

CHELSEA CREEK COMMUNITY BASED COMPARATIVE RISK ASSESSMENT
CHAPTER 4: RESPIRATORY DISEASE

1. Overview of Respiratory Disease

Respiratory disease, or illnesses that affect the lungs and other organs which allow us to breath, is one of the most serious public health problems in the United States. Over 25 million people live with a chronic respiratory disease such as asthma, emphysema, or chronic bronchitis. (American Lung Association, 2001). Chronic Obstructive Pulmonary Diseases (COPD) which include emphysema and chronic bronchitis are the fourth leading cause of death in the United States. It is estimated that smoking causes 80%-90% of COPD cases (ALA, 2001). Other known causes include second-hand smoke, also called “environmental tobacco smoke” (ETS), radon, outdoor or ambient air pollution, and occupational exposure to chemicals. The table below identifies and describes the common respiratory diseases and shows the main causes of each disease.

Table 9 - Common Respiratory Diseases		
Disease	Description	Primary Causes
Chronic bronchitis	Long term productive cough with no other illness. May precede or accompany emphysema	Smoking Viral infection Air pollution Industrial pollutants
Emphysema	Air sacs in the lungs lose elasticity resulting in shortness of breath	Smoking Genetic makeup Air pollution
Lung cancer	Varies depending on the type of cancer and where in the lung cancer develops	Smoking Radon Asbestos Industrial pollutants
Asthma	Hyper-reactive immune reaction that causes swelling and constriction of the airways leading to shortness of breath and difficulty breathing.	Smoking. Outdoor and indoor air pollutants, mold, and roach and mouse allergens can bring on asthma attacks, but the actual cause of the disease is unknown.

Asthma is a chronic respiratory disorder that causes swelling of the airways. When asthma is under control, airways are clear, and breathing is normal. During an attack the airways swell and tighten, making it more difficult to breathe. Symptoms include coughing, wheezing,

chest tightness, and shortness of breath. The severity of asthma and the frequency of attacks varies greatly between people. Asthma can be life-threatening if airways become completely blocked. However, asthma can be controlled through proper medical treatment. Asthma is controlled through a combination of medical treatments and avoiding those things which trigger attacks.

The main cause of asthma is currently unknown, but one study has found that children who participate in sports in communities with high ozone levels are more likely to develop asthma (McConnell, et al., 2002). Asthma attacks can be brought on by a variety of things that are found both inside the home and outdoors. The things that bring on an attack are called “triggers.” Each person with asthma has different triggers that can cause an attack. The most common outdoor air pollutants that can trigger an asthma attack are nitrogen dioxide, ozone, and fine particulate matter. Nitrogen dioxide is a by-product of fuel combustion and is produced by power plants, trucks, cars, and airplanes. Ozone is produced when nitrogen dioxide and sunlight are combined, so vehicular traffic also contributes to high ozone levels, particularly in the summer. Small or fine particulates develop from diesel combustion and power generation as well as through industrial processes, and wood burning. (For more information on air quality, see Chapter 2). Indoor environmental triggers include tobacco smoke, mold, animal dander, cockroach particles, and dust mites. Nitrogen dioxide, released by gas stoves and heaters, is one of the primary indoor environmental triggers.

2. Review of Existing Chelsea and East Boston Data on Respiratory Disease

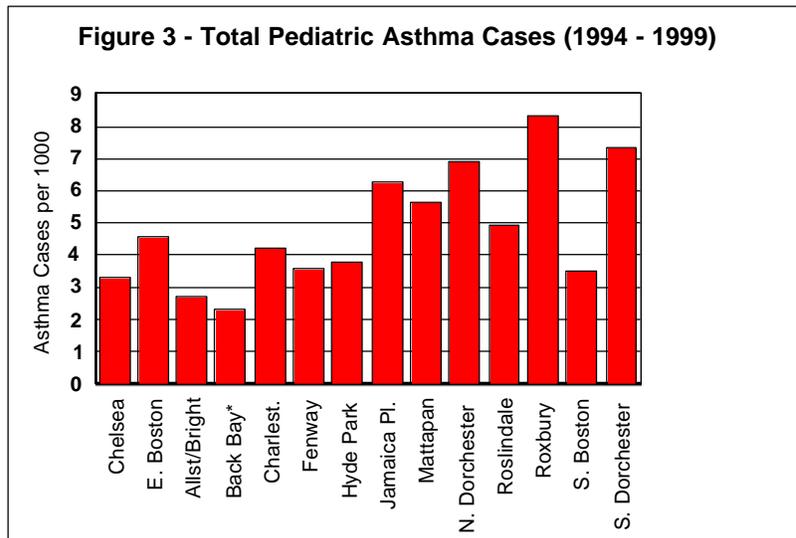
It is very difficult to get respiratory disease data on a neighborhood basis, especially regarding asthma rates. There is no reporting system that tracks the number of asthma cases in the neighborhoods of East Boston and Chelsea, so the true number of people suffering from the disease is unknown. In fact, this lack of data is not unique to East Boston and Chelsea but is a regional and national issue of concern. As a result of this problem, current information is based only on hospitalization rates due to severe asthma attacks. Asthma may also be misdiagnosed or remain undiagnosed, so counts of asthma cases probably underestimate the number of people suffering from the disease. It is estimated that 1 in 13 school aged children has asthma; rates in urban communities, particularly among Black and Latino families, are even higher (U.S. EPA, 2000).

