



Mexico's complex respiratory public health picture



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For Quintana and colleagues' study of traffic-related air pollution along the US-Mexico border see *Atmosph Environ* 2014; **88**: 353-61

For a white paper on health impacts of US-Mexico border crossings see http://media.wix.com/ugd/eec87d_ca9af50148c796e26d545fe5a6dfc4dc.pdf?dn=Health%2Bimpacts%2Bof%2BBorder%2BCrossings_White%2BPaper_FINAL.pdf

For Bedolla-Barajas and colleagues' reports on asthma in Mexican children and adolescents see *Arch Bronconeumol* 2013; **49**: 47-53 and

Asia Pac Allergy 2013; **3**: 42-49

For the systematic review of drug resistance and molecular epidemiology of *M tuberculosis* in Mexico see *Salud Publica Mex* 2014; **56**: 63-77

For Muñiz-Salazar and colleagues' report on the genetics of *M bovis* isolates from tuberculosis patients in Mexico see *Infect Genet Evol* 2014; **27**: 1-5

Despite progress in urban air pollution and tobacco consumption reduction, Mexico faces continuing respiratory health challenges, from tuberculosis to youth inhalant use, experts tell *The Lancet Respiratory Medicine*.

Mexico joined the WHO Framework Convention on Tobacco Control in 2005, and has banned indoor smoking in schools and government buildings. Outside of Mexico City, however, the tobacco industry has successfully lobbied for laws allowing indoor smoking areas, but text and graphic warnings are mandatory on all cigarette packaging.

However, other threats to Mexicans' respiratory health remain. Indoor use of biomass fuels has been associated with elevated risk of lung cancer, respiratory infections, and chronic pulmonary disease. Ambient outdoor air pollution is also a continuing public health concern, particularly in urban centres, despite gasoline reformulations and other interventions that have improved air pollution since the 1990s, when Mexico City was deemed the most air-polluted city in the world.

Air quality is also poor along Mexico's border with the USA, where both short-term and long-term exposure are issues, notes Penelope Quintana (School of Public Health, San Diego State University, CA, USA). "In addition to risks of poor ambient air quality, US-Mexico border residents often suffer disproportionately from close proximity to high-traffic areas, such as truck routes and border crossings." Adverse health outcomes, including respiratory problems such as asthma, cardiopulmonary effects, and adverse birth outcomes, have been associated with exposure to traffic pollution, Quintana notes.

"Exposure to traffic emissions along the border is an environmental justice issue, as border communities are overwhelmingly poor and Latino, and they bear the brunt of exposures

due to policies that are beyond their control, such as wait times at the US-Mexico border and associated idling vehicles", she says. Quintana and her colleagues have studied air quality at the San Ysidro port of entry, the world's busiest land border crossing. Pollution monitoring shows that proximity to this crossing and other border crossings increases local communities' and border crossers' exposure to air pollutants, an issue that can be exacerbated by long northbound vehicle wait times. "Wait times for vehicles present an obvious target for intervention, as well as separation of pedestrians from vehicles", Quintana says. "Expedited processing has reduced wait times at San Ysidro recently, but improvements require that staffing levels be maintained."

Management of border traffic "should consider the respiratory and other health effects of policies in order to achieve environmental justice and protect the most vulnerable people", Quintana says. A border commission on the health impacts of US-Mexico border crossings recommended cleaner diesel for commercial trucks, creation of buffer zones between border crossings and pedestrians, rerouting of cross-border commercial truck traffic away from residential areas, and increased budgets for border-crossing operations.

Asthma epidemiology could be changing with Mexico's economic transformation, points out Martín Bedolla-Barajas (Dr Juan I Menchaca Civil Hospital of Guadalajara, Guadalajara and Jalisco, Mexico). The country is "progressively industrialising, generating large cities and fewer rural communities, and life expectancy is increasing thanks to the improvement in health politics and the decrease in preventable infections because of immunisation", Bedolla-Barajas says. Obesity is also increasing, and family size is

decreasing substantially, he adds. Such changes make it "prudent to consider the possibility of an increase in the prevalence of asthma over the last decade", he says, but little research has been published on the matter. Bedolla-Barajas and colleagues have published cross-sectional, population-based studies that show that a maternal history of allergy and asthma, but not smoking or overweight status, are associated with asthma risk in Mexican children.

Tuberculosis remains a threat. The incidence of drug-resistant and multidrug-resistant tuberculosis is increasing in Mexico, says Raquel Muñiz-Salazar (School of Health Sciences, Autonomous University of Baja California, Baja California, Mexico). Every year, more than two thousand Mexicans die from tuberculosis. *Mycobacterium tuberculosis* has a high degree of genetic diversity in Mexico, Muñiz-Salazar tells *The Lancet Respiratory Medicine*. Authors of one systematic review suggest that 37.5% of tuberculosis cases in Mexico are drug-resistant, and 20.6% are multidrug-resistant, she notes.

