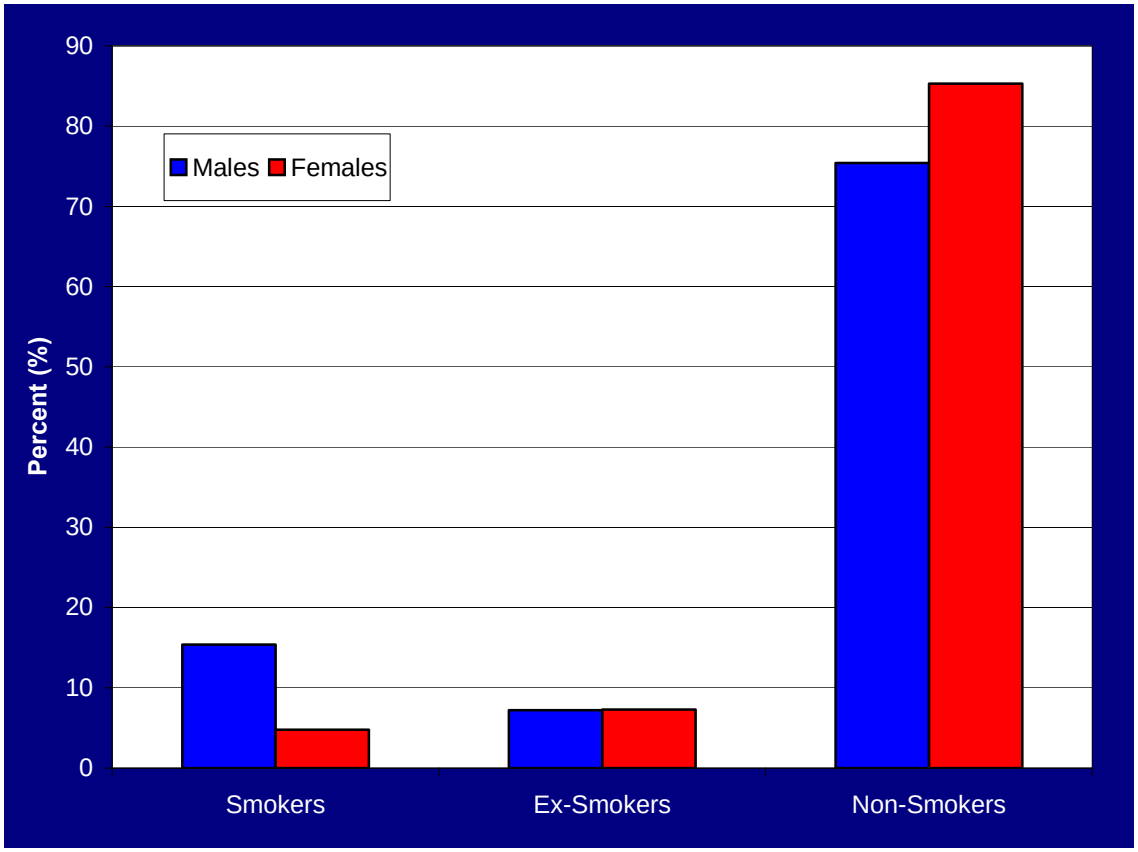


Source: ENA 2002, National Council Against Addictions (*Consejo Nacional Contra las Adicciones*—Conadic), National Institute of Pediatrics (*Instituto Nacional de Pediatría*—INP), General Bureau of Epidemiology (*Dirección General de Epidemiología*—DGE), National Institute of Statistics, Geography and Information (*Instituto Nacional de Estadística, Geografía e Informática*—INEGI)

Key Observations

- 26.2 percent of the rural population (between 12 and 65 years old) is exposed to passive smoke.
- The highest percentage of the population exposed to passive smoke is in the northern region (31.9 percent) and the lowest percentage is in the southern region (20.4 percent).

Figure 2.9: Percentage of Smokers, Ex-smokers and Non-smokers among Adolescents (12–17 years old), by Gender, in Urban Locations in Mexico, 2002

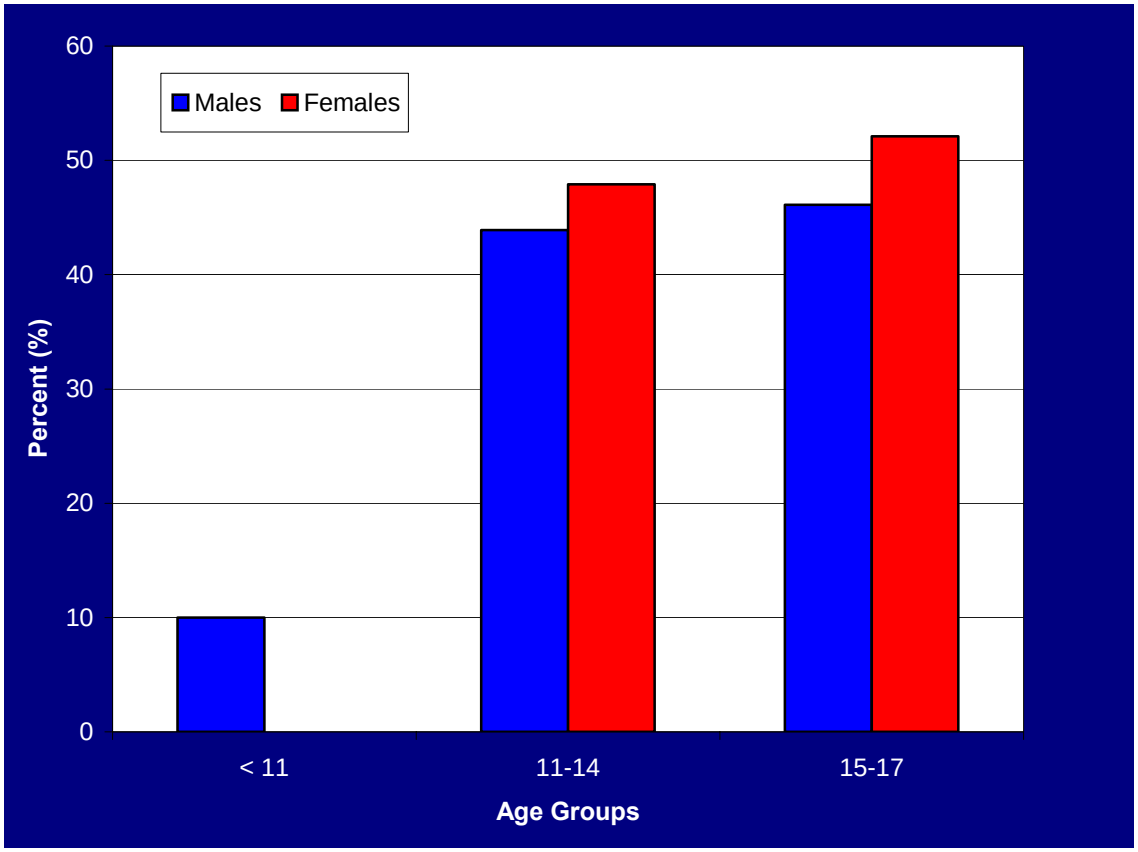


Source: National Survey of Addictions, 2002 (*Encuesta Nacional de Adicciones 2002*) *Secretaría de Salud.*

Key Observations:

- A recent study (the Mexico-Monterrey Global Youth tobacco survey, an initiative of WHO) performed in the city of Monterrey found very high environmental exposure to tobacco in first-, second- and third-year middle school students, among whom four of every ten live in homes where others smoke. Six out of ten are exposed to smoke in public places, while nearly half have parents who smoke.

Figure 2.10: Percentage of Smokers among Adolescents, by Age Group and by Gender, in Urban Locations in Mexico, 2002



Source: National Survey of Addictions, 2002 (*Encuesta Nacional de Adicciones 2002*) *Secretaría de Salud.*

Key Observations:

- With respect to the tobacco use starting age among urban youth, nearly half (47.6 percent, with some variation between the sexes—46.1 percent for males and 52.3 percent for females) began to smoke between 15 and 17 years of age. Note that while one of every ten adolescent males began to smoke before the age of 11, no women mentioned such an early starting age.
- The frequency of smoking among rural youth is 6.1 percent (231,677), of whom 11.3 percent are male and only 1 percent are female. The graph shows only the urban population.

2.3 Asthma

The health impacts of exposure to air pollutants have begun to be studied in recent years. Some studies in Mexico City have revealed a close correlation between urban air pollution and lung diseases, lung aging processes, and respiratory infections.

An individual's risk level is determined by various factors, including genetic predisposition, age, nutritional status, presence and severity of heart and respiratory conditions, and use of

prescription drugs, as well as type and place of work. In general, the highest-risk population consists of children under the age of 5, senior citizens (over the age of 65), persons with heart or respiratory diseases, and asthmatics.

Ozone and particles are the pollutants of greatest importance, both for their potential health effects and the frequency of exceedances of the corresponding air quality standards.

Acute respiratory infections (ARI), asthma, and chronic obstructive pulmonary disease (COPD) are considered to be the conditions most related to air pollution in both rural and urban areas.

In Mexico, statistical data on morbidity and mortality is compiled and analyzed as an official source through the National Epidemiological Surveillance System (*Sistema Nacional de Vigilancia Epidemiológica*—Sinave), an action program made up of a set of strategies and activities to identify and detect harm and risks to health.

Its importance resides in its capacity to generate information useful in guiding programs; diseases control interventions, and risk situations that seriously and frequently affect the community.

Since the inception of Sinave in 1995, the Centralized Epidemiological Surveillance System (*Sistema Único de Information para la Vigilancia Epidemiológica*—SUIVE) has been established. It systematizes morbidity and mortality information with the participation of the whole sector. With the creation of SUIVE, criteria, formats, and notification procedures were standardized across the institutions of the National Health System (*Sistema Nacional de Salud*—SNS).

SUIVE generates homogeneous information from the health services at their various technical/administrative levels. This information concerns the occurrence, distribution in time, place and person, risk factors, and consequences of diseases affecting public health. It is recorded in special formats for each level. From the local level it is sent to the jurisdictional level, where it is compiled and sent to the state level and, in turn, to the national level. The information from the corresponding levels is compiled and analyzed to guide and support decision-making for the design and application of health plans and programs throughout the country.

The Centralized Automated Epidemiological Surveillance System (*Sistema Unico Automatizado para la Vigilancia Epidemiológica*—SUAVE) is a software package that compiles Sinave information generated by the institutions making up the SNS. This program contains information on the 109 diseases subject to weekly reporting and the 30 subject to immediate reporting, of which 96 are reported on form SUIVE-1-2000. SUAVE is a self-installing, user-friendly program. The databases captured can be sent by electronic mail. This program offers graphic reporting and mapping capabilities; it also contains historical morbidity information and compiles information on new disease cases.

The National Epidemiological Surveillance System [Sinave] action plan has five components:

- Weekly notification of new disease cases (SUAVE).
- Hospital Epidemiological Surveillance Network (*Red Hospitalaria para la Vigilancia Epidemiológica*—Rhove).
- Epidemiological and Statistical Death Reporting System (*Sistema Epidemiológico y Estadístico de las Defunciones*—SEED).
- Special systems.
- Centralized Laboratory Information System (*Sistema Único de Information de Laboratorio*—Suilab).

These components are described in further detail in Appendix 2.

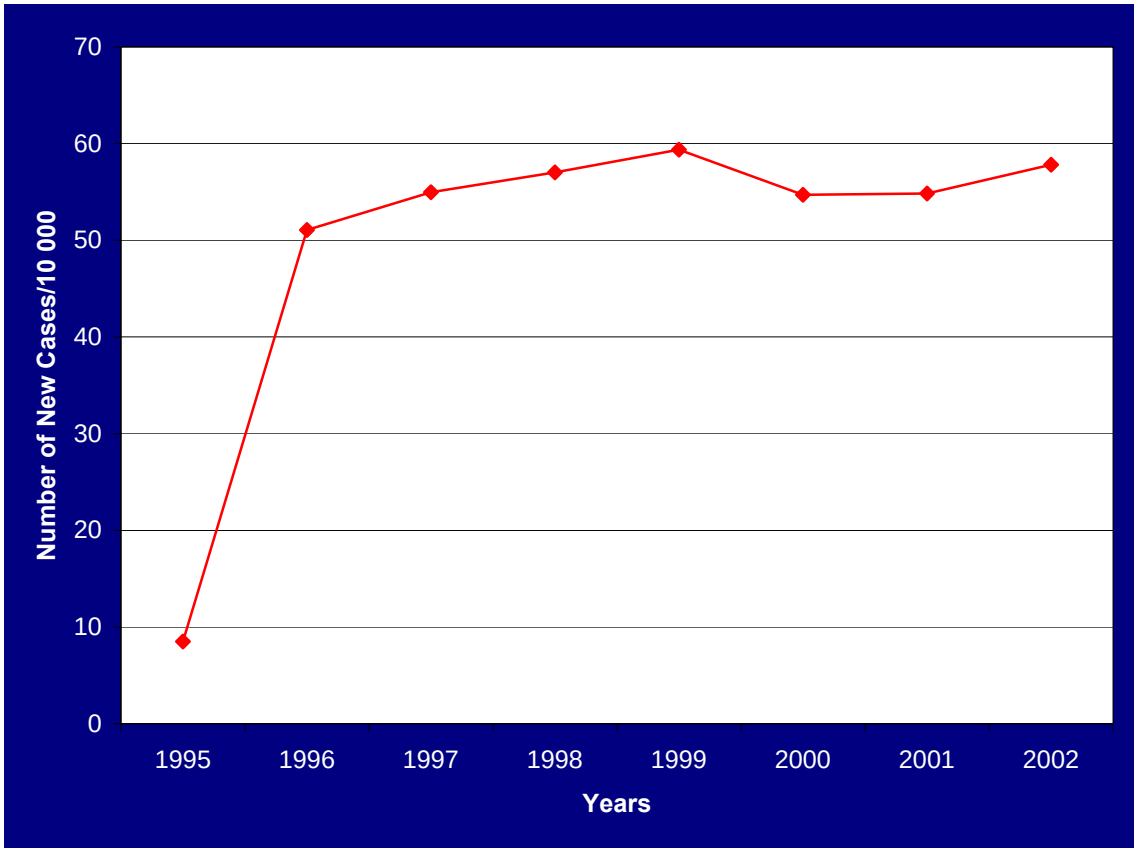
Prevalence of Asthma

Asthma is a genetically based disease that is accompanied by immunological alterations. It is the most common chronic illness in children, generally diagnosed in the first years of life due to its early clinical manifestation.

Exposure in open or closed spaces to sources of biological or chemical contamination has been shown to cause and/or exacerbate asthma. The greater the concentration of pollutants to which an asthmatic is exposed, including frequency and duration of exposure, the more severe the symptomatic and functional response. Particulate matter represents a significant public health risk due to its size and composition; the situation is particularly bad in metropolitan areas where the frequency of PM_{10} exceedance is approximately 30 percent.

In Mexico, it has been observed that the residents of coastal states are more likely to exhibit asthma, possibly due to the ambient humidity, where dust in homes has a high probability of entering the respiratory tract in the form of suspended particles. Its greater frequency in these regions has also been attributed to the use of air conditioning systems, which harbor a large quantity of dust and molds that can trigger asthmatic episodes. In a recent study, an inverse relationship was found between altitude and asthma incidence (Mario H. Vargas et al., 1999).

Figure 2.11: Incidence of Asthma in Children under Five Years Old, in Mexico 1995–2002



Source: *Boletín de Información Epidemiológica 1998–2002.* (Epidemiological Information Bulletin 1998–2002). *Dirección General de Epidemiología. Secretaría de Salud* (Secretariat of Health) <http://www.dgepi.salud.gob.mx/suave/index.htm>.

Key Observations

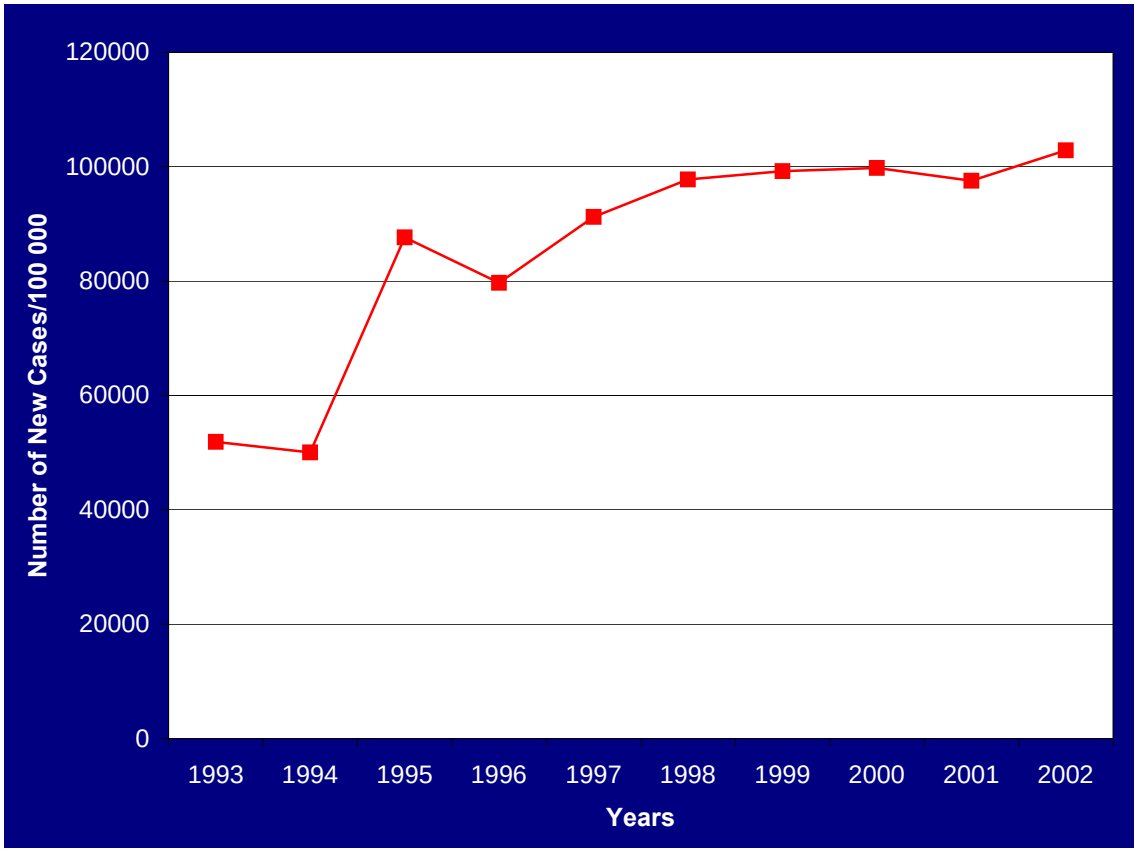
- The population of asthmatic children under the age of five is considered especially vulnerable to air pollutants.
- The incidence of asthma morbidity increased in this age group between 1995 and 1999, but a 10-point decrease was observed in 2000.

Prevalence of Acute Respiratory Infections

There is a group of viral, allergic, and bacterial illnesses classified as acute respiratory infections (ARI). They include upper respiratory tract infection, laryngitis, and acute bronchitis. They present clinically with similar symptoms and it can be difficult to identify the cause of the pathology. They are important because of the high morbidity they cause.

The ARI-related morbidity rates vary throughout the nation according to various mitigating or exacerbating factors, such as poverty; marginalization; malnutrition; lack of access to health services; physicochemical state of the pollutants and their concentration in the environment, mainly dependent on industrialization; and prevailing weather and geographical conditions.

Figure 2.12: Incidence of Acute Respiratory Infections (ARI) in Children under Five Years of Age, in Mexico, 1993–2002

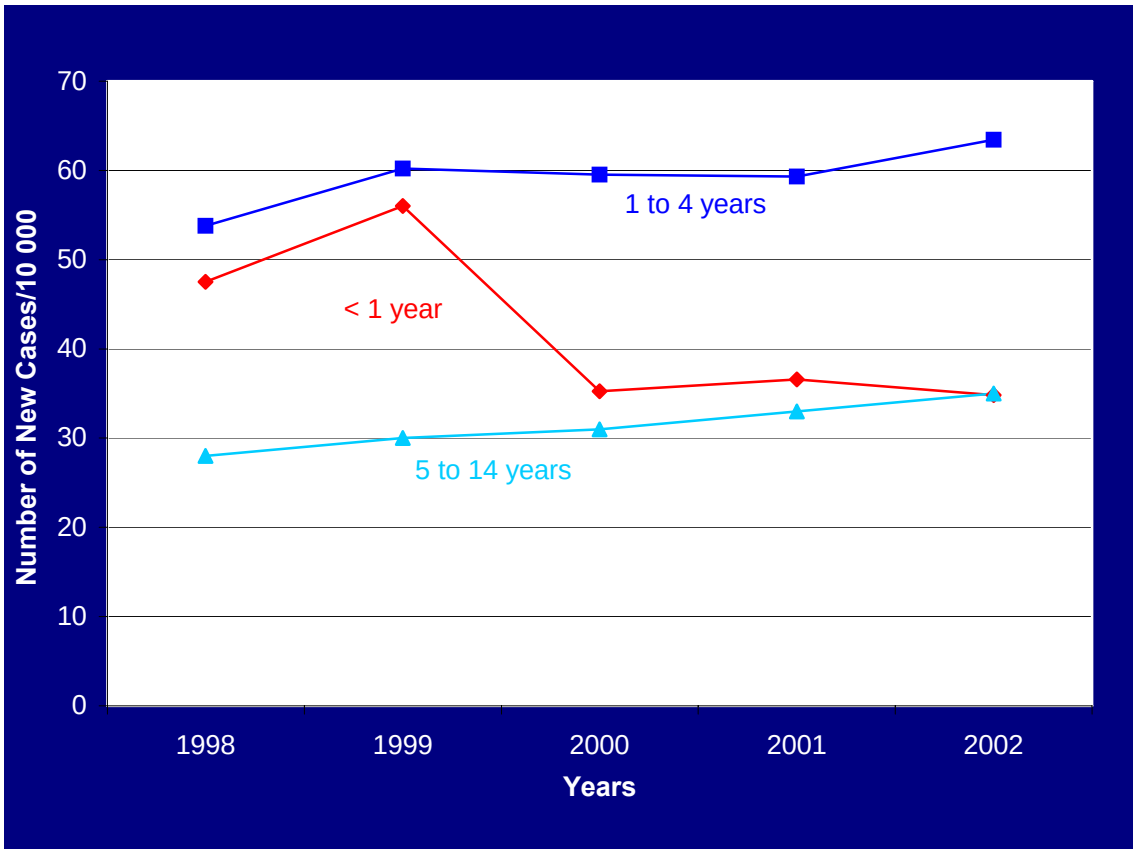


Source: *Boletín de Información Epidemiológica 1998–2002.* (Epidemiological Information Bulletin 1998–2002). *Dirección General de Epidemiología. Secretaría de Salud* (Secretariat of Health) <http://www.dgepi.salud.gob.mx/suave/index.htm>.