Available data on respiratory disease in Chelsea and East Boston is shown in the tables below and on the attached map. This data is based on the number of people who have been hospitalized rather than the actual number of asthmatics and therefore only includes the most severe or poorly managed cases of asthma. The numbers may therefore greatly underestimate the burden that asthma imposes on the community. However, hospitalization data can show the impact or burden of asthma on a community and compare it to other communities. Hospitalization data also provides at least some baseline information to measure the benefit of interventions to improve asthma management. High hospitalization rates may indicate a higher prevalence of asthma, but they also may indicate that asthma

management through use of medication could be improved or reflect problems with access to care or information, or high rates of exposure to asthma triggers.

Asthma data was provided by the Massachusetts Division of Health Care Finance and Policy which collects information on inpatient hospitalizations from around the state. Table 11 and Figure 3 show the number and rate of pediatric asthma hospitalizations in each community. The number of cases tells us how many people are affected, and the rate, adjusted for population, makes it possible to compare communities that are different sizes.

Data on other respiratory diseases is limited. All cancer cases diagnosed in the state are reported to the Massachusetts Cancer Registry, so the number of lung cancer cases by City is available. The Cancer Registry compares the number of cancer cases in a particular town to the expected number of cases, based on the statewide average and the town's population, adjusted for age. These numbers



*Back Bay/Beacon Hill/North End/West End

are used to determine if an unusual number of cancer cases is occurring in one location. As shown, the number of lung cancer cases in Chelsea is significantly higher than the expected number of cases. The cause of higher rates of cancer cannot be determined from the data. Smoking is the leading cause of lung cancer, and other cancers associated with smoking such as cancer of the esophagus, larynx, and the oral cavity are also elevated in Chelsea. However, it should be noted that bladder cancer, also associated with smoking, is not elevated in Chelsea. There may therefore be other common exposures which has resulted in elevated rates of lung cancer.

The Cancer Registry does not provide Standardized Incidence Ratios for specific communities within Boston, so a similar comparison cannot be done for East Boston. However, lung cancer deaths for each community are available for 1993-1998. The age-adjusted lung cancer mortality rate for Boston is 41.7 deaths per 100,000 population. The age-adjusted lung cancer mortality rate for East Boston for the same time period is 48.4 deaths for 100,000 population.

Table 10 - Asthma Rates per 1000 Individuals 1994-1999

These numbers represent the rate of asthma hospitalization per 1000 individuals in an age group during the years of 1994-1999. For example, out of 1000 East Boston residents between the age of 0 and 4, 8.4 of them were hospitalized for asthma in that five year period.

Age Group	East Boston	Chelsea	Massachusetts
0 - 4	8.4	7	5.3
5 - 14	4	2.1	2.7
15 - 24	1.4	1.8	1.5

* Massachusetts numbers were obtained from the Boston Public Health Commissions. Neighborhood data was obtained from the Massachusetts Division of Health Care Finance and Policy. Rates were calculated based on 1999 population because 1994-1998 population data was not available.

**Table 11 - Total Pediatric Asthma Cases (1994- 99)
(Age 0 - 24)**

	Total Number of Pediatric Asthma Cases	Rate Per 1000 Young People (Under 24 years old)
Chelsea	<202	3.6
East Boston	235	4.6
Allston/Brighton	186	2.7
Back Bay/Beacon Hill/North End/West End	58	2.3
Charlestown	81	4.2
Fenway	114	3.6
Hyde Park	170	3.8
Jamaica Plain	369	6.3
Mattapan	327	5.6
North Dorchester	858	6.9
Roslindale	255	4.9
Roxbury	744	8.3
South Boston	154	3.5
South Dorchester	1105	7.3
South End	219	5.5
West Roxbury	<74	2.3

Table 12 - Cancer of the Lung or Bronchus in Chelsea, Massachusetts			
	Expected Number of Cases	Observed Number of Cases	Standardized Incidence Ratio*
Male	49.81	95	191
Female	37.45	64	171
Total	87.26	159	182

From the Massachusetts Cancer Registry. Expected numbers are based on Massachusetts average age-specific incidence rates.

