

CHAPTER 8 Environmental Health

The relationship between environmental factors and disease continues to be a concern among the general public and public health researchers. In 2000, the PEW Environmental Health Commission found that 87% of people surveyed felt that environmental contributors to disease were either very important or more important than any other disease factor.¹

The Bureau of Environmental Health within MDPH collects data on a number of environmental and health measures.

Evaluating Environmental Risks in our Communities

The BEH works closely with residents, communities, and local health officials across the state to evaluate contaminants in our air, water, soil and food supply.

BEH investigates suspected elevations in disease occurrence and the potential relationship to the environment.

BEH also evaluates indoor air quality in public buildings, posts information on state beaches that are safe for swimming, and enforces regulations such as the state sanitary code.

Housing

“We can prevent many diseases and injuries that result from health hazards in the home...”

In June 2009, the US Surgeon General issued a *Call to Action* to promote healthy homes, and stated, “We can prevent many diseases and injuries that result from health hazards in the home...”

The *Call to Action* includes strategies to prevent childhood lead poisoning and control indoor air pollutants that trigger asthma and allergies.

Lead Poisoning

The Massachusetts Lead Poisoning Prevention and Control Act requires all children up to age three (age four in high-risk communities) to have their blood tested for lead.

Although lead-based paints were banned for use in housing in 1976, they continue to be the most important source of elevated blood lead levels in children. Lead can harm children's brain, kidneys, and nervous system. Even low levels of lead can make it hard for children to learn, pay attention, and behave.

The older the home, the more likely it is to contain lead paint. Deteriorating paint and paint disturbed during remodeling produce lead dust and can contaminate soil around a home. Children can be exposed by normal hand to mouth activity.

The Massachusetts lead law requires the removal or covering of lead paint hazards in homes built before 1978 where any children under the age of six reside.

Every child in Massachusetts must be tested for lead exposure between the ages of nine and 12 months, and again at the ages of two and three years (four years in high-risk communities). The test involves a small amount of blood drawn from the finger or arm. If a child has an elevated blood lead level, the child's health care provider can prescribe treatment. Massachusetts is one of only five states that require universal lead screening.

Figure 8.1 Childhood Lead Poisoning Screening Rates by EOHHS Region

Figure 8.1 is a bar chart showing screening rates for childhood lead poisoning in the six EOHHS regions in Massachusetts. Massachusetts has the highest screening rate in the U.S., however, there is some variation across the state. Screening rates range from 69% in the Central Region to 90% in Boston.

Source: MDPH, Childhood Lead Poisoning Prevention Program.

DPH reaches out to health care providers to increase screening rates, particularly in high-risk communities. Massachusetts has consistently had the highest childhood lead poisoning screening rates in the country.

The US Centers for Disease Control and Prevention considers a blood lead level of 10 micrograms per deciliter or greater to be a *level of concern* that should be followed by public health officials.² If a child's lead level is 25 or more, he or she is considered to have lead poisoning.

Figure 8.2 Children (9-48 Months) with Blood Lead Levels \geq 10

Figure 8.2 is a bar chart showing the number of children in Massachusetts between 9 and 48 months of age with blood lead levels of 10 micrograms per deciliter or

greater. The federal Centers for Disease Control and Prevention established ten as a blood lead level of concern in children that should be followed by public health officials. The chart covers the years 2000 through 2008 and illustrates a steady decline in blood lead levels. In the year 2000, 2990 children had levels of 10 or greater compared to 1170 children in 2008.

Source: MDPH, Childhood Lead Poisoning Prevention Program.

Despite the reduction in overall state rates, 95% of Massachusetts children with lead poisoning live within fourteen high-risk communities, where 62% of the housing units were built prior to 1950. Statewide, only 44% of housing units were built before 1950. Low income and minority children comprise a large percentage of these populations.

Figure 8.3 High-Risk Communities for Childhood Lead Poisoning July 1, 2003 through June 30, 2008

Figure 8.3 is a map showing the 14 communities in Massachusetts considered to be high-risk communities for childhood lead poisoning. While there is annual variation in communities designated as high-risk, the communities included in Figure 8.3 are Holyoke, Springfield, Fitchburg, Worcester, Lowell, Lawrence, Lynn, Everett, Chelsea, Somerville, Boston, Brockton, Taunton, and New Bedford. The high risk designation is based upon several factors including age of housing stock, blood lead levels, and other indicators.