Key Observations

- Figure 2.12 shows a nearly 100 percent increase in ARI-related morbidity between 1993 and 2000. Meanwhile, ARI-related mortality rates are on the decline. Hence these figures are a reflection of the epidemiological transition our country is undergoing, in which mortality due to infections has tailed off while mortality due to chronic degenerative diseases is on the rise.

Figure 2.13: Incidence of Asthma among Children, by Age Group, in Mexico, 1998–2002

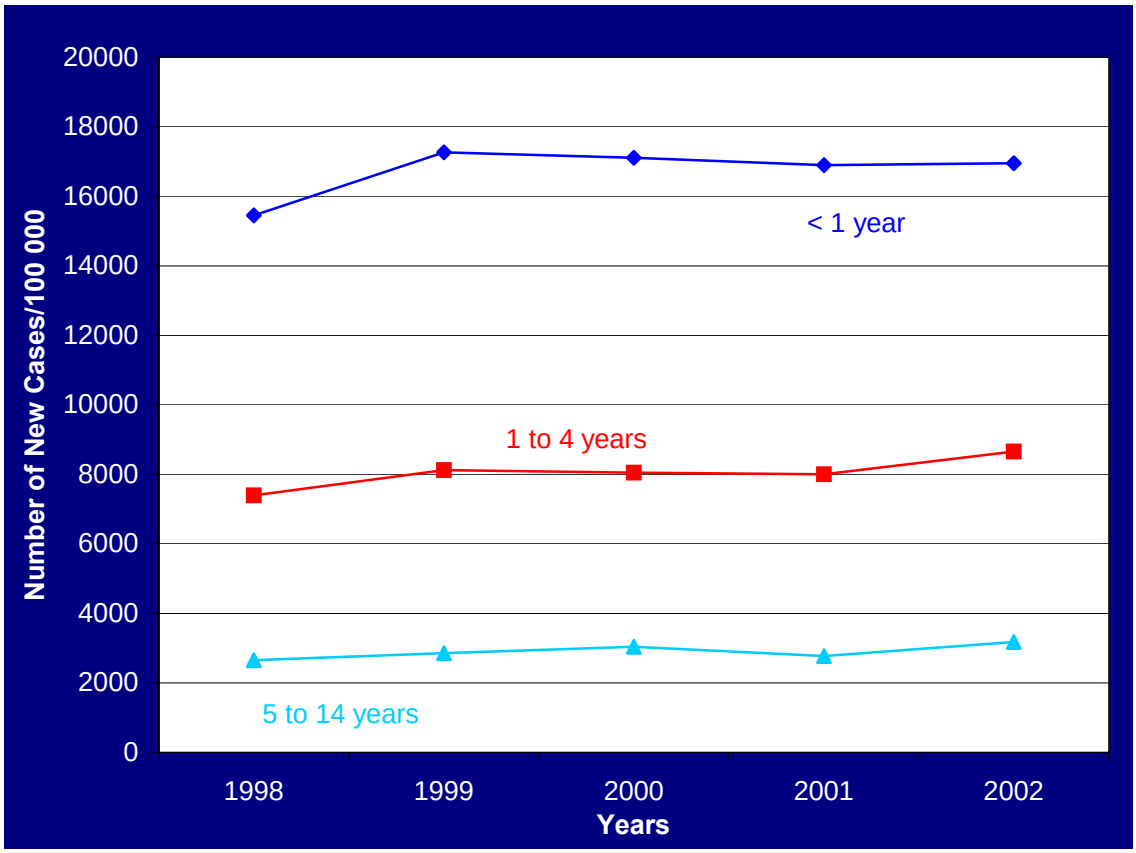


Source: *Boletín de Información Epidemiológica 1998–2002.* (Epidemiological Information Bulletin 1998–2002). *Dirección General de Epidemiología. Secretaría de Salud* (Secretariat of Health) <http://www.dgepi.salud.gob.mx/suave/index.htm>.

Key Observations

- The highest rates of asthma consistently appear in children aged 1 to 4 years, with an increasing trend from 54 cases per 10,000 in 1998 to 63 cases per 10,000 in 2002 (Figure 2.13).
- The asthma prevalence rate in children less than one year-old showed a decline since 2000, and currently remains at 33 cases per 10,000. As opposed to a true change in disease prevalence, this decline was directly attributable to a change in the immediate notice form (Epi-1 2000) for medical unit reporting. This occurred due to the difficulty in diagnosing asthma in this age group. In the 5 to 14 year-old age group, the rates have grown slightly from 28 to 32 cases per 10,000 over the sampling period.
- In Mexico, it has been observed that the residents of coastal states are more likely to exhibit asthma than populations elsewhere in the country.

Figure 2.14: Incidence of Acute Respiratory Infections (ARI) among Children in Mexico, by Age Group, 1998–2002

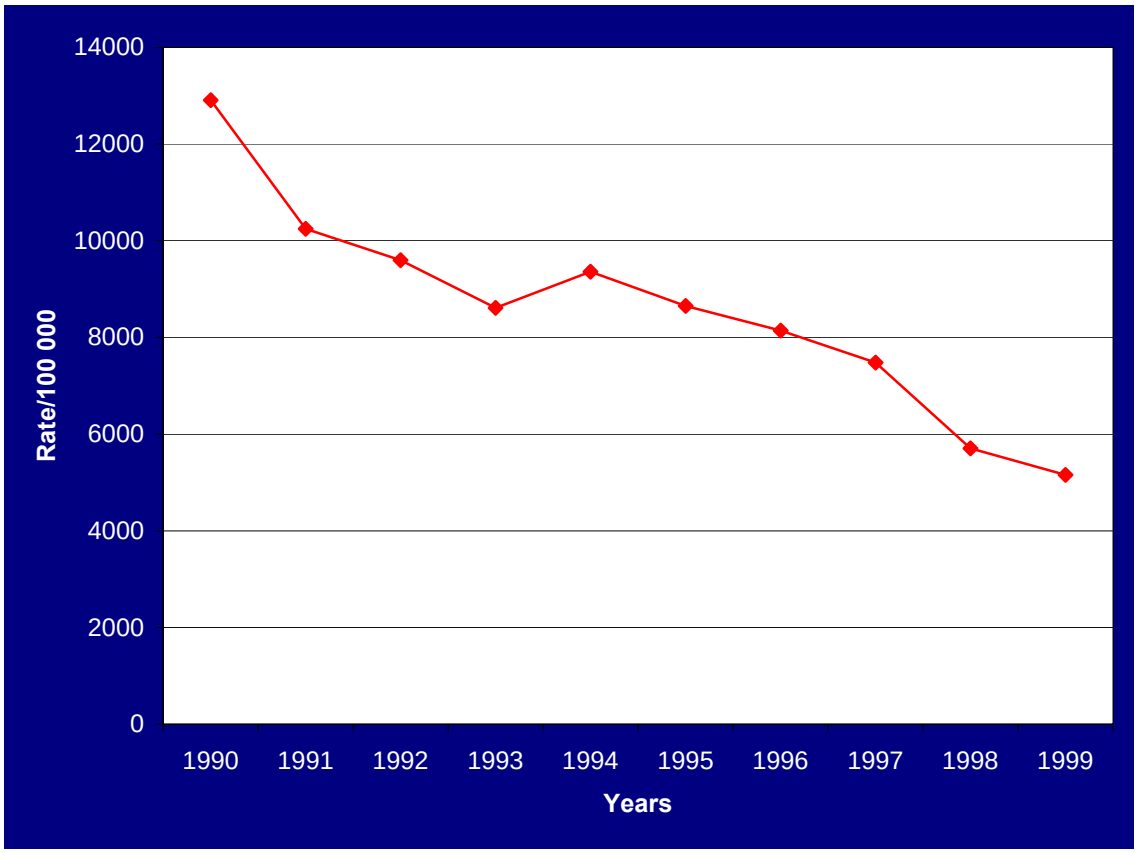


Source: *Boletín de Información Epidemiológica 1998–2002.* (Epidemiological Information Bulletin 1998–2002). *Dirección General de Epidemiología. Secretaría de Salud* (Secretariat of Health) <http://www.dgepi.salud.gob.mx/suave/index.htm>.

Key Observations

- For acute respiratory infections (ARI), children below one year of age constitute the most affected population, with annual rates averaging at 16,000 per 100,000 children (Figure 2.14). Only in 1998 were fewer cases reported during this period. The population of children aged 1 to 4 years shows a slight increase in rates from 7,500 in 1998 gradually arriving at 8,100 per 100,000 children in this age group. The lowest rates were observed for children from 5 to 14 years old.
- ARI and asthma in children and chronic obstructive pulmonary disease (COPD) in adults are considered to be the conditions most related to air pollution in both rural and urban areas.

Figure 2.15: Rate of Mortality by Acute Respiratory Infections (ARI) Infections of Five-year-old Children in Mexico, 1990–1999



Source: *Boletín de información epidemiológica 1990–1999/* Conapo national projections

Key Observations

- The number of five-year-old children dying from ARI infections has been decreasing, from 12,907 deaths per 100,000 in 1990 to 5,159 deaths per 100,000 in 1999 (Figure 2.15). This reflects the epidemiological transition, where the mortality rate due to infectious diseases has been decreasing and the mortality rate due to degenerative chronic diseases has been increasing in the last decade.

3 Lead and Other Chemicals, Including Pesticides

In Mexico, the main source of environmental exposure to lead is the manufacture and use of glazed ceramics containing lead oxide. According to the National Crafts Fund (*Fondo Nacional de las Artesanías*—Fonart), ceramics are produced in 20 states of the country and there are approximately 5 million potters, a significant proportion of them indigenous.

Various people and social groups of all ages participate in this activity. Workshops are family-run, with father, mother, children and perhaps other relatives such as cousins, uncles, godparents, etc., all participating. They use processes handed down across the generations.

Workshops are generally found in the yards of people's homes; they are rudimentary and inadequate to prevent exposure to lead, which occurs primarily while the pots are being glazed with lead oxide.

Pottery making has always been one of the primary sources of exposure to lead, and the glazing process represents the highest risk. In the 16th century, it was known that preparation and conservation of food and beverages in lead-glazed containers caused them to become contaminated, giving rise to increased blood lead levels which manifested themselves as acute or chronic lead intoxication.

Prior to 1521 when it was introduced by the Spanish, lead was not used in this process in Mexico. The use of lead became widespread and continues to this day.

When pots are fired at temperatures lower than 990°C, the lead from glazes can go into solution on contact with food, especially acidic foods such as vinegar, lemons, oranges, and tomatoes.

In terms of health effects, starting in 1960, cases of acute lead intoxication due to the consumption of fruit drinks or juices from glazed containers were reported by health institutions in Mexico City. Studies conducted on urban populations, especially school children and women of reproductive age, have found a significant association between high blood lead levels and the use of glazed ceramics to serve food and drinks. In potters themselves, a case of endemic lead intoxication was reported in a population of potters in the state of Oaxaca as early as 1878; subsequent epidemiological studies have found high lead levels in potters in Oaxaca, Michoacán and Jalisco.

The groups most likely to become intoxicated by lead are children and women of reproductive-age, although men and women of any age can be affected.

Lead has a wide range of toxic effects on multiple body systems. Acute exposure to high levels causes severe intoxication, manifested by a highly lethal encephalopathy. Chronic exposure produces a range of symptoms and a heightened risk of neuropsychological disorders, neuropathy, peripheral neuropathy, anemia, and birth defects. Lead has toxic effects even at low levels of exposure, the most notorious being an insidious effect on cognitive development in children. There is no threshold indicating exactly when lead's effects on health begin; however, levels as low as 10 μg/dL are known to produce clinical manifestations, and harm may occur at even lower levels.

Actions to Address Lead Problems in Mexico

Lead exposure assessment and prevention program in mining and metallurgy areas

Mexico, with its mineral wealth, has become one of the world's foremost mining countries, with the bulk of the country's production of lead coming from the northern state of Chihuahua.[8] The Secretariat of Health has taken various actions to reduce the risk of exposure, chief among them the regulation of its various sources and the issuance of an emergency standard establishing criteria for the determination of blood lead levels and health protection actions. In 1999, with a

[8] See <http://www.mbendi.co.za/indy/ming/ldzc/am/mx/p0005.htm>.

view to generating exposure information useful in identifying the existence of health risks, the program was brought to the states in which the country's main mining areas are located. This program made it possible to identify various companies that represent a risk to the health of their workers and the surrounding population.

Program for eliminating exposure to lead oxide among Mexicans engaged in manufacturing and using glazed pottery to prepare, consume, or store food and beverages.

Legal Framework

Within the framework of the Federal Law of Measurements and Standards (*Ley Federal sobre Metrología y Normalization*), 11 Mexican Official Standards were developed to regulate the use of lead:

NOM-002-SSA1-1993	Environmental health, goods and services. Metal containers for food and beverages. Seam specifications. Sanitary requirements.
NOM-003-SSA1-1993	Environmental health. Sanitary requirements for labeling of paints, dyes, varnishes, lacquers, and glazes.
NOM-004-SSA1-1993	Environmental health. Sanitary limitations and requirements for the use of lead monoxide (litargirio), red lead oxide (minium) and basic lead carbonate (albayalde).
NOM-005-SSA1-1993	Lead chromate and lead chromate molybdate pigments. Extraction and determination of soluble lead. Test procedure.
NOM-006-SSA1-1993	Paints and varnishes. Preparation of acid extracts of dry paint layers for determination of soluble lead. Test procedures.
NOM-008-SSA1-1993	Environmental health. Paints and varnishes. Preparation of acid extracts of liquid or powdered paint for determination of soluble lead and other methods.
NOM-009-SSA1-1993	Environmental health. Glazed ceramics. Test procedure for determination of soluble lead and cadmium.
NOM-010-SSA1-1993	Environmental health. Glazed ceramic items. Limits for soluble lead and cadmium.
NOM-011-SSA1-1993	Environmental health. Limits for soluble lead and cadmium in glazed pottery.
NOM-015-1/SCFI/SSA-1994	Bioavailability of metals in toys and school items
NOM-199-SSA1-2000	Environmental health. Blood lead levels and actions as criteria for protection of the health of the non-occupationally exposed population.
NOM-231-SSA1-2002	Glazed pottery, glazed ceramics and porcelain. Soluble lead and cadmium limits

For approximately ten years there have been rules banning the use of lead-glazed pottery in food preparation, requiring that this type of pottery be used for decoration only and perforated to ensure it is not used for food preparation. As well, several initiatives may change the distribution of pottery-making activities, distinguishing between areas where there is still a significant production of pottery glazed with lead oxide at low temperatures and those areas where kilns have been changed to raise the glazing temperature and/or use of alternative glazing methods have been introduced so that lead oxide is not used. Despite these actions, Mexican potters continue to use lead oxide in traditional pottery and the general public continues to purchase these lead-containing products.

3.1 Blood Lead Levels

Mexico has blood lead level data only from isolated studies conducted in industrial areas, as well as several regions in which pottery making is common; however, no baseline national information on blood lead levels is available.

Because of this, the Federal Commission for the Prevention of Sanitary Risks (*Comisión Federal para la Protección contra Riesgos Sanitarios*—Cofepris) undertook a project entitled "Lead in Ceramics Fired at Low Temperatures" in which strategies are developed for the elimination of this risk. These include a risk communication program, a blood lead level monitoring system, and actions to prevent and control exposure and harmful health effects caused by exposure to lead in ceramics fired at low temperatures.

Table 3.1 below summarizes several studies conducted on Mexicans exposed to lead occupationally and non-occupationally.

Table 3.1: Blood Lead Levels of Children in Rural and Urban Populations, in Mexico

				Exposure to Ceramic Glazes		Blood Lead Levels µg/dL		
Author and Year	**Place**	**Community**	**Population**	**General Public**	**Occ.**	**N**	**Mean**	**SD**
Azcona-Cruz, M., et al., 2000	Oaxaca	Rural	Children (9 years of age)	Yes	Yes (children of potters)	220	10.50**	±7.0
Olaiz, F.G., et al., 1997	Michoacán	Rural	Children (less than 16 years old)	No	Yes	181	26.20**	-
Batres, L., et al., 1994	San Luis Potosí	Rural	Children (3 to 6 years old)	Yes	No	37	26.50*	±1.3
Carrizales et al., 2005	San Luis Potosí	Rural	Children (3 to 6 years old)	Yes	No	30	14.80*	-
Romieu, I., et al., 1992	Mexico City	Urban	Children (6 to 8 years old)	Yes	No	40	12.60*	±4.6
			(Living near vehicular traffic)	Yes	No	15	15.10*	±3.9
Molina, B.G., et al., 1990	Tonalá, Jalisco	Rural	Children (0 to 9 years old)	No	Yes	9	81.90*	-
Díaz-Barriga, F., et al. 1997	Ciudad Juárez, Chihuahua	Semi-urban	Children (5 to 13 years old)	Yes	No	44	9.70**	-

Note: * Arithmetic mean. ** Geometric mean. N = Sample size; Occ. = Occupational; SD=Standard Deviation. Please see the Glossary for definitions of geometric mean and arithmetic mean.

Sources: Azcona-Cruz et al. 2000; Batres et al. 1994; Carrizales et al. 2005; Díaz-Barriga et al. 1997; Molina-Ballesteros et al. 1980; Olaiz et al. 1997; Romieu et al. 1992.

Key Observations

- Studies indicate that some populations of Mexican children have very high levels of blood lead, in some cases more than five times the action level of 10 µg/dL (Mexico, Cofepris, Date unknown).

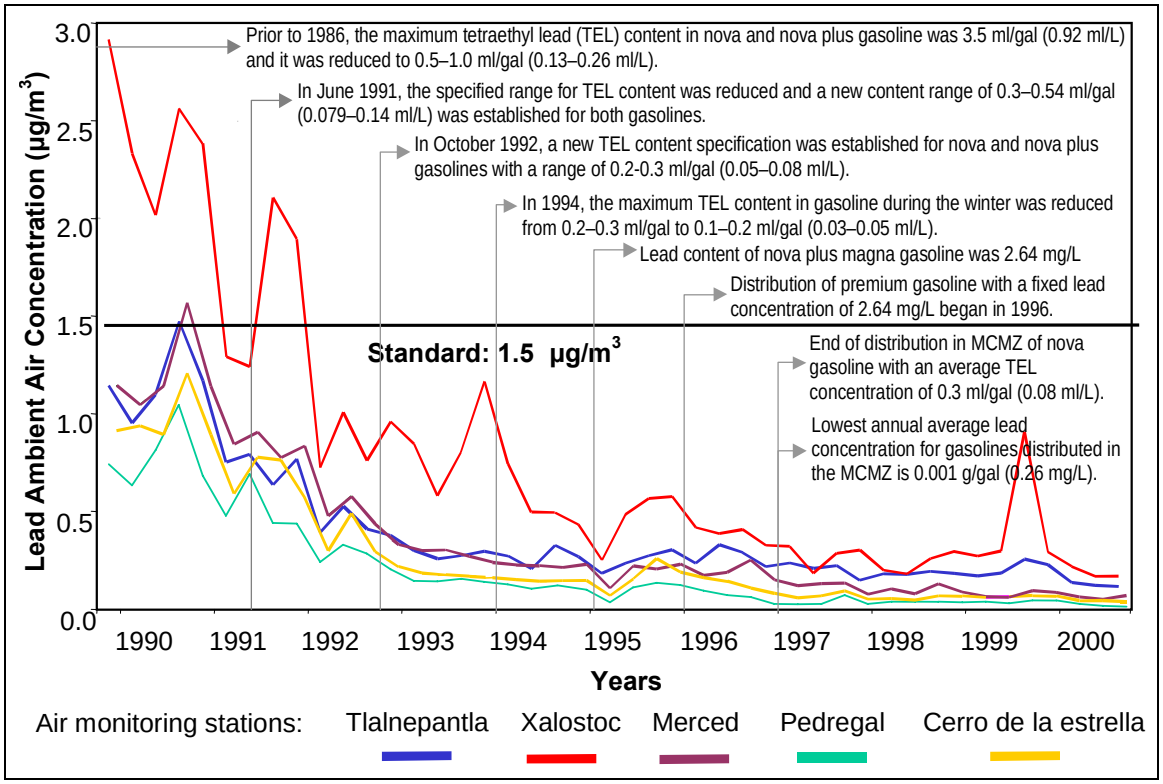
Case Study 1: Effects of Lead Management Strategies on Ambient Lead Levels in the Mexico City Metropolitan Zone

Ambient lead levels and lead exposures were dramatically reduced through a series of initiatives to reduce lead in gasoline and consumer products in Mexico. These actions, which were supported with regulations and consumer education, have produced substantial reduction in childhood exposure to lead.