*Standardized Incidence Ratio (SIR) is a method commonly used to compare rates of disease. An SIR of 100 indicates that the number of cases observed is equal to the number of cases expected. An SIR above 100 indicates that the number of cases of observed exceeds the expected number.

Respiratory diseases other than cancer are not “reportable” meaning that hospitals and doctors are not required to report or track the number of cases that they see. Massachusetts General Hospital tracked the number of hospital discharges between 1989-1998 with the diagnosis of “Chronic Obstructive Pulmonary Diseases (COPD)” which includes chronic bronchitis and emphysema by town of residence and compared the number of cases in Chelsea to the state overall. As with asthma data, this information reflects only the cases that were identified as COPD and which resulted in a hospital stay. As shown, the rates of COPD in Chelsea are significantly higher than in the state as a whole. The number of deaths caused by COPD during the same time period in Chelsea is also higher than the statewide rate. This data is adjusted by population and by the age of the population, but it does not account for the number of smokers in each population. The cause of the high rate of COPD can therefore not be easily determined.

Table 13 - COPD Hospital Discharges and Deaths in Chelsea Age-Adjusted Rates per 100,000				
	Hospital Discharges Chelsea	Hospital Discharges Massachusetts	COPD Deaths Chelsea	COPD Deaths Massachusetts
1994	609	296	34	17.6
1995	520	278	29.7	17.4
1996	515	269	27.4	17.7
1997	485	260	47	17.3
1998			33.5	18.7

The age adjusted mortality rate for COPD in East Boston from 1993-98 was 19.6 deaths per 100,000. During the same time period, the rate for Boston overall was 17.8 deaths per 100,000. The East Boston mortality rate is also slightly higher than the overall rate for Massachusetts (shown above). COPD hospitalization rates in East Boston for the years 1994-1999 were 37.1 hospitalizations per 1000 people. This rate is not age-adjusted and therefore cannot be used to compare with the statistics from Chelsea or from the State.

3. Analysis of Existing Data

As shown in the tables above, the rates of asthma per 1000 individuals are much higher in East Boston than the average state rate for children under the age of 14. For individuals between the ages of 15 and 24 years of age, the East Boston rate is lower than the state rate. In Chelsea, the number of asthma cases per 1000 individuals is high for the youngest age group (0-4 years) and for adolescents (15-24 years), but the rate is lower in Chelsea for children between the ages of 5 and 14. The table shows that Chelsea and East Boston do not have higher asthma hospitalization rates than the state as a whole, but it must be noted that this data does only reflect one measure of asthma severity. More data would be needed before the impact of asthma on the community can be understood. It is also notable that the youngest age group, 0 - 4 year olds in Chelsea and East Boston have a higher than average rate of asthma hospitalization.

Better data is needed to determine the extent of the impact of asthma on residents. Rather than focusing on hospitalization, identification of residents with asthma through the school system or by health care providers would provide a more accurate assessment of the percentage of residents who are affected. Survey instruments have been developed to evaluate the impact of asthma on activity levels, overall health, and quality of life.

While the hospitalization data shows that Chelsea and East Boston are not the most affected communities in the Boston area, the rate of asthma in these communities is still higher than the average Massachusetts municipality. Even with this limited data, the hospitalization rates alone show that asthma has a profound effect on the community.

Some of the reasons for elevated rates in urban areas include the age and condition of housing stock; older homes tend to have more indoor air problems such as dust mites, mold, and pests which may serve as asthma triggers. Aging schools have similar problems; cleaning agents and pesticides used to maintain buildings can also trigger asthma attacks. Outdoor triggers such as nitrogen dioxide, ozone, and fine particulates may also be elevated in areas where traffic is particularly heavy.

Poor access to medical care can also exacerbate the impact of asthma. Attacks can largely be controlled through the proper use of medication and avoidance of asthma triggers; this requires that the diagnosis of asthma be followed with prescriptions and sufficient training on how medications must be used. Since many asthmatics are on multiple medications to control the disease, the impact of the cost of co-payments on disease management is an area

which should be examined.

Data regarding other respiratory ailments also indicates a need for further study. Better reporting of data, data for specific communities within Boston, as well as further examination of the existing data is needed. The elevated rates of lung cancer and COPD in both Chelsea and East Boston must be studied to determine if environmental exposures are affecting the respiratory health of the community.

4. GIS Maps of Available Asthma Data and Information

Note: There is a map associated with this chapter - download the map entitled: Total Asthma Hospitalizations (Age 0 -24)

The attached map shows the distribution of pediatric asthma hospital admissions by Boston community, which is highlighted in Table 11. Since the data on other respiratory disease is limited, it was not mapped.