Source: MDPH, Childhood Lead Poisoning Prevention Program.

Asthma and Allergies

Asthma is a chronic inflammatory disease of the airways. The airways become constricted due to swelling and excessive mucous production in response to exposure to environmental triggers. Symptoms of asthma are wheezing, coughing, chest tightness, and trouble breathing.

Asthma is the most common chronic disease in children in the US, and Massachusetts has one of the highest rates of pediatric asthma in the country. The impacts of indoor and outdoor pollution are thought to play an important role. Also, Massachusetts has more complete surveillance data than any other state in the country which may, in part, account for its high rates.

Acute asthma attacks can be triggered by indoor and outdoor air pollutants and allergens such as mold.

Since 2002, the Department of Public Health has tracked the prevalence of pediatric asthma in students in kindergarten through grade eight using school health records.

Figure 8.4 Prevalence of Pediatric Asthma in Schools

Figure 8.4 is a bar chart showing the prevalence of pediatric asthma in Massachusetts school children in kindergarten through grade eight. It shows that, for about one-third of our schools, the prevalence of pediatric asthma ranges from 8 to 12 percent of the students. For another third of our schools, the prevalence ranges from 12 to over 20 percent of the students with asthma while for the remaining third, the prevalence is under 8%.

Look for more asthma data in Chapter 7:

Wellness and Chronic Disease.

Source: MDPH Bureau of Environmental Health.

Drinking Water

Working closely with the Massachusetts Department of Environmental Protection, which regulates public drinking water supplies, DPH is mandated to provide technical support when either public or private water supplies are threatened with chemical, bacteriological, or radiological contamination.

Figure 8.5 Public Water Supplies in Full Compliance with Monitoring/ Reporting Requirements

Figure 8.5 is a bar chart showing the percent of public water supplies in full compliance with federal and state monitoring and reporting requirements for health-based drinking water standards. For the years 2000 through 2008, the percent of public water supplies that were in full compliance fluctuated between 80 and 89%.

Source: Massachusetts Department of Environmental Protection, Bureau of Resource Protection.

Swimming

There are more than 1,100 public and semi-public freshwater and marine bathing beaches in the state. Under the Massachusetts Beaches Act of 2001, beaches must be monitored for bacterial contamination in the water during the bathing season

Swimming in water polluted by bacteria can cause gastrointestinal symptoms such as vomiting and diarrhea; respiratory symptoms such as sore throat and cough; eye and ear symptoms such as earache and irritation; dermatologic symptoms such as skin rashes and itching; and flu-like symptoms such as fever and chills. Beaches with high bacterial levels must be posted by the local Board of Health to prohibit recreational use of the water.

Causes of high bacteria levels include rain events, greater bather use, pet waste, spring tides, decaying plants, and illegal discharge of boat waste.

Figure 8.6 Samples Collected at Beaches with High Bacteria Levels

Figure 8.6 is table showing the number of samples collected at marine and freshwater beaches between the years 2001 and 2008 that had bacteria levels in exceedance of water quality criteria. It shows that, on average, 4 to 5% of approximately 7000 annual samples collected each year at both marine and freshwater beaches in the state exceeded bacterial standards.

Increases in bacterial contamination in 2008 were likely due to increased rainfall.

Source: MDPH Bureau of Environmental Health.

BEH maintains information on safe water at public beaches at http://mass.digitalhealthdepartment.com/public_21/index.cfm.

Under the state sanitary code, DPH also regulates public and semi-public swimming pools to prevent illness and injury. The regulations enforced by DPH cover the construction, operation, and maintenance of these pools.

Indoor Air

One in five people in the US – nearly 55 million people – spend their days in elementary and secondary schools. The US Department of Education reported in 1999 that one in five of the nation's 110,000 schools reported unsatisfactory indoor air quality, and one in four schools reported unsatisfactory ventilation.³ Indoor air

allergens (substances that can cause allergic reactions) include mold, dust, and animal dander.

Molds produce allergens, irritants, and in some cases, potentially toxic substances (mycotoxins). In sensitive individuals, inhaling or touching mold or mold spores may cause immediate or delayed allergic reactions. These reactions can include hay fever-type symptoms, such as sneezing, runny nose, red eyes, and skin rashes. Allergic reactions to mold are common. Molds can also cause asthma attacks in people with asthma who are allergic to mold. In addition, mold exposure can irritate the eyes, skin, nose, throat, and lungs of both mold-allergic and non-allergic people.