In October 1990, it was agreed to establish the Integrated Program for Air Pollution Control in the Mexico City Basin (*Programa Integral Contra la Contaminación Atmosférica en el Valle de México*—PICCA). Lead levels in Mexican gasoline were reduced by 88 percent (average of 0.2 g/L) by 1992.[9] The transition to unleaded gasoline was assisted with a reduction of the price of lead-free gasoline to encourage its use. Over the course of the program a series of further reductions in the allowable levels of lead in gasoline were implemented across Mexico. These reductions resulted in an average annual and minimum recorded lead concentration in gasoline of 0.001g/gal in the Mexican City Metropolitan Zone.

[9] See <http://www.hwwa.de/PersHome/Michaelowa_A/Lead.htm>.

Figure 3.1: Atmospheric Monitoring of Lead and Principal Activities to Reduce Lead Emissions in the Mexico City Metropolitan Zone (MCMZ), 1990–2000



Source: *Programa para Mejorar la Calidad del Aire de la Zona Metropolitana del Valle de México* 2002–2010 (Proaire).

Note: Tetraethyl lead (TEL) is a liquid. Nova, nova plus, and nova plus magna are grades of gasoline, ranked according to increasing octane levels.

Key Observations

- Actions to eliminate lead from gasoline substantially reduced airborne emissions of lead in the Mexico City Metropolitan Zone.

Case Study 2

Levels of Lead in Blood in a Child Population in Northern Mexico due to Metallurgical Activities—A Local Case Study

The city of Torreón, Coahuila, located in northern Mexico, has a population of approximately 530,000 inhabitants. Latin America's largest, and the world's fourth-largest, mining-metallurgical company, Met-Mex Peñoles, is located in this town, producing lead, silver and gold. The presence of this industry has led to the chronic environmental exposure to lead in the non-occupational population, particularly in children.

The results of formal studies performed since 1997 have shown a high concentration of lead in the soil and air, thereby documenting prolonged, historic pollution. One of these studies (García, et al. 2001) corroborated the presence of lead in the blood of school children in a relationship directly proportional to their proximity to the metallurgical plant. This problem gave rise to an environmental emergency situation, as it represented both public health and social problems.

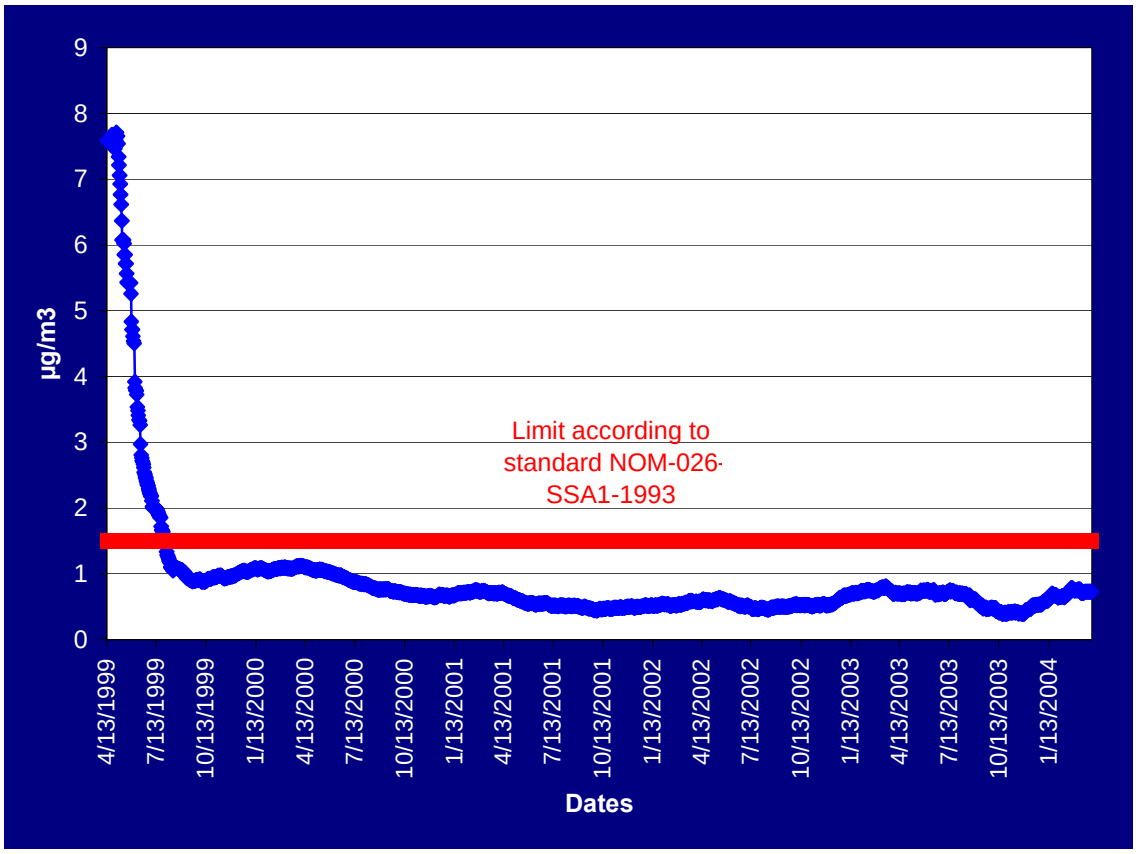
To handle this situation, the state Secretariat of Health (*Secretaría de Salud*), the Office of the Federal Attorney for Environmental Protection (*Procuraduría Federal de Protección Ambiental*—Profepa) and the company Peñoles implemented a series of actions including, among others, emissions control and reductions and improved smelting processes in the facility, the oversight of the environmental authority by Profepa, and by the *Secretaría de Salud* of the medical care provided by the by the state secretariat of health for the environmentally exposed population.

A trust was set up with funding (60 million pesos) provided by the company in 1999, creating a Metals Program (*Programa de Metales*) to coordinate health-related actions (detection, treatment and rehabilitation) for the population with environmental lead exposure. To remediate the environment, teams with high-efficiency vacuums cleaned the streets, building roofs and house interiors within a radius of four kilometers of the facility to reduce the accumulated concentration of lead on surfaces and in the soil. Contaminated soil was removed, thorough cleaning of public and private living spaces was aggressively conducted, and streets and patios near the facility were paved.

On 31 May 2004, five years after its creation, the trust that originated the Metals Program ended, having accomplished its immediate goals of gradually reducing the risks and health effects of lead to the population. However, the success attained required vigilance and continuing efforts to assure the maintenance of good environmental quality and the health of the population, so the firm developed a new program for the protection and treatment of the population exposed to lead and other heavy metals in the ambient environment in Torreón, and funds it annually in the amount of 18 million pesos.

The following graphs show the results of the intervention of the health and environmental authorities to abate the concentrations of lead in blood, as well as the decreased concentrations of lead in soil and air.

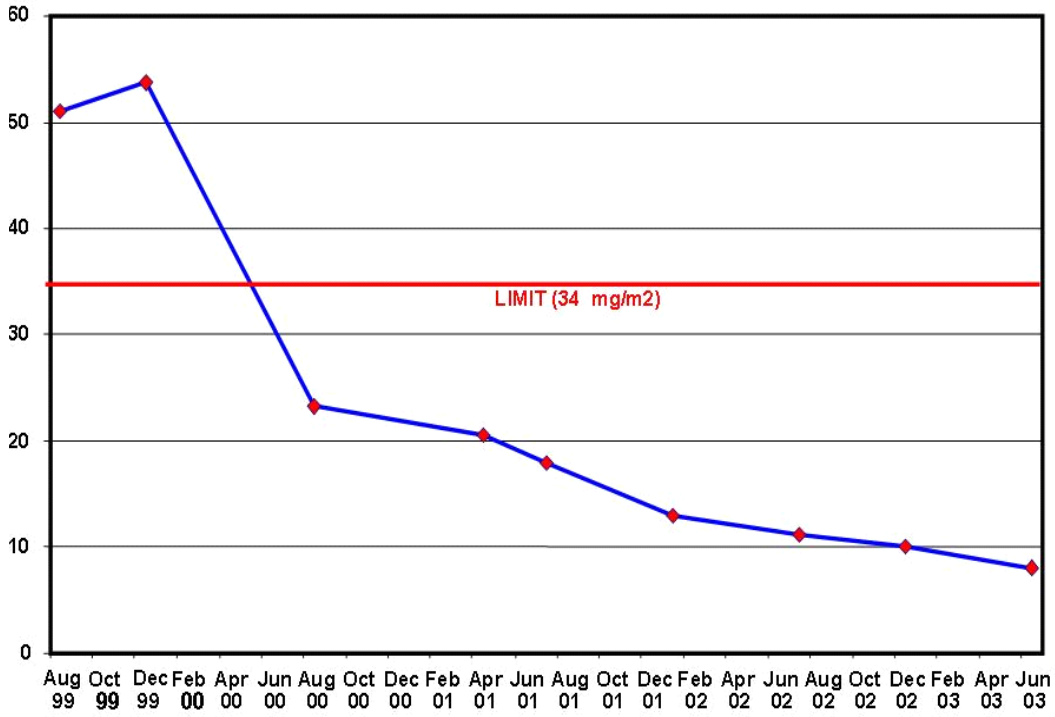
Figure 3.2: Local Air Quality Data from Metallurgical Activities in Torreón, Mexico, 1999–2003



Source: *Programa de Metales, Secretaría de Salud del Estado de Coahuila*, 1999–2003.

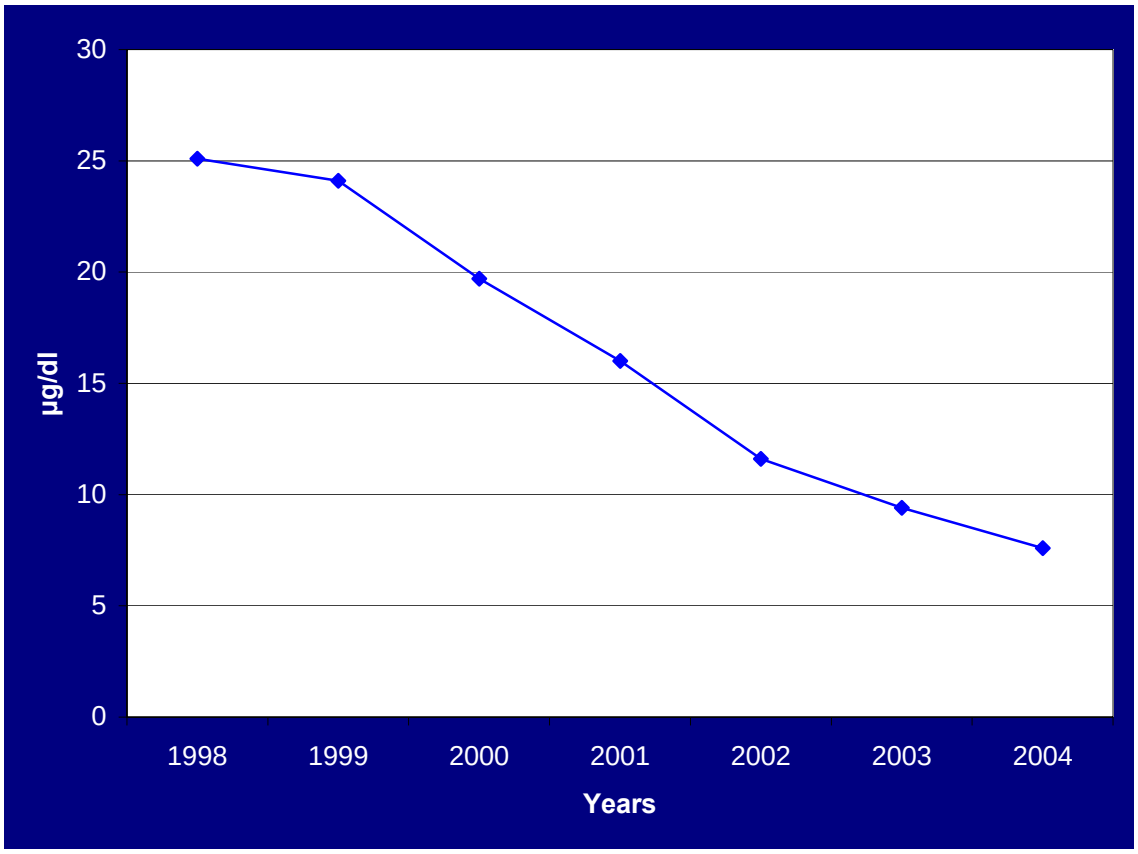
Note: Red line indicates level of the air quality standard for lead (NOM-026-SSA1-1993) =1.5µg/m^3.

Figure 3.3: Lead Content in Local Soil Samples Taken Around MET-MEX Peñoles, in Mexico, 1999–2003



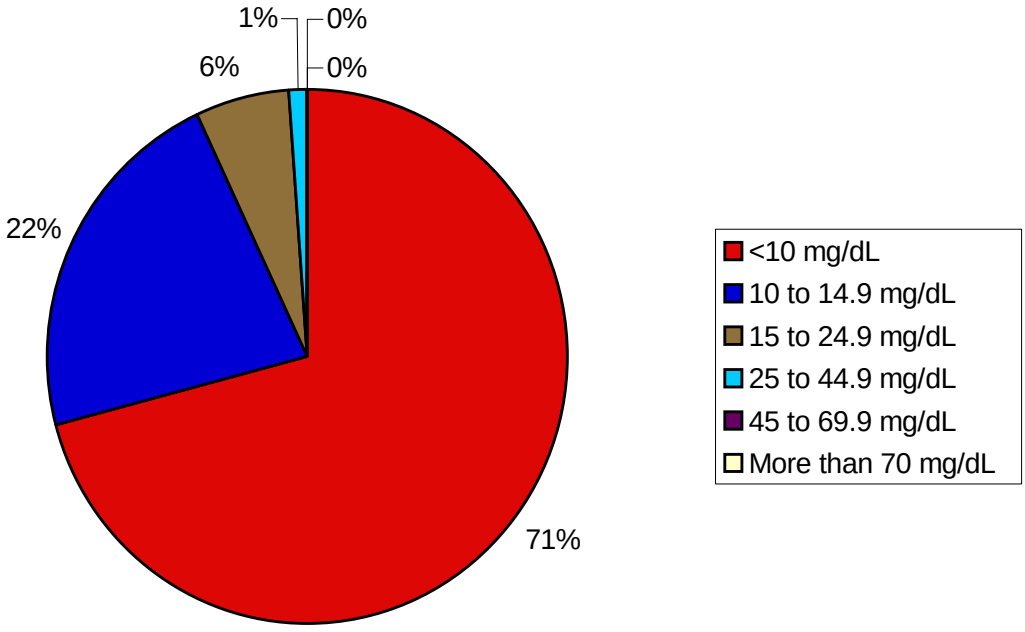
Source: *Programa de Metales, Secretaría de Salud del Estado de Coahuila*, 1999–2003.

Figure 3.4: Annual Average Blood Lead Levels in Children 15 and Under Who Participated in the Metals Program in Torreón, Mexico, 1998–2004



Source: *Programa de Metales, Secretaría de Salud del Estado de Coahuila, 1999–2003.*

Figure 3.5: Blood Lead Levels in Children, after Five Years' Participation in the Metals Program, in Torreón, Mexico



Source: *Secretaría de Salud* (SSA) Metals Program, 1999–2003

Key Observations

- The average concentration of lead in the air around the mine changed from nearly 8 µg/m^3 in April 1999 to less than 1 µg/m^3 in December 2003 (the limit under Mexican Official Standard (*Norma Oficial Mexicana*) NOM-026-SSA1-1993 is 1.5 µg/m^3). Starting in August 1999, lead concentrations remained below the official standard (Figure 3.2).
- The actions dictated by the environmental authorities enabled a decline in lead levels in both air and soil. Lead concentrations found in soil samples around the company Peñoles dropped from 50 mg/m^2 in 1999 to 9 mg/m^2 in 2003. Since 2000, lead concentrations have remained below the standard's limit of 34 mg/m^2 (Figure 3.3).
- In 1998 the annual average lead level in children's blood in the city of Torreón was 25 µg/dL; the average five years later had dropped to 10 µg/dL. These numbers are below the standard (NOM-199-SSA1-2000, Environmental health—levels of lead in blood and actions as health protection criteria for the non-occupationally exposed population) (Figure 3.4).
- After five years of operation of the Metals Program, the current situation may be deemed to no longer represent an environmental emergency, as the actions carried out have significantly reduced the population's blood lead levels (Figure 3.4).
- Figure 3.5 demonstrates that 70 percent of the child population that has been attended to since the start of the Metals Program now have blood lead levels below 10µg/dL (Figure 3.5).
- Although the population's blood lead levels have declined, the risks of exposure persist. Children's exposure to lead continues to be a public health problem (Figure 3.5).

3.2 Lead in the Home

The main cause of environmental exposure to lead in Mexico derives from the manufacture of pottery with glaze containing lead oxide. This artisanal craft is carried in 20 Mexican states, by approximately five million potters, many of whom are members of indigenous groups.

Pottery workshops are family businesses, employing all family members between 7 and 70 years of age. Each person participates in some part of the pottery production process, using techniques inherited over the generations and employing no personal protection whatsoever. This activity constitutes the main source of exposure for the child population.

Exposure to lead also comes from the use of lead glazed pottery. Studies have been conducted on urban populations, especially schoolchildren and reproductive age women, finding a significant association between high blood lead levels and the use of glazed ceramics to serve food and drinks.

Mexico does not have a representative value of blood lead levels in the general population. It therefore presents information on the number of pottery activities occurring in Mexico.

Figure 3.6: Communities with Pottery Activities by State, in Mexico, October 2001

Source: National Artisan Development Fund (*Fondo Nacional para el Fomento de las Artesanías*—FONART), Lead Program <http://www.cofepris.gob.mx/bv/libros/l31.pdf>.

Key Observations

- Much of Mexico's pottery production occurs in the heavily indigenously populated state of Chiapas in the south.
- Epidemiological studies have also found high lead levels among potters in Oaxaca, Michoacán and Jalisco.

3.3 Industrial Releases of Lead

To date, Mexico has no information for this indicator, due to the fact that the contributions of information from Mexican companies to the pollutant release and transfer register are currently voluntary and there are a small percentage of companies reporting. Legislation was enacted in 2001 for a mandatory, publicly accessible PRTR, and in June 2004 the implementing regulations were passed; thus Mexico will likely be in a position to furnish data for this indicator in future reports.

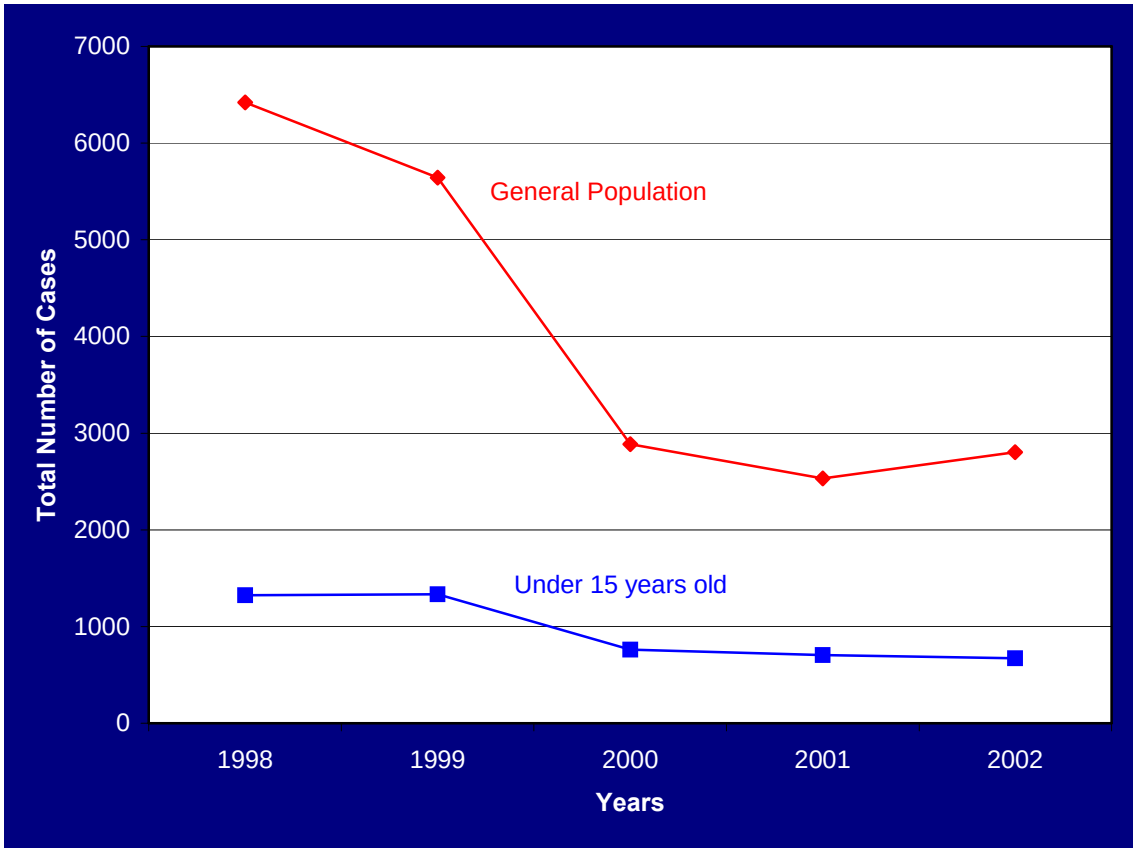
3.4 Industrial Releases of Selected Chemicals

To date, Mexico has no information for this indicator such contributions of information from Mexican companies to the pollutant release and transfer register are currently voluntary and there are a small percentage of companies reporting. Legislation was enacted in 2001 for a mandatory, publicly accessible PRTR, and in June 2004 the implementing regulations were passed; thus Mexico will likely be in a position to present information on this indicator in future reports.