Mexico's surveillance system does not detect *Mycobacterium bovis* tuberculosis in humans, Muñiz-Salazar notes. Little evidence exists of increasing human *M bovis* infection rates or of pyrazinamide-resistant or multidrug-resistant strains, particularly in regions where it is endemic in cattle. Authors of studies suggest that human *M bovis* infection rates might be higher in Mexico than elsewhere in the Americas.

Prospective influenza surveillance measures put in place early in the 2009 A/H1N1 pandemic by Mexico's Ministry of Health and the Mexican Institute of Social Security are allowing improved and continuing surveillance of influenza infection dynamics, reports Gerardo Chowell-Puente (Arizona State University, AZ, USA).

"While the Mexican Institute of Social Security surveillance system has been invaluable in increasing our understanding of seasonal and pandemic influenza in Mexico, there is a need to integrate and revitalise existing private and public surveillance systems in order to have a clearer picture of the influenza burden and the factors that have contributed to the high excess mortality rates associated with respiratory disease in Mexico", Chowell-Puente cautions.

Surveillance efforts during the 2009 pandemic showed an age-distribution shift that suggests improved resistance of people who were exposed to H1N1 in childhood in the 1957 pandemic, Chowell-Puente notes. "Our work has highlighted the importance of school cycles in the transmission dynamics of this pandemic influenza strain and suggests that school closure or other mitigation measures could be useful to mitigate future influenza pandemics", he says. "We have also documented geographical variation in identified medical risk factors, including the prevalence of diabetes and [HIV/AIDS-associated] immune suppression, which may in part explain the between-country differences in pandemic mortality burden."

Mexico has a "particularly high" pandemic death rate of about five deaths per 100 000 people—about three times that seen in Chile, a country with a similar economy, Chowell-Puente notes. Surveillance during the 2013–14 influenza season suggests "a slow build-up of immunity among younger populations, reminiscent of the age profiles of past epidemics", he says.

One neglected public health issue for Mexico's youth is recreational inhalation of solvents, glues, and other volatiles—a practice that goes back to at least the 1940s, says Roy Gigengack (Free University of Amsterdam, and Wageningen University and Research, Amsterdam, Netherlands). In Mexico City, the inhalant of

choice is known as "activo", a liquid composed almost entirely of toluene, a volatile petrochemical. Inhalants are "definitely the poor child's drug", notes Gigengack, who has studied inhalant use's roles in Mexico City street youth culture. "In fact, for a very long time, inhalants have actually been the street children's drugs." Rates have climbed for girls over recent years, and inhalants are increasingly popular in gang youth, he says.

Partly because inhalants are less expensive than other street drugs, street youth commonly use them daily and in large quantities, placing them at particular risk of harm, including chronic cough and lung pain, diminished pulmonary function, respiratory arrest, and asphyxiation, Gigengack says. Volatile inhalants can be carcinogenic and neurotoxic, and can trigger "sudden sniffing death", he notes. "Sudden sniffing death is not always recognised as such, and the role of inhalants as a lethal factor may be overlooked."

Although inhalants are less expensive than other drugs, their widespread misuse fuels a bustling black-market trade. Users face cascading social harms as well. "This is not only problem behaviour associated with drug use, such as delinquency, but also social exclusion by friends, neighbours, and family members, and active persecution by the police", Gigengack notes.

Inhalants "structure the world of street youth", he says. Their identification with inhalants therefore still represents a "firm boundary" between self-professed street children ("banda") and other impoverished youth—a pattern noted not only in Mexico City, but throughout Latin America. In street youth, sniffing sessions create and solidify social groups. Even users' sexuality is intertwined with inhalant use; some child prostitutes are paid with tins of glue, for example.

"Inhalants are a stigma, singling out the most vulnerable among



the drug users", he explains. "They organise their lives around the purchase and the consumption of these substances. Peer groups of street youths usually use the same type of inhalant. Inhalants also mark the circuits of street youths; glue and solvent sniffers will not easily mix: the activo sniffers look down upon the glue sniffers, and both regard themselves as better than those who use turpentine." Unlike Australia or Canada, where inhalant use is concentrated primarily among indigenous ethnic minorities, inhalant use in Latin America is largely an urban phenomenon, Gigengack says.

However, because inhalant misuse plays a part in social alliances, public health interventions can be particularly challenging, he notes—for example, frustrated police sometimes resort to smearing inhalants on homeless children's hair or genitals in an effort to discourage use. "These are not mere examples of senseless police violence; in fact, it reflects the desperation policemen may feel whose work it is to deal with drug-using street children", Gigengack says.

Control of toluene might help harm-reduction efforts, Gigengack believes. But tight control is "also a challenge", he notes, because of Mexico's "persistent problems fighting organised crime and institutionalised corruption".

Bryant Furlow

For Chowell-Puente and colleagues' analysis of recent pandemic A/H1N1 influenza dynamics in Mexico see *PLoS Curr* 2014; 6: Edition 1