Figure 8.7 Asthma Prevalence in Schools by Moisture/Mold Problems

Figure 8.7 is a table showing the relationship between the prevalence of asthma and the presence or absence of moisture or mold in a school. This relationship was based on a sample of schools in the state that showed the greater the prevalence of mold/moisture problems in the schools, the higher the asthma prevalence.

The key to mold control is moisture control.

Source: MDPH Bureau of Environmental Health. Statistically significant difference between two school groups ($p \leq 0.01$).

Skating Rinks

To ensure the health and safety of patrons who use indoor skating rinks, Massachusetts is one of only two states that regulate the indoor air concentrations of carbon monoxide and nitrogen dioxide in public and private skating rinks. These gases are produced by ice resurfacing and edging equipment powered by combustible fuels such as gasoline and propane.

Indoor ice rink operators who use this type of equipment must conduct air sampling for these gases; maintain a log book of the air measurements; and take action to reduce the levels of carbon monoxide and nitrogen dioxide when necessary. Rinks that use electric equipment are exempt from DPH regulations.

Ambient Air

Exposure to ambient (outdoor) air pollution, including particulate matter and ozone, has been linked to a wide range of cardiovascular and respiratory health effects. Sensitive individuals, such as the elderly and people with pre-existing heart disease

or chronic obstructive pulmonary disease (COPD), are particularly vulnerable. Air pollutants such as particulate matter, ozone, and sulfur dioxide can trigger asthma attacks. Exposure to particulate matter has also been shown to increase the rate of heart attacks, arrhythmia, and premature death.

In April 2009, ESPN ran a feature story – "Danger in the Air" – on the dangers of ice rink pollution, using Massachusetts as an example of a state that has acted to control pollutants in indoor skating rinks.

Figure 8.8 Times Ozone Air Quality Standard Exceeded

Figure 8.8 is a graph showing the number of times the air quality standard for ozone was exceeded annually between 2000 and 2008. It shows that the number has fluctuated between 15 and 124 per year, with the highest numbers of exceedances in the 2001-2002 timeframe.

The Air Quality Index, or AQI, is broadcast during local TV and radio weather reports to alert residents about health risks from air pollution.

Source: Massachusetts Department of Environmental Protection, Bureau of Waste Prevention.

Food Safety

Food poisoning can occur when food becomes contaminated with bacteria, viruses, parasites, toxins, or chemicals. The US Centers for Disease Control and Prevention estimate that there are 76 million cases of food poisoning or foodborne illness in the US each year. An estimated 300,000 hospitalizations and 5,000 deaths occur each year from foodborne illness. The actual number of illnesses may be much higher since many non-serious food-related illnesses are not reported to health officials.

Although some contaminants can cause illness within minutes, others can take days or several weeks to cause symptoms.

DPH's Food Protection Program works with local health officials to facilitate food recalls and to investigate and track reports of suspected and confirmed foodborne illnesses. If a pattern is found among the reports, DPH investigates to identify the source of the contamination. In the case of food recalls, DPH works with local health officials to locate the adulterated food and, if appropriate, issue embargoes and require destruction of the food products.

It normally takes 12 - 72 hours for symptoms of salmonella poisoning to appear.

Figure 8.9 Complaints of Suspected Foodborne Illness

Figure 8.9 is a bar chart showing the number of complaints of suspected foodborne illness reported to MDPH for the years 2000 through 2008. The numbers range from 301 to 611 in a given year. The graph shows that the number of suspected cases being reported has increased in the last several years.

Source: MDPH Food Protection Program.

Campylobacteriosis and salmonellosis are the most commonly reported bacterial foodborne illnesses in Massachusetts and in the US. Food purchased in food service establishments is identified in the majority of complaints reported.

Figure 8.10 Suspected Foodborne Illness Complaints by Type of Food Establishment

Figure 8.10 is a pie chart showing the various sources of foodborne illness complaints by type of food establishment. It shows that the majority of complaints (63%) are associated with food service establishments followed by supermarkets (accounting for 14%), home-related foodborne illnesses (at 12%), and then retail markets (at 5%).

Source: MDPH Food Protection Program.

Foodborne illnesses can be prevented or minimized by effective hand washing, keeping dishcloths and sponges clean, and sanitizing surfaces such as cutting boards and sinks.