3.5 Pesticides

Intoxication caused by toxic substances is not adequately recorded in Mexico. The only available information is on those cases caused by pesticides. As in the rest of Latin America, the most urgent problems of acute intoxication occurring in both workers and the general public are due to pesticide exposure. Publications are available on the chronic effects of organochlorine insecticide accumulation in human milk and adipose tissue, as well as the neurotoxic effects of certain organophosphorus insecticides and the pulmonary effects of certain dipyridil-like herbicides.

Figure 3.7: Cases of Pesticide Poisoning of Children (Under 15 Years Old) and the General Public in Mexico, 1998–2002



Source: *Secretaría de Salud* (Secretariat of Health) Centralized Epidemiological Information System (*Sistema Único de Información para la Vigilancia Epidemiológica*—SUIVE) <http://www.dgepi.salud.gob.mx/suave/index.htm>.

Key Observations

- The above figure shows that 6,422 pesticide poisonings were reported in 1998. A steady decline to 2,802 in 2002 was observed.
- As regards cases recorded in children under the age of 15, the number decreased from a high of 1,335 in 1999 to a low of 672 in 2002.
- It is believed that pesticide poisonings are under-recorded in Mexico for various reasons, including the relative inaccessibility of health services, under-reporting by physicians in private practice, lack of knowledge as to the real population at risk, inadequate diagnostic training for physicians visiting rural communities and lack of training in safe handling of toxic substances in the workplace.

4 Waterborne Diseases

Among the environmental and public health problems facing the country are those relating to inadequate basic sanitation and poor water quality. Furthermore, the availability of water for the growing human population is limited. The availability of reliable and safe water sources is fundamental to the protection of public health, since many diseases are caused by chemicals and pathogens found in contaminated water.

Water contamination is a health risk. Because of its social, economic, and political implications, water is one of the most fragile elements for the sustainable development of the social fabric.

The risks related to the degradation and scarcity of water may be classified as:

- those transmitted by water itself;
- those transmitted by waterborne vectors;
- those attributable to lack of water for personal and household hygiene;
- those transmissible by parasites or pathogens spending part of their life cycle in water; and
- the presence of chemicals in water.

Mexico has made substantial progress toward the goals set in the National Water Plan (*Plan Nacional Hidráulico*—PNH) for 1995–2000. The goals of providing access to drinking water, sewerage, and wastewater treatment services were amply met in urban areas, although in rural areas efforts fell somewhat short. Today, more than 95 percent of the drinking water supply is disinfected. This has led to a dramatic decrease in the number of gastrointestinal disease cases, and cholera has been eradicated.

Mexico has developed a practical water quality indicator (ICA) to describe the quality of its surface water. The ICA ranges from 0 (toxic) to 100 (pristine). The indicator is a composite of up to 18 variables (e.g., BOD, oxygen, coliforms, nutrients, and suspended solids). An extensive national monitoring network with 535 stations has been set up. Measurement frequency varies according to the importance of each station. Not all 18 parameters are measured at all stations.

The results published by the National Water Commission (*Comisión Nacional del Agua*—CNA) show that 78 percent of monitoring stations recorded an ICA of 50 or better in 2001. The proportion of water bodies with ICA less than 50 rose from 17 percent in 1998 to 23 percent in 2001. These figures may reflect the fact that the number of sewer hook-ups has increased faster than the rate of wastewater treatment.

Table 4.1: Water Quality of Mexican Water Bodies for 1998 and 2001

ICA range[a]	Water quality	Use	% of water bodies[b]	
			1998	2001
100-85	Excellent	All uses	4	6
84-70	Acceptable	Potable with conventional treatment	21	20
69-50	Slightly contaminated	Potable with advanced treatment	58	51
49-30	Contaminated	Not fit for most direct uses	13	16
29-0	Highly contaminated	Not fit for most direct uses	2	6
Off the scale	Presence of toxic substances	Not fit for most direct uses	2	1

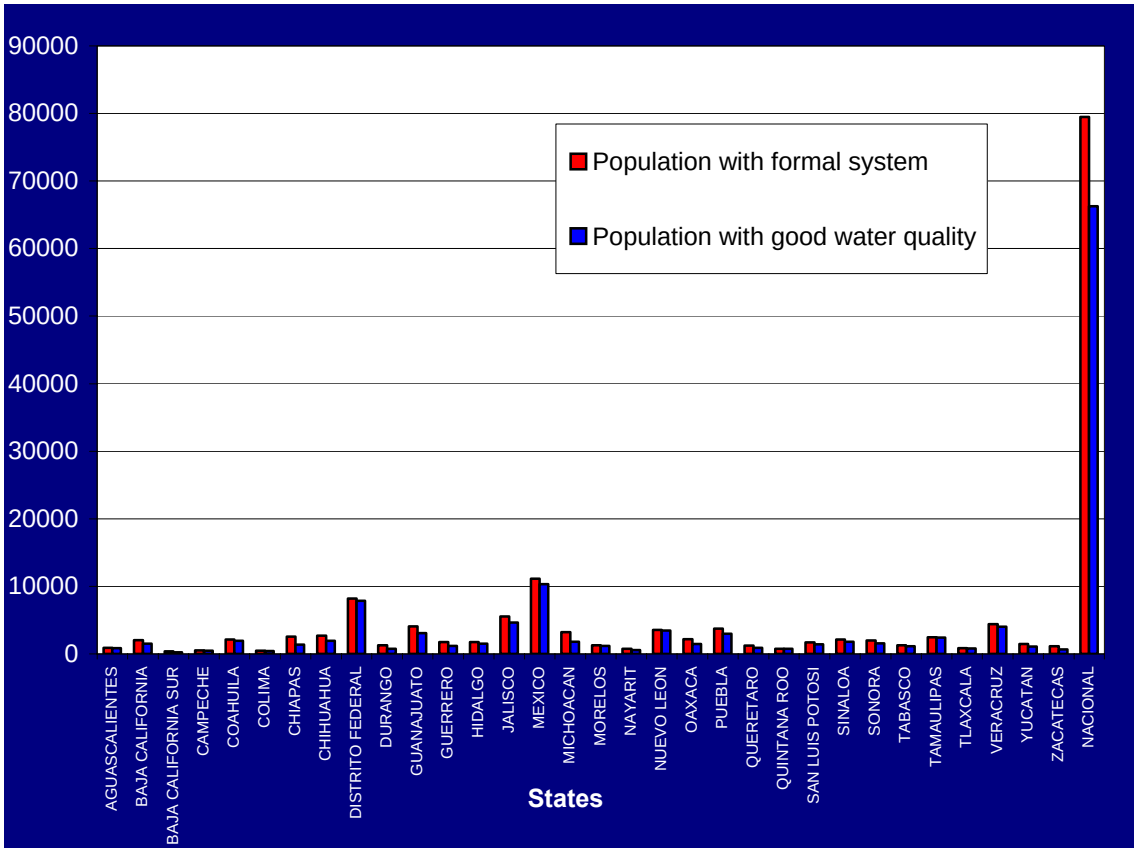
a) ICA = Mexican water quality indicator (*índice práctico de la calidad del agua*), a composite of 18 water quality parameters such as pH, BOD5, and suspended solids.
b) Measured in 535 surface water bodies of Mexico
Source: PNH 2001–2006.

4.1 Drinking Water

The treatment of water for human use and consumption assures the destruction of most pathogens transmissible to human beings.

Maintaining residual chlorination above 0.2 mg/L is effective in destroying pathogenic bacteria and viruses that reach the water supply system. Monitoring of water's bacteriological safety is achieved by ongoing periodic monitoring of free residual chlorine in the water supply system.

Figure 4.1: Segment of Mexico's Population (in Thousands) with Access to Bacteriologically Safe Water by State, 2003

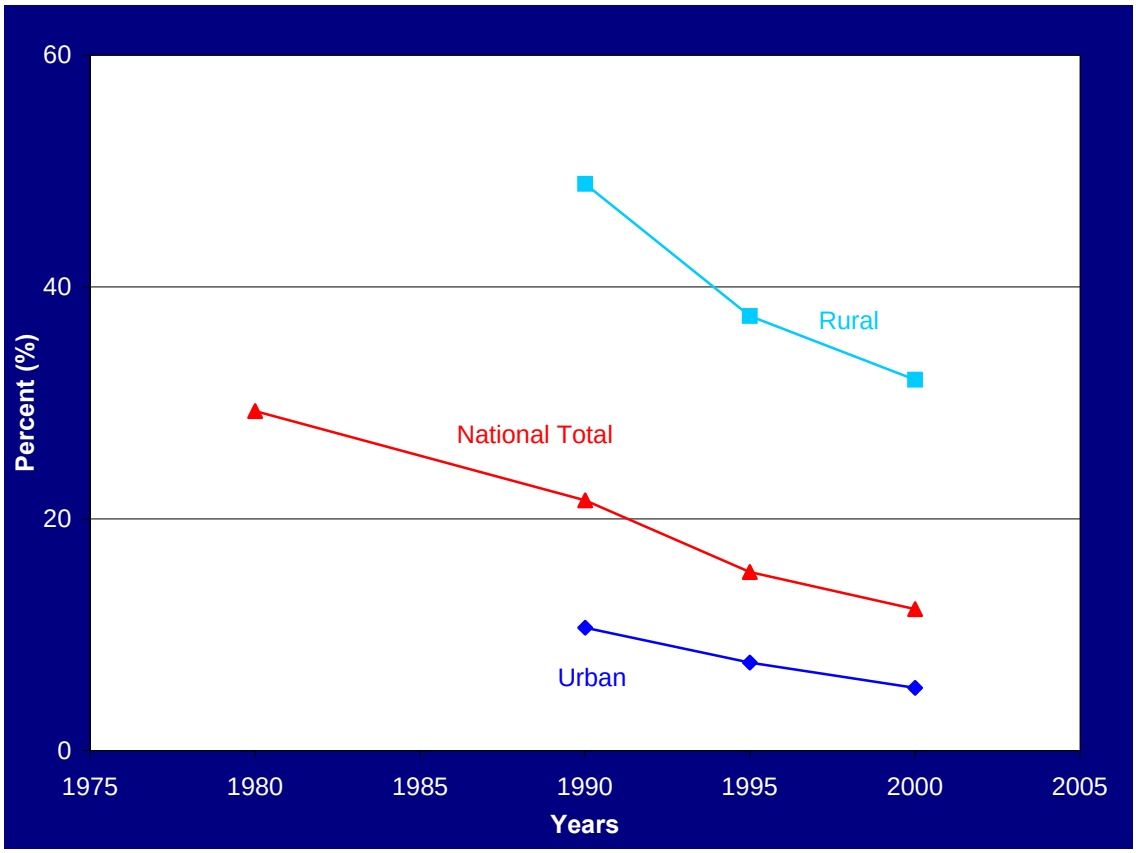


Source: Bacteriological Water Quality Program (*Programa de Agua de Calidad Bacteriológica*), Federal Commission for the Protection against Health Risks (*Comisión Federal para la Protección contra Riesgos Sanitarios*—Cofepris)/SSA

Key Observations

- The chart shows the proportional distribution of the population having access to bacteriologically safe water versus the population whose homes are equipped with formal systems for 2003.

Figure 4.2: Percentage of the Population without Potable Water, in Mexico, 1980–2000



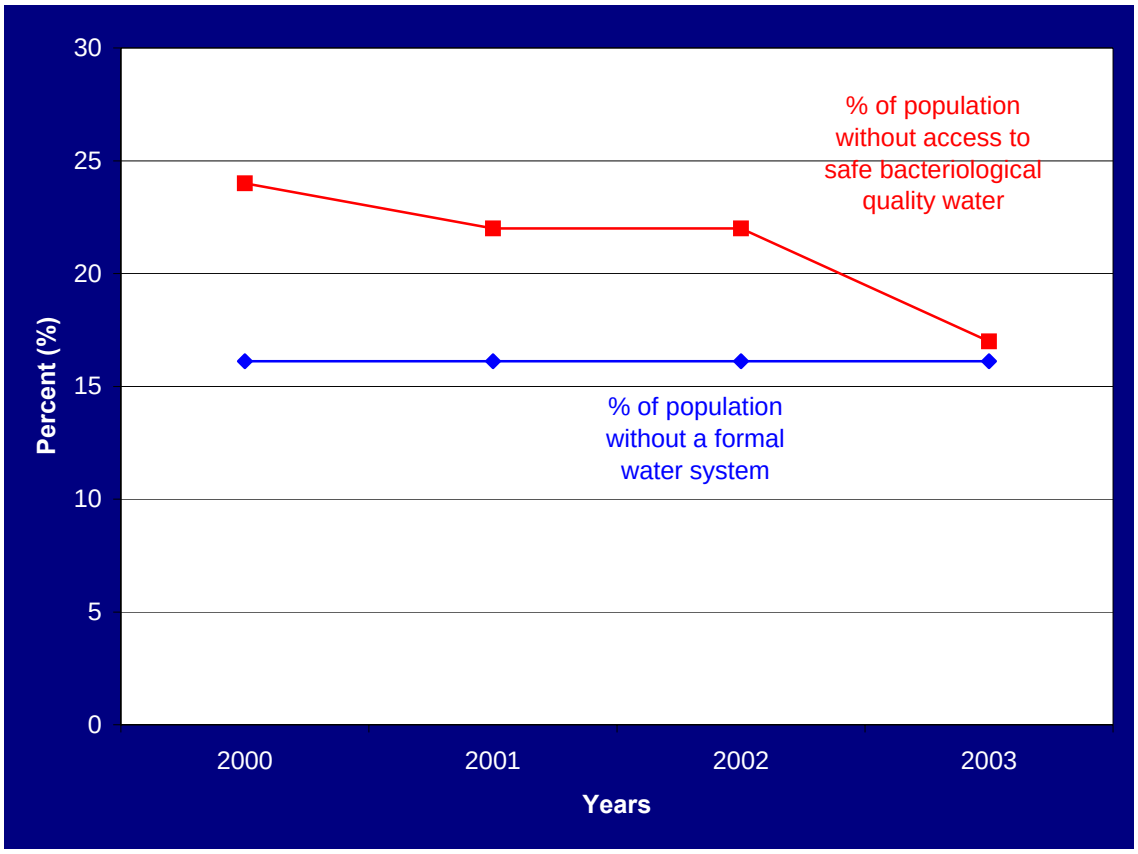
Source: Based on database of XII General Census of Population and Housing, 2000, *Instituto Nacional de Estadística, Geografía e Informatica* (National Institute of Statistics, Geography and Informatics—INEGI) <http://www.inegi.gob.mx/est/default.asp?c=703>.

Note: * There are no available separate data for urban and rural populations for 1980.

Key Observations

- The 1980 census reported only national figures. National data show a decrease from 29 percent to 12 percent of the general population without access to potable water in the period from 1980 to 2000.
- The percent of the population without access to potable water in urban areas decreased by 5.2 percent from 10.6 percent in 1990 to 5.4 percent in 2000.
- The percent of the population without access to potable water rural areas decreased by approximately 17 percent, from 48.9 percent in 1990 to 32 percent in the 2000 census.

Figure 4.3: Percentage of the Population without Access to Bacteriologically Safe Water, in Mexico, 2000–2003

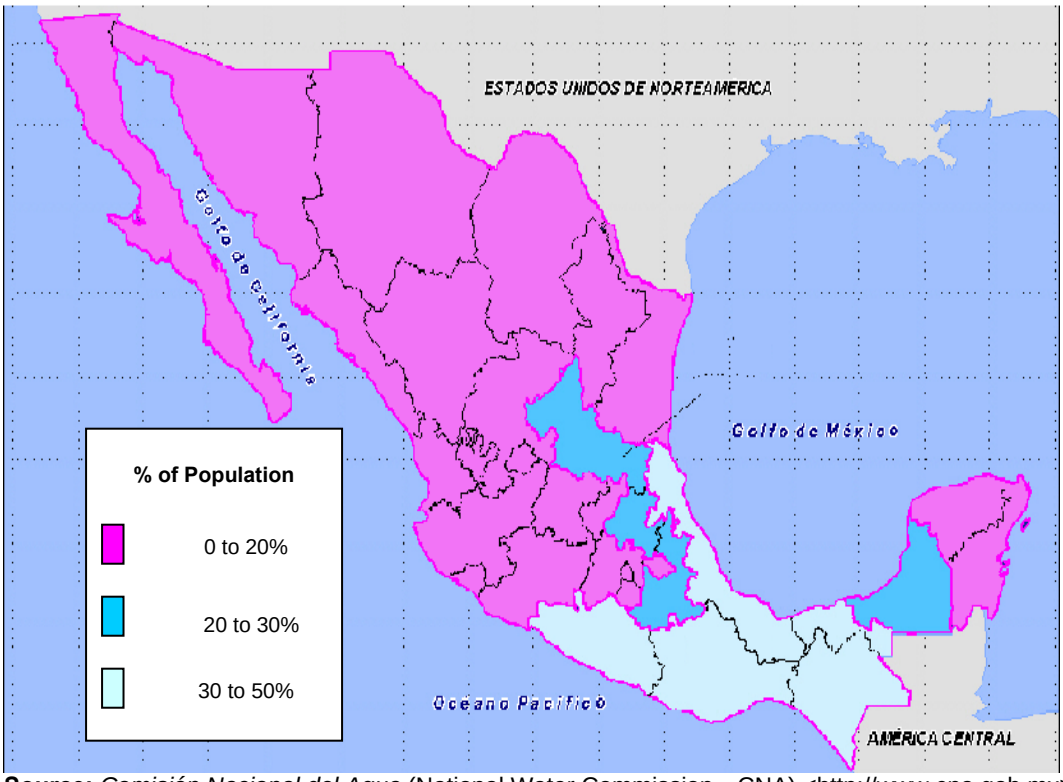


Source: Water Bacteriological Quality Program (*Programa de Agua de Calidad Bacteriológica*), Cofepris/SSA.

Key Observations

- The percent of the population without access to safe bacteriological safe water has decreased from 24 percent in 2000 to 17 percent in 2003
- The percent of the population without a formal water system has remained stable at 16 percent from 2000 to 2003.

Figure 4.4: Percentage of the Population without Piped Water, by State, in Mexico, 2000



Source: *Comisión Nacional del Agua* (National Water Commission—CNA) <http://www.cna.gob.mx>.

Key Observations:

- The highest percentage of Mexico's population without piped water supply is in the southern states, with 30 to 50 percent of the population without coverage.

4.2 Sanitation

In late 2002, approximately 76.4 million people had access to sewer services. Therefore, the PNH 1995–2000 goal for urban areas was attained, though progress in rural areas lagged seriously behind. In Mexico, the term *alcantarillado,* which translates directly as "sewer system," generally covers drainage systems, septic tanks, and direct drainage into furrows, ravines, or bodies of water; it is important to keep this in mind when making comparisons with other countries. Sewer coverage in Mexico is below the average for Latin America and the Caribbean as well as North America. Lack of access is marked in rural areas, especially in southeast Mexico.

Table 4.2: Drinking Water and Sewer Coverage in Mexico, February 2000
National Water Program, 2001–2006

Population type	Population in private dwellings (in millions)	Potable water		Sewerage	
		Million inhabitants	%	Million inhabitants	%
Urban	71.1	67.3	94.6	63.7	89.6
Rural	24.2	16.4	68.0	8.9	36.7
Total	95.3	83.7	87.8	72.6	76.2

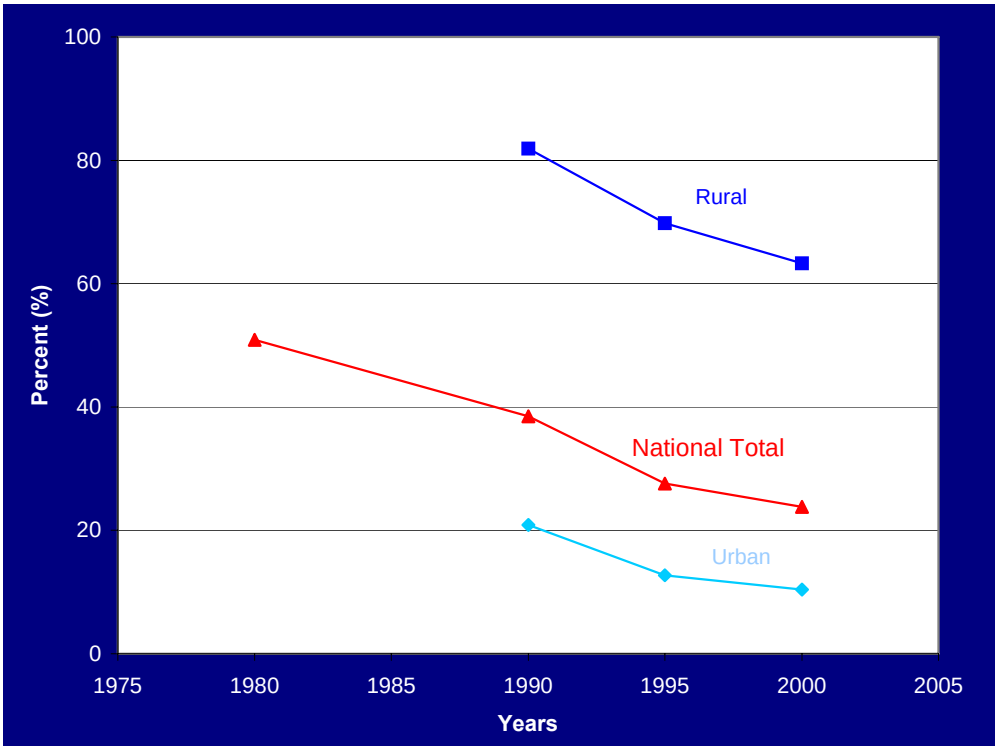
Source: Based on the database of the XII General Census of Population and Housing (*Censo General de Población y Vivienda XII, 2000)* INEGI 2000

Note: The census estimated the total population at 97.4 million, of whom 2.1 million lived in collective housing and it is unknown whether or not they have access to the service.

Key Observations

- A little over 72.6 million people had access to sewer services in 2000, approximately 76 percent of the population. This includes 63.7 million in urban areas and 8.9 million in rural areas. These figures include hook-ups to drainage systems (81 percent), septic tanks (15 percent) and other types of drainage. The number of persons without hook-ups fell from 32.3 to 22.7 million during the same period.

Figure 4.5: Percentage of the Population Not Served with Sewer Services, in Mexico, 1980–2000



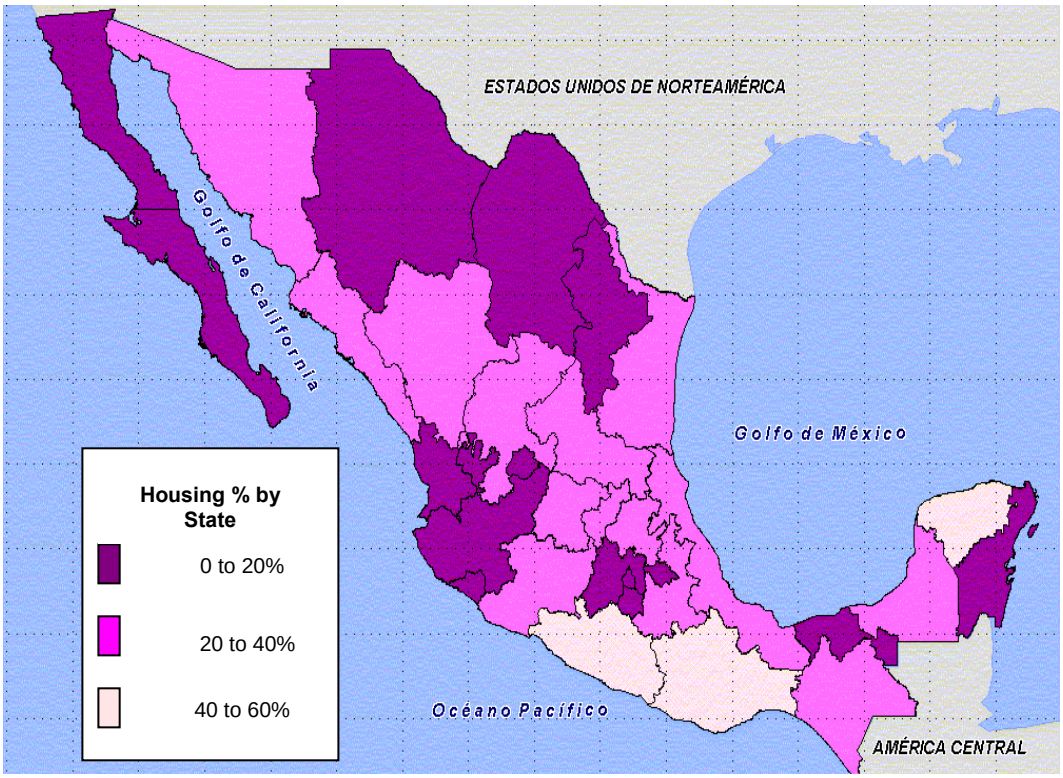
Source: Based on database of XII General Census of Population and Housing, 2000, *Instituto Nacional de Estadística, Geografía e Informatica* (National Institute of Statistics, Geography and Informatics—INEGI) <http://www.inegi.gob.mx/est/default.asp?c=703>.

Note: * Data for 1980 for urban and rural populations not available.

Key Observations

- The population without sewer service coverage decreased approximately 27 percent nationally, from 50 percent to 23 percent as reported in the 1980 and 2000 censuses respectively.
- Urban areas not covered by sewer services decreased from 21 percent to 10 percent, between 1990 and 2000 census data.
- Rural areas without sewer service coverage decreased by approximately 19 percent, from 82 percent in the 1990 census to 63 percent in the 2000 census.

Figure 4.6: Percentage of Homes without Sewer Services, by State, in Mexico, 2000



Source: XII General Census of Population and Housing, 2000, *Instituto Nacional de Estadística, Geografía e Informatica* (National Institute of Statistics, Geography and Informatics—INEGI) <http://www.inegi.gob.mx/est/default.asp?c=2417>.

Key Observations:

- According to the INEGI population and housing census for 2000, the number of inhabitants with sewer services is 72,654,381, or 74 percent of the country's total population. This means that one of every four inhabitants does not have sewer services. The number of homes with sewer services is 10,202,934, representing 63 percent of the country's total. This means that one of every three homes does not have such service.
- The majority of homes without sewer services are located in southern Mexico, with 40 to 60 percent of households without coverage.

4.3 Waterborne Diseases

According to the World Health Organization, 80 percent of gastrointestinal infections and parasitic diseases and one-third of deaths caused by these are due to the use and consumption of unsafe water. The WHO also acknowledges that only 41 percent of the world's population drinks treated water that is sufficiently disinfected as to be considered safe.

Among the main environmental aspects that traditionally influence the causes of disease and death in our country are:

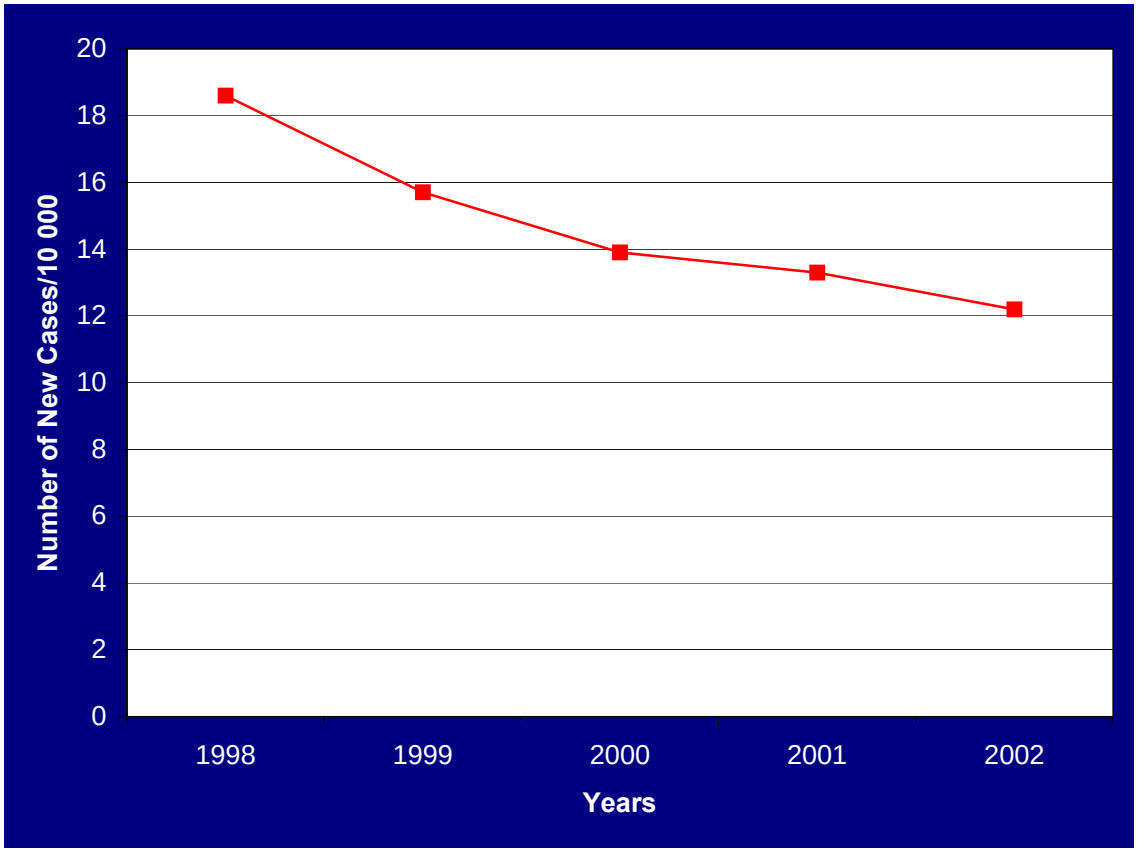
- Poor water quality for human use and consumption
- Inadequate disposal of human waste
- Inadequate municipal solid waste management
- Deficient pest control
- Poor hygiene conditions in dwellings and public spaces

The history of humanity has witnessed numerous disease outbreaks related to water, overcrowding, and deficient environmental conditions. These have been characterized by their high prevalence, high mortality, widespread nature, or unusual characteristics.

In countries like Mexico, diarrheal diseases continue to be a serious problem in children. These diseases are caused by bacteria, viruses, or pathogenic protozoa. They are spread via the fecal-oral route and are potentially transmissible through water used for various activities in the home, including personal hygiene, as well as through primary contact with contaminated recreational waters.

A key challenge for Mexico is to halve the population that lacks access to safe drinking water and basic sanitation services. In late 2001, 10.8 million people (including 7.5 million in rural areas) did not have piped water supply. More than 22 million still lack access to any form of sanitary drainage. Access to basic services such as clean water, sanitation, electricity, health care, and education in less-developed regions is considerably lower than the national average.

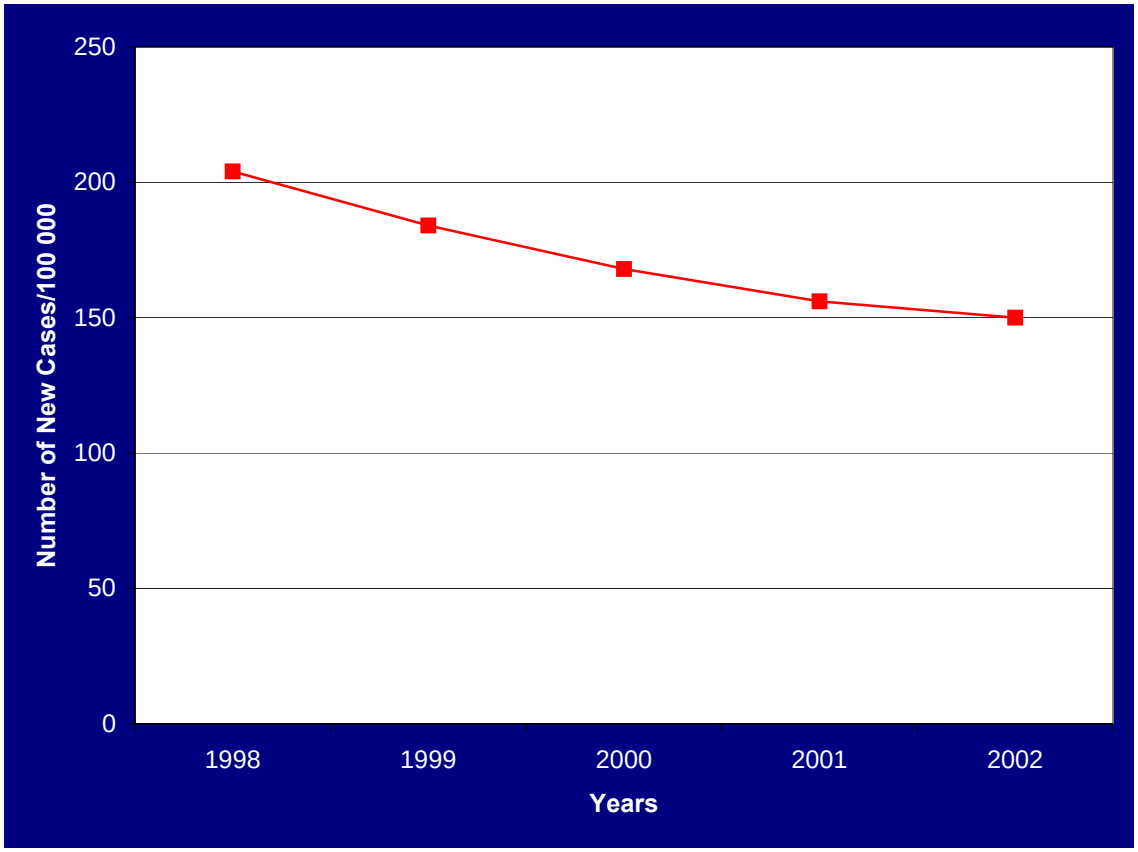
Figure 4.7: Incidence of Shigellosis in Children under the Age of Five, in Mexico, 1998–2002



Key Observations:

- Further to the measures taken to improve water quality, the chart shows that the national incidence of shigellosis in children under the age of five declined from 18.6 per 10,000 children in 1998 to 12.2 in 2002.

Figure 4.8: Incidence of Giardiasis in Children under the Age of Five, in Mexico, 1998–2002

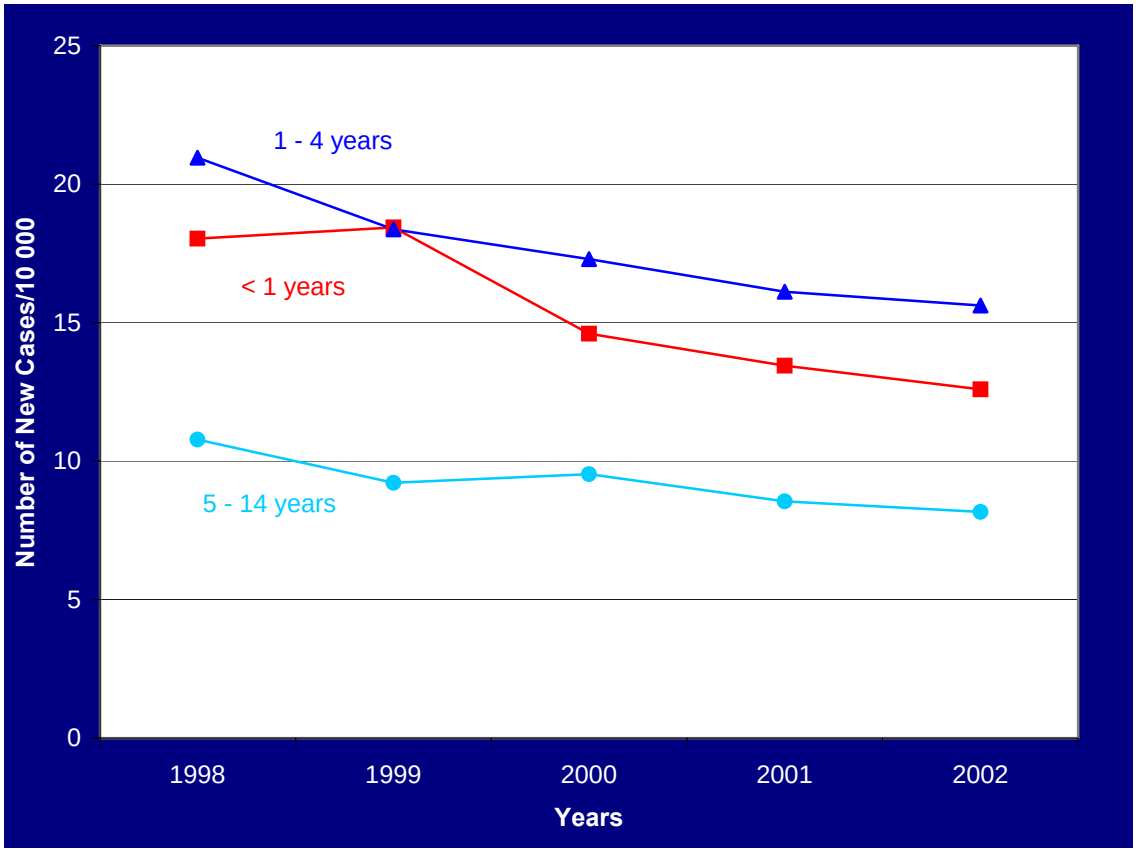


Source: *Secretaría de Salud* (Secretariat of Health) Centralized Epidemiological Information System (*Sistema Único de Información para la Vigilancia Epidemiológica*—SUIVE) <http://www.dgepi.salud.gob.mx/suave/index.htm>.

Key Observations:

- As in the previous chart, the water quality improvement measures had an impact in decreasing the national incidence of this disease in children under the age of five; this chart shows that the incidence dropped from 204 per 100,000 in 1998 to 150 in 2002.

Figure 4.9: Incidence of Giardiasis among Children, by Age Group, in Mexico, 1998–2002

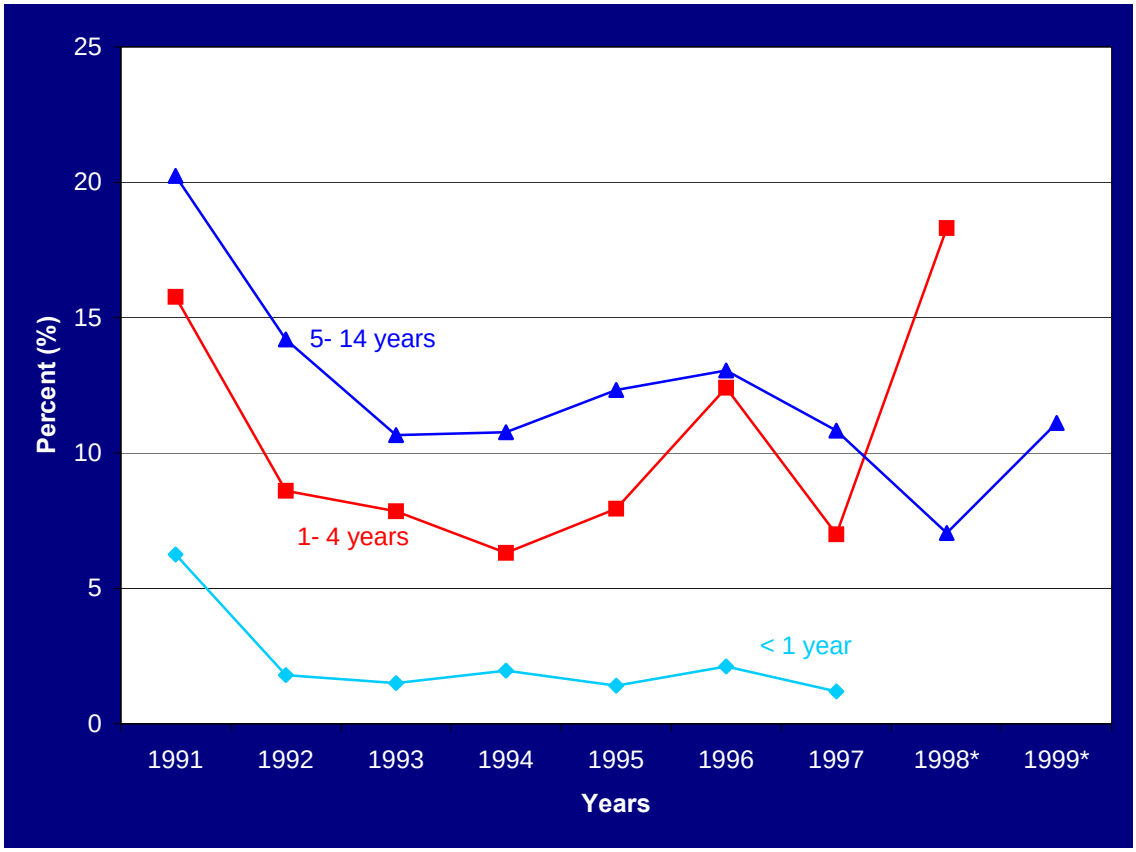


Source: *Secretaría de Salud* (Secretariat of Health) Centralized Epidemiological Information System (*Sistema Único de Información para la Vigilancia Epidemiológica*—SUIVE) <http://www.dgepi.salud.gob.mx/suave/index.htm>.

Key Observations:

- The epidemiological evidence of giardiasis demonstrates that the most vulnerable group is that of the 1 to 4 years olds, showing a rate of incidence per 10,000 children for 1998 of 21 and diminishing to 16 for 2002.
- In the group of children below one year of age, the measures implemented for the diarrhea programs have decreased the incidence of giardiasis, from 18 to 13 per 10,000 children for 1998 and 2002 respectively.
- The incidence of giardiasis among 5 to 14-year-olds has dropped from 11 cases per 10,000 children in 1998 to 8 cases per 10,000 children in 2002

Figure 4.10: Percentage of Cases of Cholera among Children, by Age Group, in Mexico, 1991–1999



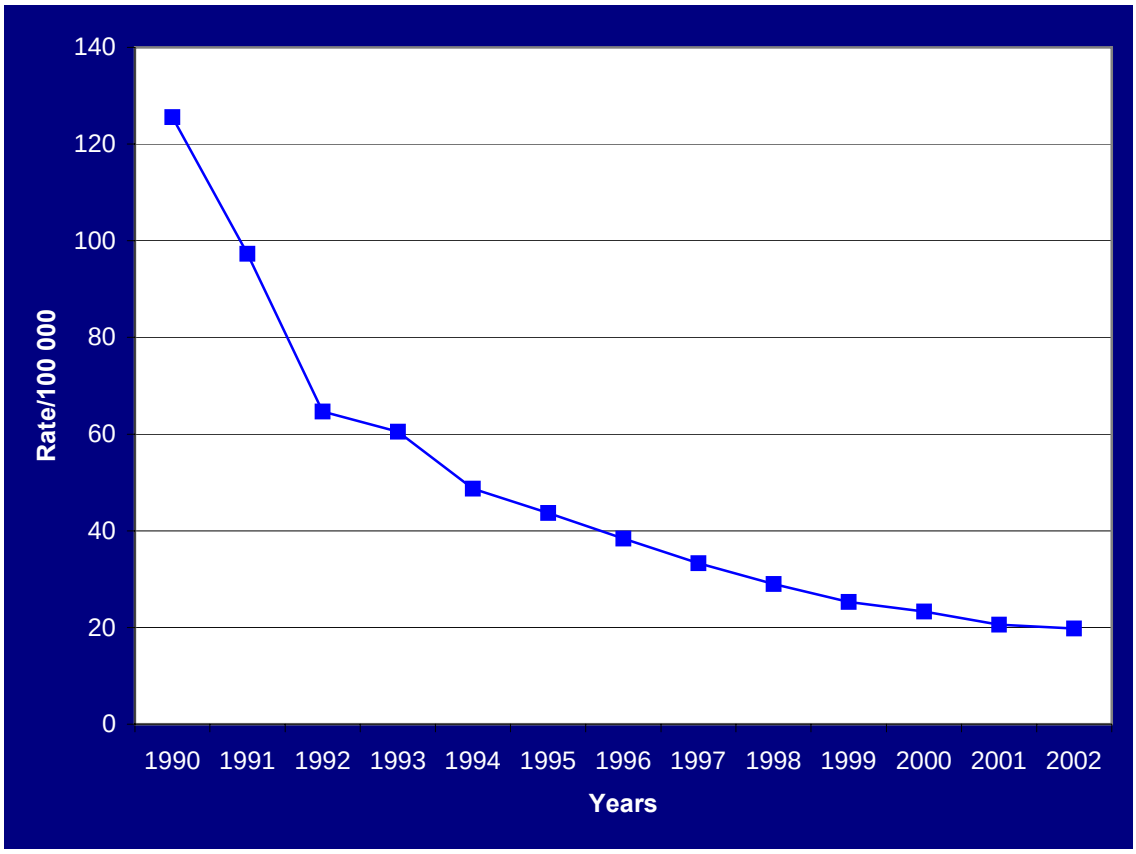
Source: *Secretaría de Salud* (Secretariat of Health) *Dirección General de Epidemiología. Manual de Vigilancia Epidemiológica de Cólera* (Epidemiological Oversight Manual for Cholera). <http://www.dgepi.salud.gob.mx/suave/index.htm>.