The Cardinal Rule of Safe Food Preparation: Keep everything clean!

Reducing Environmental Health Risks in our Communities

Whether it is enforcing regulations, evaluating contamination in our environment, or conducting community health assessments, preventing or mitigating environmental exposure opportunities is an important component of maintaining and improving the public's health.

Policy Perspective: Environmental Health

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There are dramatic secular and geographical differences in life expectancy, infant mortality, and other health indices. Babies born in Massachusetts today will live more than twice as long as their counterparts a century ago, and more than twice as long as babies born today in sub-Saharan Africa. Why? The most important determinants of life expectancy relate to the environment. The air we breathe, the water we drink, the homes we live in, our occupation, and the choices we make are critical determinants of our health. Genetics and access to healthcare are important, but matter less.

Investment in environmental health strategies such as systematic exposure assessment should be consistent with this reality. In particular, we need to emphasize children. They are the future of our families and of the Commonwealth. Moreover, children are particularly vulnerable to environmental toxins. There is abundant evidence that early childhood, as well as embryonic development prior to birth, are critical determinants not only of a healthy childhood, but of adult health as well. There are well demonstrated links between early exposures to toxins and later outcomes in children and adults. We must continue to explore critical periods of human development and the most vulnerable populations by virtue of their genetics, geographical location, or behavior.

Our public health efforts must be based on rational, science-based health policies as well as on accurate, extensive environmental and health surveillance data. We often know what to do, but lack the staff and resources to implement effective programs in environmental health. The Commonwealth of Massachusetts has an outstanding record. We need to maintain this momentum and increase our efforts, especially in regard to those who are poorest and most affected by environmental insults.

FIGURE NOTES

Figure 8.1:

The population is the number of children aged nine to 48 months of age in each EOHHS region, based on the 2000 US Census. The percent screened is based on the number of children in this age group screened for lead poisoning between July 1, 2007 and June 30, 2008.

Figure 8.2:

The counts represent the number of children in Massachusetts 9 to 48 months of age with blood lead levels of 10 or greater micrograms of lead per deciliter of blood, as confirmed by either a venous test or two capillary tests within 84 days. CDC considers a level of 10 or greater as a level of concern.

Figure 8.3:

High-risk communities are defined based on a comparison of the incidence of blood lead levels in the community to the statewide incidence. The incidence rates are adjusted for socioeconomic status and age of the housing stock.

Figure 8.4:

The Massachusetts Department of Elementary and Secondary Education provided total enrollment figures for public schools. Private schools provided their enrollment totals. Prevalence estimates are based on 2,075 participating public, private, and charter schools, representing 97% of the K-8 school population in Massachusetts.

Figure 8.5:

Refers to compliance with monitoring/reporting requirements for health-based drinking water standards, according to 310 CMR 22.00. Data presented in Environmental Progress Report FY 2009: Drinking Water. Available at: <http://www.mass.gov/dep/water/priorities/09water.pdf>.

Figure 8.6:

For marine beaches, the indicator species is Enterococcus. For freshwater beaches, the indicator species is E. coli or Enterococcus. A sample exceedance is based on comparison to the appropriate water quality criterion. Data are presented in Marine and Freshwater Beach Testing in Massachusetts Annual Report: 2008 Season. Available at: <http://www.mass.gov/dph/topics/beaches.htm>.

Figure 8.7:

For 2003/2004 through 2005/2006 school years.

Figure 8.8:

Refers to exceedance of the 8-hour ozone air quality standard. Data available at: http://www.mass.gov/dep/air/aq/pollutants_ozone.doc.

Figure 8.9:

Available from the MDPH Working Group on Foodborne Illness Control.

Figure 8.10:

Available from the MDPH Working Group on Foodborne Illness Control.

ENDNOTES

1 Pew Environmental Health Commission. America's Environmental Health Gap: Why the Country Needs a Nationwide Health Tracking Network, Companion Report. Prepared by the Environmental Health Tracking Project Team at Johns Hopkins School of Hygiene and Public Health. September 2000. Available at: <http://healthyamericans.org/reports/files/healthgap.pdf>.

2 Centers for Disease Control and Prevention, Lead [homepage]. <http://www.cdc.gov/nceh/lead/>

3 US Department of Education, National Center for Education Statistics. Condition of America's Public School Facilities: 1999. Washington, D.C. 2000.