Note: * Data for children under one year old not available for 1998 or 1999, nor for one to four year olds for 1999.

Key Observations

- In the period from 1991 to 1998, children under one year of age had the lowest percentage of cases of cholera, with a general downward trend. No cases have arisen in this age group since 1998.
- The age group most affected by cholera is from one to four years of age, with the percentage of cases ranging from 6 percent to 18 percent of all cases.
- Cholera declined for the 5–14-year-old age group from 20 percent in 1991 to 7 percent in 1998. The growing availability of disinfected drinking water and the prevention measures to limit cholera outbreaks were effective in controlling this public health problem.

Figure 4.11: Mortality Rate from Diarrheic Diseases in Children under five, in Mexico, 1990–2002

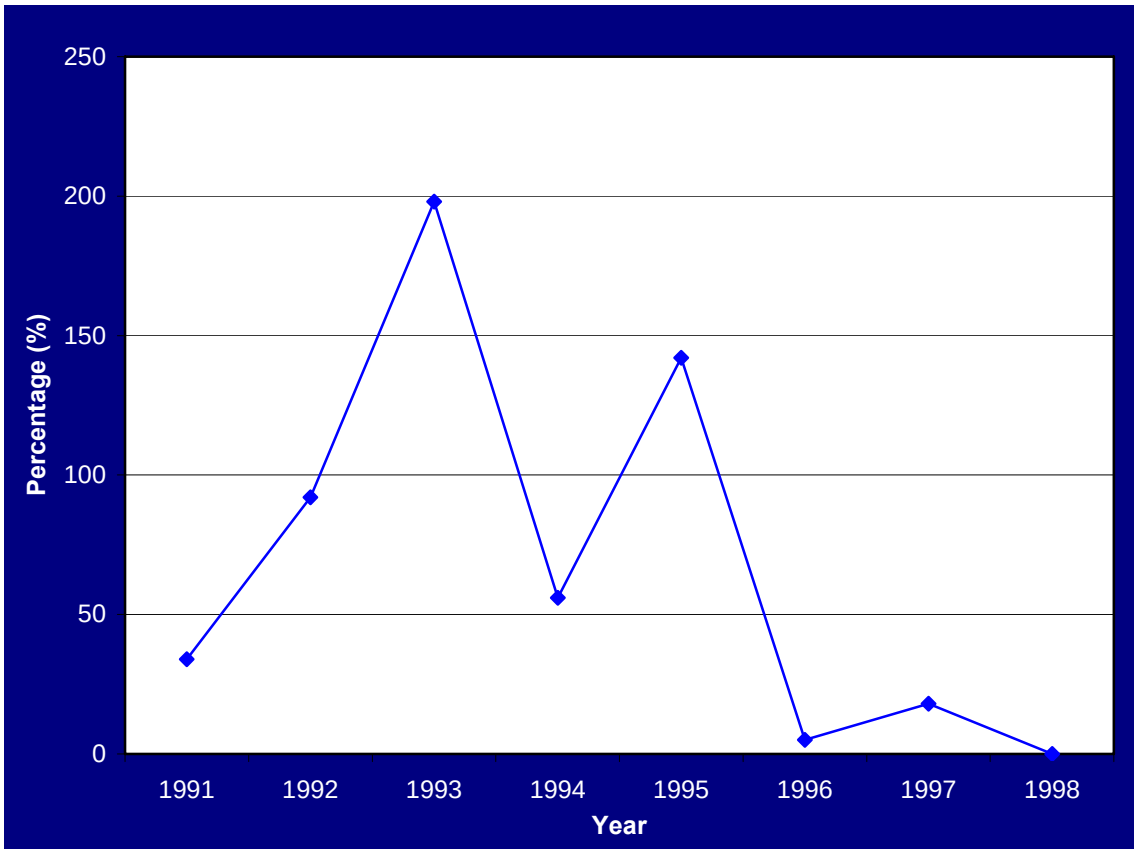


Source: INEGI, DGE, SSA. Statistical Information Bulletin 1990–2002.

Key Observations:

- The rate of mortality from diarrheic disease per 100,000 inhabitants under five decreased from 125.6 in 1990 to 33.32 in 1997, representing a reduction of 73.5 percent. This was above the original goal of 50 percent as stated in the World Children's Summit. By 2002, the mortality rate for children under five decreased to 20 per 100,000 inhabitants. This is primarily due to specific healthcare actions and the actions of other sectors, principally education and basic sanitation. It should be noted that the phenomenon is worse in marginalized urban and rural areas.

Figure 4.12: Mortality from Cholera in the General Population in Mexico, 1991–1998



Source: SSA National Cholera Oversight Program (*Programa Nacional de Vigilancia del Cólera*)

Key Observations:

- Recent decreases in mortality due to cholera (23 deaths over the period of 1996–1998 compared to 34 deaths in 1991 the lowest previous year) reflect prevention measures and the control of cholera dissemination managed under the Epidemiological Oversight Manual for Cholera created by the Secretariat of Health, and the health authorities' and field workers' flagging of the pandemic.
- The highest rate of mortality from cholera was in 1993 with 198 deaths.

5 Opportunities for Improvement

Outdoor Air Pollution

Opportunities for improvement:

Finding ways in which Mexico's air quality monitoring network can support the future development of a population-based exposure indicator for outdoor air pollution is one area of opportunity. More information is needed on how pollutants that are monitored currently disperse in the environment, as this will be important to extending the estimates of exposure in regions where no monitoring exists. In addition, efforts to expand monitoring to include $PM_{2.5}$ and other air pollutants of concern to human health and, in particular, children's health, would be worthwhile. Data on population exposures are not available at this time; thus efforts to generate this indicator will require the development of methods to combine census data with air quality data.

Indoor Air Pollution

Opportunities for Improvement:

Work is underway in Mexico to develop a more direct measure of the percentage of children who are exposed to un-vented emissions from wood and charcoal use in the home. This indicator could provide further information on the regional distribution of these exposures in Mexico. In this report, Mexico presents some information on the exposure of children to environmental tobacco smoke (ETS) in the home. The ability to present a more complete ETS indicator in future reports will require increased monitoring, especially in the age groups most susceptible to adverse health effects from ETS exposure, from birth to three years. Further improvements could include the use of bio-monitoring of blood cotinine levels, coupled with additional information on socio-economic factors.

Asthma

Opportunities for Improvement:

Data from Mexico's National Epidemiological Surveillance System is used in presenting the indicators in this section. Information on incidence and prevalence of respiratory conditions presented is collected through the medical system, thus access to medical care is an important factor in the collection of this information. Work to improve the consistency of definitions and the diagnosis of these respiratory conditions is ongoing.

Blood Lead

Opportunities for Improvement:

Numerous studies have investigated blood lead in children and adults in Mexico. While these studies provide insights into lead exposures they do not provide nationally representative data on blood lead levels in children. National blood lead data from direct measures would provide better information on children's exposures to lead, which could be used to identify populations at increased risk.

Lead in the Home

Opportunities for Improvement:

Children who live or work in close proximity to lead-based glazes are at increased risk of lead exposure, as are children who eat food that has come in contact with lead-based pottery glaze. The availability of national blood lead data would improve the identification of home-based exposure to lead-based glazes and aid in targeting preventive actions.

Industrial Releases of Lead

Opportunities for Improvement:

Lead is among the pollutants currently listed for reporting under *Mexico's Registro de Emisiones y Transferencia de Contaminantes* (RETC). As the mandatory RETC system becomes

operational, Mexico will likely be in a position to report industrial emissions of lead in future reports.

Industrial Releases of Other Chemicals, Including Pesticides

Opportunities for Improvement:

Mexico's pollutant release and transfer register tracks a number of pollutants in common with those tracked by Canada's National Pollutant Release Inventory (NPRI) and the United States' Toxics Release Inventory (TRI). Ensuring comparable reporting thresholds for those substances will be important in enabling tri-lateral comparability of data on industrial releases of selected chemicals. Future efforts could also focus on increasing the number of chemicals reported in common across North America.

Pesticides

Opportunities for Improvement:

Mexico will review the availability of organophosphate pesticide residue measurements on fruits and vegetables to determine the feasibility of reporting on this indicator in the future. Surveillance programs for pesticide use as well as bio-monitoring programs may also be explored in preparation for future reports.

Drinking Water

Opportunities for Improvement:

Mexico continues to increase the percentage of the population served with treated water. Measuring access to potable water for rural and remote communities will be considered as a possible focus for future indicators. Data tracking violations of water quality standards would contribute to improved reporting of indicators in this area for future reports.

Sanitation

Opportunities for Improvement:

The availability of sewer services as a means of reducing exposure to contaminants has been an important step in the management of waterborne diseases in Mexico. Indicators in future reports can be improved by measuring the availability of sewage treatment. Furthermore, it is important to measure the lack of availability of sewer services and sewage treatment for children. Differentiating among levels of treatment would be useful in tracking efforts to prevent source water contamination.

Waterborne Diseases

Opportunities for Improvement:

Efforts to ensure that diseases associated with waterborne morbidity and mortality are differentiated from other sources such as food are a part of the ongoing efforts to improve this indicator. Future efforts may include the measurement of additional waterborne diseases and/or priority chemicals of concern to children's health for which indicators can be developed.

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Appendix 1 Health of Indigenous Peoples

The Mexican population consists of approximately 10 percent indigenous peoples (one of the criteria for determining whether individuals or communities are indigenous or not is whether they refer to themselves as indigenous). There exist more than 50 ethnic groups and various languages and dialects. Nearly 72 percent of the indigenous population lives in southern and southeastern Mexico. The indigenous communities tend to be socially and economically marginalized with little access to basic environmental, health, and education services.

Frequently, areas with indigenous settlements have high environmental value and biodiversity. Indigenous communities are located in and around more than 30 percent of Mexico's main protected areas. The population of marginal (e.g., extremely arid or mountainous) lands is more than 50 percent indigenous. Nearly 90 percent of the forest resources of the state of Oaxaca are situated on land where indigenous communities are located.

In 1995, the indigenous population was estimated at 9.17 million. The growth rate was 1.23 percent with respect to 1990, nearly half that of the rest of the population (2.13 percent). The life expectancy at birth of indigenous people was estimated for 1995 at 69.5 years (67.6 for men and 71.5 for women), more than three years lower than the rest of the population. The infant mortality rate is nearly double that of the country as a whole (54 versus 29 deaths per 1,000 live births). The average number of children born to indigenous women was 4.1, versus 2.9 for non-indigenous women.

In 1995, the potential years of life lost (PYLL) per capita for the three main groups of causes of death showed premature mortality of 19.0 years for indigenous men versus 15.3 for non-indigenous men, and corresponding figures of 15.4 and 11.2 for women. There are differences between indigenous peoples that have yet to be sufficiently explained. For example, a lower rate of infant mortality is found for mothers who speak Chontal (33 per 1,000 live births), Maya (36), Chinanteco (40) and Zapoteco (40) as compared with those who speak Chatino (77), Popoluca (79), Tarahumara (79), Tepehuán (80), Tzotzil (81) and Tojolabal (87). Differences in the number of children are also found, with a minimum of 3.7 for Chontal speakers and a maximum of 4.5 for Tojolabal speakers.

Semarnat's special program for indigenous peoples promotes the sustainable use of natural resources and the conservation of biodiversity in areas where indigenous people live. It values their traditional knowledge and protects their intellectual property rights. Indigenous communities participate in drafting, implementing, and evaluating plans and programs that may affect them directly (e.g., land use planning, designation of protected natural areas and/or national parks, ecotourism projects).

Public authorities, NGOs and indigenous communities have formed corporations to promote innovative models of production and mobilization for indigenous communities, combining traditional values with modern technology and marketing. Successful examples include organic agriculture, coffee cooperatives, community-owned forestry companies, and natural/cultural tourism.

Appendix 2 Components of the National Surveillance System

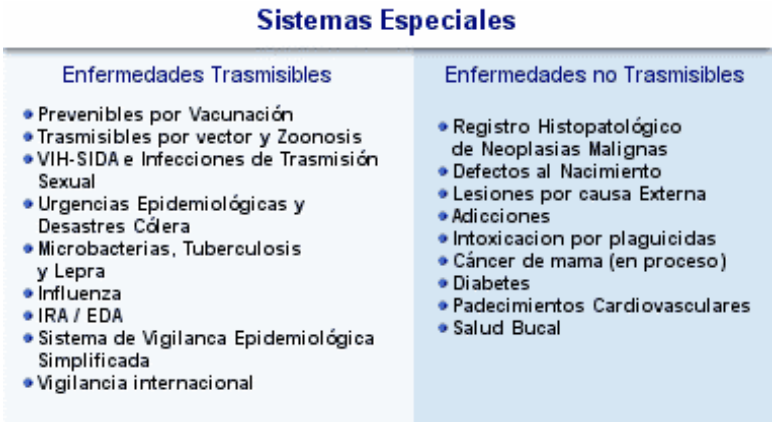
CONAVE-CEVE The National Committee for Epidemiological Surveillance is a national standards body that facilitates, promotes and guides the country's epidemiological work. It is composed of the directors of each institution of the SNS. In each state of the Republic, CONAVE is represented by another collegiate body called the State Committee for Epidemiological Surveillance (CEVE) that coordinates the state-level efforts of all the institutions. It is composed of the directors of each SNS institution in that state.

SIGMESA The Mexican Georeferenced Health Information System is an information tool that provides morbidity and mortality data from the municipal to the national level in the form of thematic maps based on the digital cartography of Mexico.

Rhove The Hospital Epidemiological Surveillance Network operates in general and specialty hospitals to cover the information requirements regarding reportable diseases and nosocomial infections. It currently operates in more than eighty hospitals and in the National Health Institutes.

SEED The Epidemiological and Statistical Death Reporting System compiles death certificate information with the objective of keeping a record of causes of death. This makes it possible to detect risks and take timely action to prevent the public from dying from such causes.

Special systems There are diseases which, because of their magnitude, consequence, characteristics, or the severity of the harm they cause, are given special attention by SUIVE. For epidemiological surveillance of these diseases, SUIVE has special information systems and specific operational strategies.



Communicable diseases	Non-communicable diseases
Vaccine-preventable	Histopathological Registry of Malignant
Vector-borne and zoonotic	Neoplasias
HIV-AIDS and STDs	Birth defects
Epidemiological emergencies and cholera outbreaks	External lesions
	Addictions
Microbacteria, tuberculosis and leprosy	Pesticide intoxication
Influenza	Breast cancer (in process)
ARI/ADD	Diabetes
Simplified Epidemiological Surveillance System	Cardiovascular diseases
International surveillance	Oral health

Suilab The Unified Laboratory Information System is an automated laboratory system for the identification of clinical or environmental samples or isolations from the local level. It makes it possible to maintain the confidentiality and continuity of the diagnostic process at all stages of analysis of the sample through the use of advanced technology. This ensures efficacy in the delivery of quality results. The system also generates searchable historical data. Suilab is composed of 3 modules: NETLAB records and tracks samples and allows for Internet transmission of results; the Internal Laboratory Information System (SILAB) tracks, captures and produces results from the various laboratories; and the National Public Health Laboratory Performance Information System tracks the performance of the laboratory network. Suilab is a modern system whose design and implementation is based on cutting-edge technology.

Appendix 3 Indicator Templates

Percentage of days that exceed the Imeca air quality index in Mexico, 1999–2002	**Type of indicator: Exposure**
INDICATOR 2.- Description	
Definition	Mexico presents annual average peak levels of ground-level ozone concentration for five major cities in the country from 1990 to 2002; and mean annual concentrations for PM_{10} for the same period and cities. Mexico, like other countries, has developed more easily understandable pollution indices. Mexico uses the Metropolitan Air Quality Index (*Índice Metropolitano de la Calidad del Aire*—Imeca*), whereby each pollutant's concentration under the Air Quality Standard is equal to 100 Imeca points. *Imeca: Converts pollution levels to a number on a numerical scale (see below, "Computation"), so that the population-at-large can understand it.
Rationale and role	This is an indirect measure of exposure to air pollution at levels that may cause negative health effects, such as asthma and other respiratory illnesses.
Data Range	1999–2002
Data sources, availability and quality	National Institute of Ecology (*Instituto Nacional de Ecología*—INE) through the National Air Quality Information System (*Sistema Nacional de Información de la Calidad del Aire*—Sinaica) Valley of Mexico City Metropolitan Environment Commission (*Comisión Ambiental Metropolitana del Valle de México*—CAM)
Units of measurement	Parts per billion (ppb) for ground-level ozone and $\mu g/m^3$ for PM_{10} (for Figure 2.3, the percentage of days [y-axis values] is calculated from Imecas)
Computation	Air quality per annual average for ground-level ozone and PM10 for each year during the period 1990 to 2002. Imeca index: An Imeca score of 100 points represents air quality within the Mexican Official Standard (*Norma Oficial Mexicana*—NOM) for a given pollutant. Multiples of 100 are developed through simple algorithms, taking into account environmental health criteria. *Imeca score* — *Air quality* 100 — Satisfactory 101–200 — Unsatisfactory 201–300 — Poor 301 or more — Very poor First, the average is determined by dividing the total number of days that air quality was deemed **Satisfactory**, **Unsatisfactory**, **Poor** or **Very Poor** under by the Imeca index, by the total number of days in the year. Then, the percentage of averages exceeding the levels per standard is calculated for each.
Sources of further information	INE: http://www.ine.gob.mx CAM: http://www.edomexico.gob.mx/se/cam.htm Sinaica: http://www.sinaica.ine.gob.mx.
Scale of application	Metropolitan areas: Valley of Mexico City (Mexico City and surrounding areas); Guadalajara; Monterrey; Valley of Toluca; Ciudad Juárez; Tijuana-Rosarito; Mexicali.

Useful references	Secretariat of the Environment and Natural Resources (*Secretaría de Medio Ambiente y Recursos Naturales*—Semarnat): http://www.semarnat.gob.mx
Strengths of the Indicator	Monitoring information includes the country's primary metropolitan areas.

Metropolitan areas with air quality programs including air monitoring, Mexico, 2004	**Type of indicator: Exposure**
INDICATOR Description	
Definition	Metropolitan areas with air quality improvement programs (*programas de mejoramiento de la calidad del aire*—Proaire): Includes short- and medium-term goals to improve air quality and identify specific responsibilities for industry and the transportation sector. Environmental Monitoring Network (*Red de Monitoreo Ambiental*): Series of automatic or manual tracking stations to collect, analyze and systematically monitor environmental air samples.
Rationale and role	Map shows the principal metropolitan areas with an Environmental Monitoring Network, enabling the location of such areas in national territory.
Data Range	1999–2002
Data sources, availability and quality	Semarnat INE through Sinaica <http://www.sinaica.ine.gob.mx> CAM
Units of measurement	Value on the Imeca scale for all pollutants, ppb for ozone, NO_2, SO_2, and CO; $\mu g/m^3$ for PM_{10}
Computation	Number of cities or metropolitan areas with an environmental monitoring network and a regular system for recording air pollution measurements.
Sources of further information	INE: <http://www.ine.gob.mx> CAM: <http://www.edomexico.gob.mx/se/cam.htm>
Scale of application	Metropolitan areas: Valley of Mexico; Guadalajara; Monterrey; Valley of Toluca; Ciudad Juárez; Tijuana-Rosarito; Mexicali.
Useful references	Semarnat: <http://www.semarnat.gob.mx>
Strengths of the Indicator	Exact location of the metropolitan area on the map of Mexico.

Percentage of the general population exposed to biomass smoke, by region, Mexico, 2000 **Percentage of population under 19 years exposed to biomass smoke, by region, Mexico, 2000**	**Type of indicator: Body burden**
INDICATOR Description:	
Definition	Proportion of general population exposed to the use of biomass as household fuel. Proportion of population under 19 years of age exposed to the use of biomass as household fuel. The exposed population refers to all inhabitants of households that use biomass as cooking or heating fuel. Biomass: Wood and coal
Rationale and role	Household indoor air pollution caused by the burning of wood or coal for cooking constitutes a public health problem with repercussions for the child population, especially for children under 5 and women of reproductive age.
Data Range	2000
Data sources, availability and quality	The National Institute of Statistics, Geography and Information (*Instituto Nacional de Estadística, Geografía e Informática*—INEGI) conducts the National Population and Housing Census (*Censo Nacional de Población y Vivienda*) every 10 years. The information on this indicator was obtained from the 12th national census, conducted in 2000. The two main units analyzed in the census were habitual residents and households. Information was obtained from direct interviews with appropriate interviewees, defined as persons of at least 15 years of age who live in the household and know the information for all residents thereof. Two types of questionnaires (basic and extended) were used. The extended questionnaire was applied to a probability sample of households, while the basic questionnaire was applied exhaustively to all households. For further information on census methodology, see http://www.inegi.gob.mx
Units of measurement	Percentage
Computation	The population of interest for evaluation living in households using biomass as fuel divided by the overall population living in households using biomass as fuel X 100 Population under 19 living in households using biomass as fuel divided by the overall population living in households using biomass as fuel X 100
Sources of further information	National Population Council (*Consejo Nacional de Población*—Conapo): www.conapo.gob.mx
Scale of application	National
Useful references	Semarnat: http://www.semarnat.gob.mx
Strengths of the Indicator	Population and housing censuses provide the most complete information as to the geographic breakdown enabling an awareness of the national situation. With this information, various national sectors may prepare development plans and programs, analyze human settlement conditions and carry on a range of research, among other things.

Percentage of Users Consuming Wood as a Fuel at the Municipal Level in Mexico, 2000	**Type of indicator: Effect**
INDICATOR Description	
Definition	Proportion of population per state that used wood and coal as fuel during 2000
Rationale and role	This is an indicator of potential risk to health, showing the predominantly rural states, with the most at-risk population, where wood and coal are most often used as fuel. That states that use the most wood include Oaxaca and Chiapas, where between 50 and 60 percent of the population is believed to use this kind of fuel. In general, Mexico's southern states have the greatest proportion of persons exposed to wood and coal use.
Data Range	Dates: 2000
Data sources, availability and quality	XII General Census of Population and Housing (*Censo General de Población y Vivienda XII, 2000)* INEGI 2000.
Units of measurement	Percent
Computation	Number of inhabitants living in homes that use biomass fuel/Total population X 100
Sources of further information	XII General Census of Population and Housing (*Censo General de Población y Vivienda XII, 2000)* INEGI 2000.http://www.inegi.gob.mx
Scale of application	National
Useful references	Semarnat: http://www.semarnat.gob.mx
Strengths of the Indicator	These states are representative of the rural areas inhabited by the most at-risk populations most susceptible to exposure to pollutants from wood use.

Prevalence of Passive Smoking in Urban Populations (Ages 12–65) in Mexico, 2002 **Prevalence of Passive Smoking in Rural Populations (Ages 12–65) in Mexico, 2002**	**Type of indicator: Risk**
INDICATOR Description	
Definition	"Passive smoker" or "involuntary smokers" are those persons not classified as active smokers and exposed to tobacco smoke (environmental smoke) at home, the classroom or workplace. Around 48 million Mexicans are so classified. Urban area: Urban population: Living in towns with a population of more than 2500 inhabitants. Rural area: Rural population: Living in towns with a population of no more than 2500 inhabitants
Rationale and role	Mexico is a country with a predominantly young population and has a certain social tolerance for tobacco addiction. The regulation of the tobacco trade and protection for nonsmokers are still deficient, in both enforcement and compliance. Thus, the country may be highly vulnerable to the will of tobacco companies, with the resulting promotion of tobacco smoking and an increased number of smokers. Involuntary smoking causes a number of illnesses, such as lung cancer, various respiratory illnesses such as pneumonia and bronchitis, and cardiovascular disease. However, children exposed to tobacco smoke are at the greatest risk of illness, especially at an early age, given the immaturity of their immune systems. There is a potential health risk for passive smokers to suffer premature lung damage or begin a smoking habit.
Data Range	Date: 2002
Data sources, availability and quality	The information for this indicator was obtained from the National Addictions Survey (*Encuesta Nacional de Adicciones*—ENA), composed of two parts. The first part summarizes the general aspects, methodology and organization of the survey, while the second part provides an executive summary of the most important indicators obtained from the information collected, as well as statistical precisions for the key variables. The information was collected using standardized questionnaires applied through face-to-face interviews by trained surveyors. The questionnaires used the basic indicators proposed by the World Health Organization (WHO) to assess substance use/abuse and dependence and the associated problems. The survey was designed as a random stratified sampling (probability sample) with a selection of conglomerates at various sampling stages. ENA 2002, National Council Against Addictions (*Consejo Nacional Contra las Adicciones*—Conadic), National Institute of Pediatrics (*Instituto Nacional de Pediatría*—INP), General Bureau of Epidemiology (*Dirección General de Epidemiología*—DGE), INEGI
Units of measurement	Rate

Computation	Number of inhabitants who smoke at homes/the number of exposed persons between 12 and 65 years of age. Divided into three zones: Northern, Central and Southern
Sources of further information	Conadic: http://www.conadic.gob.mx INEGI: http://www.inegi.gob.mx DGE: http://www.dgepi.salud.gob.mx
Scale of application	National and regional, urban and rural
Useful references	National Institute of Public Health (*Instituto Nacional de Salud Pública*—INSP): http://www.insp.gob.mx
Strengths of the Indicator	Every four years starting in 1988, the Secretariat of Health (*Secretaría de Salud*—SSA) has conducted this survey, which represents an important set of topical data that will doubtless support the performance of studies analyzing this area in greater depth.

Percentage of smokers, ex-smokers and non-smokers among adolescents (Ages 12–17), by gender, in urban locations in Mexico, 2002	**Type of indicator: Exposure**
INDICATOR Description	
Definition	Population of adolescent smokers, ex-smokers, and non-smokers in urban areas.
Rationale and role	This indicator expresses the tobacco smoking habits of the adolescent population in urban areas, indicating the potential risk to health in early stages of life. According to data from the Anti-Tobacco Program developed by the National Council Against Additions, there are around 13 million smokers in Mexico, of whom 24.6 percent are women and 75.4 percent are men. In Mexico, studies have shown that adolescents begin smoking at increasingly early ages. At present, the average starting age is around 13. The prevalence of smokers in the adolescent age group in urban areas was 10.1 percent, equal to nearly one million individuals. The prevalence of ex-smokers in the urban population between 12 and 17 years of age was 7.1 percent, or 705,963 young people.
Data Range	Date: 2002
Data sources, availability and quality	ENA 2002, Conadic, INP, DGE, INEGI
Units of measurement	Percentage
Computation	Number of adolescent smokers, ex-smokers, and non-smokers in urban areas/number of exposed population between 12 and 17 years of age X 100
Sources of further information	Conadic: http://www.conadic.gob.mx INEGI: http://www.inegi.gob.mx DGE: http://www.dgepi.salud.gob.mx
Scale of application	National, urban
Useful references	INSP: http://www.insp.gob.mx
Strengths of the Indicator	Every four years starting in 1988, the SSA has conducted this survey, which represents an important set of topical data that will doubtless support the performance of studies analyzing this area in greater depth.

Percentage of smokers among adolescents, by age and gender, in urban locations in Mexico, 2002	**Type of indicator: Exposure**
INDICATOR Description	
Definition	Percentage of population per age group of children under 17, by gender, who smoke and live in urban locations.
Rationale and role	This indicator expresses the tobacco smoking habits of the under-17 population in urban areas, indicating the potential risk to health in early stages of life.
Data Range	Date: 2002
Data sources, availability and quality	ENA 2002, Conadic, INP, DGE, INEGI.
Units of measurement	Percentage
Computation	Number of adolescents per gender and age group who smoke in urban households/total exposed population X 100
Sources of further information	Conadic: http://www.conadic.gob.mx INEGI: http://www.inegi.gob.mx DGE: http://www.dgepi.salud.gob.mx
Scale of application	National, urban
Useful references	INSP: http://www.insp.gob.mx
Strengths of the Indicator	Information obtained from national surveys conducted every four years.

Incidence of asthma in children under five years of age in Mexico, 1995–2002	Type of indicator: Health effects
INDICATOR 3.- Description	
Definition	Number of cases with a clinical diagnosis of asthma in children under 5, during 1995–2002 **Morbidity rate**: Number of cases handled in health centers for a given illness in a given year, for a given age group, per 100,000 inhabitants. **Asthma**: Any individual with an allergy history having attacks of thoracic oppression, dyspnea and sibilance, accompanied by an intense cough with heavy expectoration. In accordance with IDC 10th Review, includes: J45, J46 Asthma is a genetic illness with immunological alterations. It is the most common chronic illness among children, with early clinical manifestations, and thus its diagnosis is generally made in the first years of life.
Rationale and role	This indicator shows the extent of change in incidences of asthma, which may be related to exposure to indoor and outdoor air pollution. Although air pollution is only one of the several risk factors, it has been shown that respiratory symptoms are exacerbated by high pollution levels, especially in vulnerable groups. An asthmatic will have a greater symptomatic and functional response from being exposed to greater concentrations of pollution, including the frequency and duration of exposure. In Mexico, residents of coastal states have been found to show a greater number of asthma cases, possibly due to environmental humidity. These regions also are believed to have a higher frequency due to the use of air conditioning systems that hold a considerable amount of dust and fungus, which may trigger asthma attacks.
Data Range	Dates: 1995–2002 Age: Under 5
Data sources, availability and quality	In Mexico, statistical data on morbidity and mortality are compiled and analyzed as an official source through the National Epidemiological Oversight System (*Sistema Nacional de Vigilancia Epidemiológica*—Sinave), which is an action program involving a set of strategies and actions enabling the identification and detection of harms and risks to health. The system is managed by the DGE. From its creation in 1995, Sinave has established the Centralized Epidemiological Oversight Information System (*Sistema Único de Información para la Vigilancia Epidemiológica*—SUIVE), which systemizes morbidity and mortality information with the involvement of the entire health sector. SUIVE created uniform notification criteria, forms and procedures for the various institutions within the National Health System (*Sistema Nacional de Salud*—SNS), generating uniform health services information at the different technical-administrative levels. This information refers to the occurrence, distribution in terms of time, place and persons, risk factors and results of illness affecting human health, and is reported on special

	forms for each level. Local information is forwarded to the jurisdictional level, which is concentrated and forwarded to the state level, and the state levels forward information to the national level. Information is concentrated at each corresponding level and analyzed to guide and support decision-making in the design and application of nationwide health plans and programs. The Centralized Automated Epidemiological Oversight System (*Sistema Único Automatizado para la Vigilancia Epidemiológica*—SUAVE) is a software package concentrating Sinave information generated by SNS institutions. The weekly reporting covers a total of 110 illnesses, of which 47 are nontransmittable and 63 are transmittable; 29 require immediate notification and a specific epidemiological study for final confirmation and final classification. Specific diagnostic criteria and procedures are applied for a more complete clinical and epidemiological characterization. Illnesses are reported on form SUIVE-1-2000. SUAVE is self-installing program that allows the user to operate it with limited knowledge of computing. It also provides for the emailing of entered data. This software offers graphical and mapped reporting with historical information on morbidity and concentrates information on new cases of illnesses. Epidemiological Information Bulletin 1995–2000, Population Projections 1990–2010/Conapo
Units of measurement	Morbidity rate
Computation	Number of cases of asthma reported for children between 0 and 5 years of age in a year/total population of same age group in same year Rate per 10,000 inhabitants
Sources of further information	SSA: http://www.ssa.gob.mx DGE: http://www.dgepi.salud.gob.mx Conapo: http://www.conapo.gob.mx
Scale of application	National. Epidemiological Information Bulletin 1995–2000, Population Projections 1990–2010/Conapo
Useful references	INSP: http://www.insp.gob.mx
Strengths of the Indicator	This illness is reported in SUIVE for all first-, second- and third-tier care facilities.

Incidence of Acute Respiratory Infections (ARIs) in children under five years of age in Mexico, 1993–2002	Type of indicator: Health effects
INDICATOR 4.- Description	
Definition	There is a series of acute respiratory illnesses determined as being caused by virus, allergens and bacteria such as rhinopharyngitis, laryngitis, acute bronchitis, etc., with similar clinical diagnoses, the pathological causes of which are often difficult to identify. These are important given their extensive morbidity. Incidence rate: Number of new cases of illness / Exposed population Acute respiratory infections (ARIs): All children under five that are clinically diagnosed with sudden onset of obstruction or nasal secretion, throat pain or burning, dysphony, coughing with or without expectoration, fever, back pain, dyspnea or cyanosis. In accordance with IDC 10th review, including: J00, J01, J02.8, J02.9, J03.8, J06, J20, J21.
Rationale and role	This indicator shows the extent of changes in the prevalence of respiratory infections by age group, which may be related to the exposure to indoor and outdoor air pollution. The rate of incidence of ARIs varies throughout national territory due to factors influencing the increase or decrease of cases, such as poverty, marginalization, malnutrition, access to health services, the physicochemical conditions and concentration of air pollution, and the meteorological and geographical conditions of the country's different regions.
Data Range	Date: 1990–2003 Age: Under 5
Data sources, availability and quality	Data obtained by DGE's Sinave, which is an action program involving a set of strategies and actions enabling the identification and detection of harms and risks to health. Epidemiological Information Bulletin 1995–2000, Population Projections 1990–2010/Conapo
Units of measurement	Rate
Computation	Number of new ARI cases reported for children between 0 and 5 years of age/Exposed population Rate per 100,000 inhabitants
Sources of further information	SSA: http://www.ssa.gob.mx DGE: http://www.dgepi.salud.gob.mx Conapo: http://www.conapo.gob.mx
Scale of application	National. Epidemiological Information Bulletin 1995–2000, Population Projections 1990–2010/Conapo
Useful references	INSP: http://www.insp.gob.mx
Strengths of the Indicator	This illness is reported in SUIVE for all first-, second- and third-tier care facilities.

Prevalence of asthma among children, by age group, Mexico, 1998–2002	**Type of indicator: Health effects**
INDICATOR Description	
Definition	Prevalence of asthma among children, by age group, Mexico, 1998–2002 **Asthma**: Any individual with an allergy history having attacks of thoracic oppression, dyspnea and sibilance, accompanied by an intense cough with heavy expectoration. In accordance with IDC 10th Review, includes: J45, J46 Prevalence rate: Number of new and old cases/Total exposed population.
Rationale and role	This indicator shows the extent of change in the prevalence of asthma, which may be related to exposure to indoor and outdoor air pollution. Although air pollution is only one of the several risk factors, it has been shown that respiratory symptoms are exacerbated by high pollution levels, especially in vulnerable groups. An asthmatic will have a greater symptomatic and functional response from being exposed to greater concentrations of pollution, including the frequency and duration of exposure.
Data Range	Dates: 1998–2002 Age: Under 1, 1 to 4 and 5 to 14 years.
Data sources, availability and quality	Data obtained by DGE's Sinave, which is an action program involving a set of strategies and actions enabling the identification and detection of harms and risks to health.
Units of measurement	Prevalence rate
Computation	Number of cases (new and old) of ARIs in children under 1, from 1 to 4, and from 5 to 14/Total exposed population. Rate per 100,000 inhabitants.
Sources of further information	SSA: Epidemiological Information Bulletin 1995–2000: http://www.dgepi.salud.gob.mx Conapo: Population Projections 1990–2010/Conapo: http://www.conapo.gob.mx INEGI: http://www.inegi.gob.mx
Scale of application	National
Useful references	SSA: http://www.ssa.gob.mx INSP / Health Atlas: http://www.insp.gob.mx
Strengths of the Indicator	This illness is reported in SUIVE for all first-, second- and third-tier care facilities.

Incidence of Acute Respiratory Infections (ARI) among children, by age group, Mexico, 1998–2002	**Type of indicator: Health effects**
INDICATOR Description	
Definition	Prevalence rate of ARIs in children per age group, in 1998–2002 ARIs: All children clinical diagnosed with sudden onset with obstruction or nasal secretion, throat pain or burning, dysphony, coughing with or without expectoration, fever, back pain, dyspnea or cyanosis. In accordance with IDC 10th review, including: J00, J01, J02.8, J02.9, J03.8, J06, J20, J21.
Rationale and role	This indicator shows the extent of changes in the prevalence of respiratory infections by age group, which may be related to the exposure to indoor and outdoor air pollution.
Data Range	Dates: 1998–2002 Age: Under 1, 1 to 4, and 5 to 14 years of age.
Data sources, availability and quality	Data obtained by DGE's Sinave, which is an action program involving a set of strategies and actions enabling the identification and detection of harms and risks to health. Epidemiological Information Bulletin 1995–2000, Population Projections 1990–2010/Conapo
Units of measurement	Prevalence rate
Computation	Number of cases (new and old) of ARIs in children under 1, from 1 to 4, and from 5 to 14/Total exposed population. Rate per 100,000 inhabitants.
Sources of further information	SSA: http://www.ssa.gob.mx DGE: http://www.dgepi.salud.gob.mx Conapo: http://www.conapo.gob.mx
Scale of application	National
Useful references	INSP: http://www.insp.gob.mx
Strengths of the Indicator	This illness is reported in SUIVE for all first-, second- and third-tier care facilities.

Rate of mortality by Acute Respiratory Infection (ARI) of children under five in Mexico, 1990–99	**Type of indicator:**
INDICATOR Description	
Definition	Mortality rate in children under five years of age from acute respiratory infections (ARIs), 1990–99. Mortality rate: Number of deaths from a specific cause among the total population in a given period of time.
Rationale and role	This indicator represents the declining mortality rate from ARIs in the stated age group, from 1990 to 1999.
Data Range	Date: 1990–99 Age: children under five
Data sources, availability and quality	Illness reported in the Epidemiological and Death Statistics System (*Sistema Epidemiológico y Estadístico de las Defunciones*—SEED). SEED compiles information from death certificates to record causes of death among the population, thereby detecting risks in order to develop health measures and prevent deaths from such causes. Population Projections 1990–2010/Conapo
Units of measurement	Mortality rate
Computation	Total deaths per age group, from ARIs in children under five/Total population of age group Rate calculated per 100,000 inhabitants
Sources of further information	SSA: http://www.ssa.gob.mx DGE: http://www.dgepi.salud.gob.mx Conapo: http://www.conapo.gob.mx
Scale of application	National
Useful references	INSP: http://www.insp.gob.mx
Strengths of the Indicator	This illness is reported in Sinave through SEED, for all first-, second- and third-tier care facilities.

Blood lead levels in rural and urban populations	**Type of indicator: Action**
INDICATOR Description:	
Definition	Mexico has data on the blood lead levels only from isolated studies in industrial zones and some pottery-making regions, and not national basal information on blood lead levels.
Rationale and role	Lead has a wide range of toxic effects on several body systems. Elevated acute exposure leads to severe poisoning manifested by highly lethal encephalopathy. Chronic exposure produces a range of constitutional symptoms and a heightened risk of neuropsychological deficiencies, nephropathy, peripheral nephropathy, anemia and reproductive alterations. Lead has toxic effects even at low levels of exposure, with a notable, insidious effect on children's cognitive development. There is no threshold precisely indicating when lead begins to affect health, although clinical manifestations are believed to arise at 10 μg/dL, even though damage may occur at lower levels.
Data Range	Studies conducted between 1960 and 2000.
Data sources, availability and quality	Data obtained from studies published in indexed journals
Units of measurement	Micrograms per deciliter of blood
Computation	For further information, look up the respective study by author.
Sources of further information	See Table 3.1
Scale of application	Regional, urban and rural
Useful references	As specified in Table 3.1
Strengths of the Indicator	Studies published in indexed journals

Atmospheric monitoring of lead and principal activities to reduce lead emissions in the Valley of Mexico Metropolitan Area, 1990–2000	**Type of indicator:**
INDICATOR Description	
Definition	Atmospheric monitoring of lead and principal activities to reduce lead emissions in the Valley of Mexico Metropolitan Area. Quarterly trends in lead monitoring, considering 1.5 µg/m^3 as the standard level for the metropolitan area. Tracking stations located at Tlalnepantla, Xalostoc, Merced, Pedregal, and Cerro de la Estrella, pertaining to the Environmental Monitoring Network. Series of automatic or manual tracking stations to collect, analyze and systematically environmental air samples.
Rationale and role	Lead has a wide range of toxic effects on several body systems. Elevated acute exposure leads to severe poisoning manifested by highly lethal encephalopathy. Chronic exposure produces a range of constitutional symptoms and a heightened risk of neuropsychological deficiencies, nephropathy, peripheral nephropathy, anemia and reproductive alterations. Lead has toxic effects even at low levels of exposure, with a notable, insidious effect on children's cognitive development. There is no threshold precisely indicating when lead begins to affect health, although clinical manifestations are believed to arise at 10 µg/dL, even though damage may occur at lower levels.
Data Range	Date: 1990–2000
Data sources, availability and quality	Mexico City Air Monitoring System (*Sistema de Monitoreo Atmosférico de la Ciudad de México*): http://www.sima.com.mx
Units of measurement	µg/m^3
Computation	Standard quarterly average value of 1.5 µg/m^3
Sources of further information	INE: http://www.ine.gob.mx CAM: http://www.edomexico.gob.mx/se/cam.htm NOM-026-SSA1-1993, "Environmental health. Criteria for assessing ambient air quality with respect to lead (Pb). Standard value for lead (Pb) concentration in ambient air as a public health protection measure."
Scale of application	Valley of Mexico Metropolitan Area
Useful references	Semarnat: http://www.semarnat.gob.mx
Strengths of the Indicator	Establishes the reference for decision-making in developing control and assessment programs.

Local Air Quality Data from Metallurgical Activities	**Type of indicator:**
INDICATOR Description:	
Definition	Quarterly trends in lead monitoring, considering 1.5 µg/m3 as the standard level for the area neighboring the company MET-MEX Peñoles, under NOM-026-SSA1-1993).
Rationale and role	The city of Torreón, Coahuila, located in northern Mexico, has a population of approximately 530,000 inhabitants. Latin America's largest, and the world's fourth-largest mining-metallurgical company, MET-MEX Peñoles, is located in this town, producing lead, silver and gold. The presence of this industry has led to the chronic environmental exposure to lead in the non-occupational population, particularly in children.
Data Range	Date: December 1999–January 2004
Data sources, availability and quality	Metals Program (*Programa de Metales*)/Coahuila State Secretaríat of Health
Units of measurement	µg/m^3
Computation	Quarterly average of 1.5 µg/m^3, for values found at all tracking stations neighboring the company
Sources of further information	NOM-026-SSA1-1993, "Environmental health. Criteria for assessing ambient air quality with respect to lead (Pb). Standard value for lead (Pb) concentration in ambient air as a public health protection measure." Office of the Federal Attorney for Environmental Protection (*Procuraduría Federal de Protección Ambiental*—Profepa): http://www.profepa.gob.mx
Scale of application	State of Coahuila
Useful references	Semarnat: http://www.semarnat.gob.mx INE: http://www.ine.gob.mx
Strengths of the Indicator	To address this situation, the state Secretariat of Health, Profepa and the company Peñoles implemented a series of actions including, among others, emissions control by the company, the oversight of the environmental authority and the medical care of the environmentally exposed population by the state Secretariat of Health.

Annual average lead in children's blood in the city of Torreón, 1998–2004. **Blood lead levels in children following five years of attendance in the metals program in Mexico, 2000.**	**Type of indicator: health effects**
INDICATOR Description	
Definition	Annual average lead in blood of children under 15 years of age. Total population of children under 15 recorded in the Metals Program with blood lead levels above the NOM-199-SSA1-2000 standard, setting a limit value of 10 µg/dL, as well as the blood lead value categories for intervention. Category BLL I < 10 µg/dL II 10 to 14.9 µg/dL III 15 to 24.9 µg/dL IV 25 to 44.9 µg/dL V 45 to 69.9 µg/dL VI More than 70 µg/dL
Rationale and role	The results of formal studies performed since 1997 have shown a high concentration of lead in the soil and air, thereby documenting prolonged, historic pollution. One of these studies (García V.G. & coll., 2001) corroborated the presence of lead in the blood of school children, having a directly proportional relationship to their proximity to the metallurgical plant. The presence of this industry has led to the chronic environmental exposure to lead in the non-occupational population, particularly in children.
Data Range	Date: December 1999–January 2004
Data sources, availability and quality	Epidemiological oversight system under the Metals Program/Coahuila State Secretariat of Health
Units of measurement	µg/dL in blood
Computation	The state lead oversight system is based on the criteria and actions provided in the standard, which specify and categorize the values of lead in blood required for health authority intervention.
Sources of further information	NOM-199-SSA1-2000, Environmental health–levels of lead in blood and actions as health protection criteria for the non-occupationally exposed population. SSA: http://www.salud.gob.mx
Scale of application	Local
Useful references	García et al. 2001
Strengths of the Indicator	To address this situation, the state Secretariat of Health, Profepa and the company Peñoles implemented a series of actions including, among others, emissions control by the company, the oversight of the environmental authority and the medical care of the environmentally exposed population by the state Secretariat of Health.

Cases of pesticide poisonings in children (under 15 years old) and the general public in Mexico, 1993–2002	**Type of indicator: Health effects**
INDICATOR 5.- Description	
Definition	Annual pesticide poisoning cases in the overall population and in children under 15 years of age. Pesticide poisoning: Any person showing bradycardia, hypotensión, dizziness, increased salivatin, myosis or one or more of the following symptoms: convulsions, tremors, nausea, vomiting, increased sweating, pulmonary edema, hepatic degeneration, relaxation of sphincters, depression and coma. In accordance with IDC 10th review, includes: T60.
Rationale and role	Children may be especially vulnerable to the effects of pesticide, given their particular susceptibility and because they may be exposed to higher pesticide levels than adults. In proportion to their body mass, children eat more than adults and may be more exposed to certain pesticides by reason of their different, less varied diets than adults.
Data Range	1993 to 2002 for the overall population, and 1998 to 2002 for children under 15.
Data sources, availability and quality	Data obtained by DGE's Sinave, which is an action program involving a set of strategies and actions enabling the identification and detection of harms and risks to health. National Health Information System (*Sistema Nacional de Información en Salud*—Sinais): http://www.sinais.gob.mx SSA: http://www.salud.gob.mx INEGI: http://www.inegi.gob.mx
Units of measurement	Cases reported
Computation	Number of cases of pesticide poisoning in children under 15/Overall population
Sources of further information	DGE: http://www.dgepi.salud.gob.mx INEGI: http://www.inegi.gob.mx
Scale of application	State and federal information available
Useful references	SSA: http://www.salud.gob.mx Federal Commission for Protection Against Health Risks (*Comisión Federal de Protección Contra Riesgos a la Salud*—Cofepris): http://www.cofepris.gob.mx
Strengths of the Indicator	National coverage. Information processed in SUIVE. Poison control centers are being integrated to improve reporting.

Population (in thousands) with access to bacteriologically safe water, by state, Mexico, 2003 **Percentage of the population without access to bacteriologically safe water in Mexico, 2000–2003**	**Type of indicator: Exposure**
INDICATOR Description	
Definition	Population receiving chlorinated water: Inhabitants with water from a supply network to which chlorine has been applied as a disinfection treatment. Bacteriologically safe water: Water suitable for human consumption and not containing microorganisms endangering health, in accordance with NOM-127-SSA1-1994 The disinfection of water intended for human use and consumption ensures the inactivation or destruction of most pathogens that may be transmitted to humans.
Rationale and role	The primary environmental and public health problems faced by the country are those relating to a lack of basic sanitation and poor water quality. Furthermore, limited water is available for its growing population. Therefore the availability of safe and reliable supply sources is fundamental to ensure adequate public health, since may illnesses are caused by chemical agents and pathogenic organisms living in polluted water. This indicator presents an overview of the population with water from a disinfected supply network. Not all piped water is bacteriologically safe.
Data Range	2003 2000–2003
Data sources, availability and quality	Water disinfection oversight is carried on with the periodic and ongoing tracking of free residual chlorine in the distribution network. Keeping residual chlorine above 0.2 mg/L is effective to inactivate pathogenic bacteria and viruses in the network. State Health Services; National Water Commission (*Comisión Nacional del Agua*—CNA): http://www.cna.gob.mx INEGI: http://www.inegi.gob.mx Conapo (population projections by gender, age groups and states, 1995–2005): http://www.conapo.gob.mx
Units of measurement	Thousands of inhabitants Percentage
Computation	Overall population receiving bacteriologically safe water. Overall population with bacteriologically safe water/Total population. Overall population with formal supply system/Total population.
Sources of further information	Modification to NOM-127-SSA1-1994, Environmental health. Water for human use and consumption. Allowable quality limits and treatment for drinkability. CNA: http://www.cna.gob.mx INEGI: http://www.inegi.gob.mx Conapo: http://www.conapo.gob.mx
Scale of application	State and national information available
Useful references	SSA: http://www.salud.gob.mx

	Cofepris: http://www.cofepris.gob.mx
Strengths of the Indicator	Representative, including the 32 Mexican states and information from official sources.

Percent of the population without potable water in Mexico, 1980–2000 **Percent of the population without piped water, by State, Mexico, 2000 (map)**	**Type of indicator: Exposure**
INDICATOR Description	
Definition	**Population receiving drinking water**: Inhabitants with water from a supply source. This indicator refers to urban and rural zones. Population censuses conducted from 1980 to 2000. Drinking water: Free of physicochemical and biological pollutants, under the modification to NOM-127-SSA1-1994.
Rationale and role	This indicator presents an overview of the differences between rural and urban populations in the availability of piped water, and the population most at risk from waterborne illness, given the access to treated (chlorinated) water.
Data Range	Date: 1980–2000 Census 2000
Data sources, availability and quality	Database of the XII General Population and Housing Census, 2000 Counting of Population and Housing, 1995 Database of the XI General Population and Housing Census, 1990 Database of the X General Population and Housing Census, 1980 Modification to NOM-127-SSA1-1994, Environmental health. Water for human use and consumption. Allowable quality limits and treatment for drinkability.
Units of measurement	Percentage
Computation	Overall population receiving piped household water/Total population x 100.
Sources of further information	INEGI: http://www.inegi.gob.mx Conapo: http://www.conapo.gob.mx SSA: http://www.salud.gob.mx CNA: http://www.cna.gob.mx
Scale of application	Urban, rural and national Regional map: Central, northern and southern
Useful references	Semarnat: http://www.semarnat.gob.mx National Water Program: http://www.imacmexico.org/ev_es.php?ID=5876_201&ID2=DO_TOPIC
Strengths of the Indicator	Population and housing censuses provide the most complete information as to the geographic breakdown enabling an awareness of the national situation. With this information, various national sectors may prepare development plans and programs, analyze human settlement conditions and carry on a range of research, among other things.

Percent of the population not served with sewer services in Mexico, 1980–2000	**Type of indicator: Exposure**
INDICATOR Description	
Definition	**Population** with a drainage or sewer system for carrying and/or discharging sewage. **Households** per state with a drainage or sewer system for carrying and/or discharging sewage. In Mexico, the term "sewer" (*alcantarillado*) refers to drainage networks, septic tanks and direct drainage into trenches, ditches or bodies of water; this is important when comparing with other countries.
Rationale and role	This measure reflects the percentage of the population that may be exposed to untreated sewage and contract waterborne illnesses. May be expressed in terms of type of sewer or sewage treatment system (latrines, septic systems).
Data Range	1980–2000 2000
Data sources, availability and quality	Database of the General Population and Housing Census, 1980–2000 Database of the General Population and Housing Census, 2000
Units of measurement	Percentage
Computation	Population (households) with drainage or sewer systems/Total population X 100 Households with drainage or sewer systems/Counted households X 100
Sources of further information	National Population Council: http://www.conapo.gob.mx
Scale of application	National – Database of the XII General Population and Housing Census, 2000 State – (map)
Useful references	CNA: http://www.cna.gob.mx INEGI: http://www.inegi.gob.mx Cofepris: http://www.cofepris.gob.mx National Water Program: http://www.imacmexico.org/ev_es.php?ID=5876_201&ID2=DO_TOPIC
Strengths of the Indicator	Coverage; information obtained from census

Percent of homes without sewer services, by state, Mexico, 2000	Type of indicator: Exposure
INDICATOR Description	
Definition	Population per state with a drainage or sewer system for carrying and/or discharging wastewater, based on the 2000 census. The indicator provides information on the increase in services in rural and urban areas.
Rationale and role	This measure reflects the percentage of the population that may be exposed to untreated sewage and contract waterborne illnesses. May be expressed in terms of type of sewer or sewage treatment system (latrines, septic systems).
Data Range	2000
Data sources, availability and quality	XII General Census of Population and Housing 2000
Units of measurement	Percentage
Computation	Overall population (households) with drainage or sewer system/Total population
Sources of further information	National Population Council: http://www.conapo.gob.mx
Scale of application	National and state
Useful references	CNA: http://www.cna.gob.mx INEGI: http://www.inegi.gob.mx Cofepris: http://www.cofepris.gob.mx National Water Program: http://www.imacmexico.org/ev_es.php?ID=5876_201&ID2=DO_TOPIC
Strengths of the Indicator	Coverage; information obtained from census

Incidence of shigellosis in children under 5 years old in Mexico, 1998–2002	Type of indicator: Health effects
INDICATOR Description	
Definition	Shigellosis: Acute intestinal bacterial infection caused by the bacteria *shigella*, characterized by first watery and then bloody stools, accompanied by abdominal pain and fever, nausea and vomiting, lasting for 4 to 7 days. In accordance with IDC 10th review, includes: A03. Incidence rate: Number of new cases of illness in children under 5/total exposed population. Rate per 10,000 inhabitants.
Rationale and role	According to WHO, 80 percent of infectious and parasitic gastrointestinal illnesses, and a third of deaths caused thereby, are due to the consumption of insalubrious water. WHO further notes that only 41 percent of the world's population drinks water that is treated and disinfected to be deemed safe. The primary environmental aspects that traditionally influence the causes of illness and death in Mexico include: • Poor water quality for human use and consumption • Inadequate sewage disposal • Inadequate handling of municipal solid waste • Insufficient pest control • Poor hygiene conditions in homes and public areas In countries such as Mexico, diarrheic illnesses continue to be a serious problem for the child population. These illnesses are caused by bacteria, viruses and protozoan pathogens passed by the fecal-oral route and potentially transmitted by drinking water used in various household activities, including personal hygiene, and through primary contact with contaminated recreational waters.
Data Range	Date: 1998–2002
Data sources, availability and quality	Data obtained by DGE's Sinave, which is an action program involving a set of strategies and actions enabling the identification and detection of harms and risks to health. Sinais: Statistical Information Bulletin: http://www.sinais.gob.mx SSA: http://www.salud.gob.mx INEGI: http://www.inegi.gob.mx
Units of measurement	Incidence rate
Computation	Number of new shigellosis cases in children under 5/Total exposed population of children under 5
Sources of further information	DGE: http://www.dgepi.gob.mx
Scale of application	National
Useful references	Conapo: http://www.conapo.gob.mx SSA: http://www.salud.gob.mx
Strengths of the Indicator	This illness is reported in SUIVE for all first-, second- and third-tier care facilities.

Incidence of giardiasis in children under 5 years old in Mexico, 1998–2002	**Type of indicator: Health effects**
INDICATOR Description	
Definition	Giardiasis: Inflammatory intestinal condition caused by the proliferation of the protozoan *Giardia lamblia*, characterized by chronic diarrhea (more than 14 days), esteatorrhea, abdominal cramps, feeling of distension and the expulsion of loose, pale and fatty stools. In accordance with IDC 10th review, includes: A07.
Rationale and role	As mentioned for the preceding indicator, this infectious, parasitic gastrointestinal illness is caused by the consumption of contaminated water and deficient hygiene, passed by the fecal-oral route and potentially transmitted by drinking water used in various household activities, including personal hygiene, and through primary contact with contaminated recreational waters.
Data Range	Date: 1998–2002
Data sources, availability and quality	Data obtained by DGE's Sinave, which is an action program involving a set of strategies and actions enabling the identification and detection of harms and risks to health. Sinais: Statistical Information Bulletin: http://www.sinais.gob.mx SSA: http://www.salud.gob.mx INEGI: http://www.inegi.gob.mx
Units of measurement	Incidence rate
Computation	Number of new giardiasis cases in children under 5/Total exposed population of children under 5.
Sources of further information	DGE: http://www.dgepi.gob.mx
Scale of application	National
Useful references	Conapo: http://www.conapo.gob.mx SSA: http://www.salud.gob.mx
Strengths of the Indicator	This illness is reported in SUIVE for all first-, second- and third-tier care facilities.

Incidence of giardiasis among children, by age group, Mexico, 1998–2002	**Type of indicator: Health effects**
INDICATOR Description	
Definition	Inflammatory intestinal condition caused by the proliferation of the protozoan *Giardia lamblia*, characterized by chronic diarrhea (more than 14 days), esteatorrhea, abdominal cramps, feeling of distension and the expulsion of loose, pale and greasy stools. In accordance with IDC 10th review, includes: A07. Prevalence: Number of cases (new and old)/Total exposed population.
Rationale and role	This indicator shows the impact on the prevalence in children under 5 years of age. The illness is caused by the consumption of contaminated water and deficient hygiene, passed by the fecal-oral route and potentially transmitted by drinking water.
Data Range	Date: 1998–2002
Data sources, availability and quality	Data obtained by DGE's Sinave, which is an action program involving a set of strategies and actions enabling the identification and detection of harms and risks to health. Sinais: http://www.sinais.gob.mx SSA: http://www.salud.gob.mx INEGI: http://www.inegi.gob.mx
Units of measurement	Prevalence rate
Computation	Number of giardiasis cases (new and old) in children under 5/Total exposed population of children under 5.
Sources of further information	DGE: http://www.dgepi.gob.mx
Scale of application	National
Useful references	Conapo: http://www.conapo.gob.mx SSA: http://www.salud.gob.mx
Strengths of the Indicator	This illness is reported in SUIVE for all first-, second- and third-tier care facilities.

Percentage of cases of cholera among children, by age group, Mexico, 1991–99	**Type of indicator: Health effects**
INDICATOR Description	
Definition	Cholera cases: All cases isolating toxogenic V. cholerae 01 or V. cholerae 139 in fecal matter or gastrointestinal contents or showing seroconversion of vibriocidal antibodies or cholera antitoxin. Outbreak: Association of two or more cases sharing original source of infection.
Rationale and role	This indicator shows the impact of cholera outbreaks in Mexico in different years. Epidemiological oversight of this illness is needed because the climate and sanitary conditions enabling such outbreaks are present in the country. For this reason, there is a special cholera oversight system in which all institutional and international health authorities cooperate.
Data Range	Date: 1991–99 Age: Under 1; 1–4 and 5 to 14 years of age.
Data sources, availability and quality	Data obtained by DGE's Sinave, which is an action program involving a set of strategies and actions enabling the identification and detection of harms and risks to health. This is one of the 29 illnesses requiring immediate notification and a specific epidemiological study for final confirmation and final classification. Specific diagnostic criteria and procedures are applied for a more complete clinical and epidemiological characterization. Epidemiological information on transmittable diseases is also obtained from active oversight in first- and second-tier healthcare facilities, nominal case reporting, the review of death certificates and health surveys, as required. Given their epidemiological importance some mandatory-reporting illnesses require comprehensive study and exhaustive tracking. In recent years, special epidemiological oversight systems have been established, supported by an increasingly broad infrastructure of human resources and laboratories, increasing the sensitivity and specificity of epidemiological oversight. DGE: Source: Epidemiological Oversight Manual for Cholera (*Manual de Vigilancia Epidemiológica del Cólera*/SSA): http://www.dgepi.salud.gob.mx
Units of measurement	Percentage
Computation	Number of cases of cholera per under-14 age group / total exposed population X 100.
Sources of further information	DGE: http://www.dgepi.salud.gob.mx SSA: http://www.salud.gob.mx
Scale of application	National
Useful references	Sinais: http://www.sinais.gob.mx
Strengths of the Indicator	Illness subject to epidemiological oversight with immediate notice. This illness is covered by the special ADI/ARI program system, with a specific laboratory diagnosis procedure.

Mortality rate from diarrheic diseases in children under 5 years old in Mexico, 1990–2002	**Type of indicator: Health effects**
INDICATOR Description	
Definition	Diarrhea: Under the program for children under 5, diarrhea is the presence of liquid, watery or formless stools and more than 3 evacuations in 24 hours. **Death from diarrhea:** Death where diarrhea is the primary cause of death in children under 5. **Total population of children under 5:** Number of living children under 5 years of age.
Rationale and role	Acute diarrheic illnesses (ADIs) represent an important public health concern worldwide; these illnesses affect all age groups, although children under 5 are most vulnerable. ADIs are almost always infectious and self-limiting. The disease agents are generally transmitted in the fecal-oral route and may potentially be transmitted through drinking water. They adopt various modalities depending on the vehicles and means of transmission. According to WHO and UNICEF studies, the two primary complications in ADIs are dehydration and malnutrition. SEED records deaths from diarrheal and gastrointestinal infections, although the proportion caused by water contamination is not known.
Data Range	Date: 1990–2002 Age: Under 5
Data sources, availability and quality	Data obtained by DGE's Sinave, which is an action program involving a set of strategies and actions enabling the identification and detection of harms and risks to health. Illness reported in SEED. SEED compiles information from death certificates to record causes of death among the population, thereby detecting risks in order to develop health measures and prevent deaths from such causes. INEGI, DGE, SSA. Statistical Information Bulletin 1990–2002 National Conapo, Population Projections 1990–2002
Units of measurement	Specific mortality rate
Computation	Total number of deaths from diarrhea in children under 5 in a given year. Total population of children under 5 in the same year.
Sources of further information	DGE: http://www.dgepi.salud.gob.mx SSA: http://www.salud.gob.mx
Scale of application	National
Useful references	SSA: http://www.salud.gob.mx DGE: http://www.dgepi.salud.gob.mx
Strengths of the Indicator	Consistency of information; reported to SEED; methodology includes verbal autopsies.

Mortality from Cholera in Mexico, 1991–98	**Type of indicator: Health effects**
INDICATOR Description	
Definition	Cholera cases: All cases isolating toxogenic V. cholerae 01 or V. cholerae 139 in fecal matter or gastrointestinal contents or showing seroconversion of vibriocidal antibodies or cholera antitoxin. Mortality from cholera: Death with a diagnosis of cholera in either listed serotype.
Rationale and role	The indicator represents the impact on cholera deaths in its different outbreaks in Mexico from 1991 to 1998.
Data Range	Date: 1991–98 General population
Data sources, availability and quality	Illnesses reported in SEED. SEED compiles information from death certificates to record causes of death among the population, thereby detecting risks in order to develop health measures and prevent deaths from such causes. DGE: http://www.dgepi.salud.gob.mx Source: SSA Epidemiological Oversight Manual for Cholera.
Units of measurement	Percentage
Computation	Number of cholera deaths/Total exposed population
Sources of further information	DGE: http://www.dgepi.salud.gob.mx SSA: http://www.salud.gob.mx
Scale of application	National
Useful references	Sinais: http://www.sinais.gob.mx
Strengths of the Indicator	Illness subject to epidemiological oversight with immediate notice. This illness is covered by the special ADI/ARI program system, with a specific laboratory diagnosis procedure.

Appendix 4 Indicators Steering Group—Mexico

MEXICO

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