5. Current Asthma Projects or Activities in Chelsea/East Boston

There are several local asthma projects in Chelsea and East Boston.

- The Donald McKay Elementary School in East Boston works with the Institute for Healthcare Improvement to improve the quality of health care for pediatric asthma. The goals of the project are to raise awareness of asthma and to research methods for improving care of asthmatic children.
- The Boston Public Health Commission (BPHC) sponsors several programs which serve Boston residents, with asthma, including the Healthy Home Programs, which focuses on low-cost remediation and distribution of asthma prevention materials (mattress covers, pillow cases) and the Kids With Asthma Can ... Swim! programs which offers free swimming lessons and asthma education in different neighborhoods of Boston. BPHC also runs the Kids With Asthma Can Camp! program which is a day camp for children in Boston with asthma.
- The Chelsea Department of Health and Human Services is working with Partners Health Care and MGH to conduct visits to homes of children with chronic health problems and high absenteeism. Walk-through inspections of homes to identify asthma triggers and information about proper medication are available. A study conducted by MGH has shown a decrease in hospitalization and emergency room visits among study participants.
- The EPA Tools for Schools program is available to interested schools; the program includes indoor air quality training and walk through inspections of schools to identify asthma triggers. In Boston, the Environmental Health Office of the Boston Public Health Commission implements Tools for Schools.

6. Greatest Concerns Related Respiratory Disease for Chelsea and East Boston Residents

It is difficult to determine the impact of asthma and other chronic respiratory diseases in the community because they are not well tracked. The most important thing that residents can do is to make sure that respiratory diseases are properly diagnosed, treated, or managed. There is increasing evidence that exposure to air pollutants results in an increase in respiratory disease and other health impacts. For example, a study published in “Circulation: Journal of the American Heart Association” found that the fine particulate matter released in vehicle, industrial, and power plant emissions can trigger heart attacks in people who are already at risk (Peters, et al., 2001). A study in Atlanta during the 1996 Summer Olympic Games found that a reduction in the number of acute asthma attacks corresponded to the reduced traffic counts during Olympic events (Friedman, et al., 2001). The impact of today’s air pollutants may also effect the next generation. Exposure to air pollutants during pregnancy has been correlated with a higher rate of children born with heart defects (Ritz, et al., 2002). Asthma and respiratory diseases have a tremendous social cost, including school and work absenteeism and limits on physical and social activity. Over 10 million school days per year are missed because of asthma, and the toll in sleepless nights and family and caregiver stress is uncounted.

7. Recommendations to Address the Greatest Concerns Regarding Respiratory Disease

Asthma and respiratory diseases are closely linked both to ambient air pollutant and indoor air quality. Actions on both the community level and on a personal scale can help reduce exposure to respiratory irritants.

Community Actions

- Providing adequate public transportation to reduce private vehicle use.
- Enforcing no-idling laws for buses and trucks.
- Converting diesel vehicles to use cleaner fuel.
- Improve school maintenance to prevent ceiling leaks and mold growth in classrooms.
- Support smoking cessation programs.
- Support creating no-smoking policies in restaurants and other public areas.

Longer Term Priorities

- Conduct studies to determine the rates of respiratory disease in Chelsea and East Boston and to determine the potential cause of disease.

Personal Actions

The following is a list of recommended actions that can help prevent asthma attacks by limiting the exposure to triggers. Since many things that bring on asthma attacks are also respiratory irritants, many of the recommended actions may reduce other respiratory illnesses.

Table 14 - Recommendations to Reduce Asthma Attacks	
Asthma Trigger	Recommended Action
Tobacco smoke	Do not smoke in the house or other indoor space
Mold	Fix leaky roofs and walls. Remove carpeting in homes and classrooms.
Animal dander	Remove things that attract rodents. Avoid having pets
Cockroach particles	Keep areas clear of food and water. Reduce clutter. Caulk holes in walls, floors, and cabinets.
Dust mites	Laundry bedding and stuffed toys in hot water. Ask your doctor about allergy blocking bed covers. Remove carpeting in homes and classrooms.
Nitrogen dioxide	Do not use gas oven or stove for heating house. In the outdoor environment, reduce vehicular emissions by driving less or using a higher mileage vehicle. Turn off car engines when waiting.
Ozone	Turn off car engines when waiting; encourage trucks and buses in the neighborhood to observe no idling laws.
Particulate matter	Turn off car engines when waiting; encourage trucks and buses in the neighborhood to observe no idling laws.

8. Contact List

U.S. EPA Tools for Schools Coordinator, Eugene Benoit (617) 918-1639
 U.S. EPA Asthma Coordinator, Rhona Julien (617) 918-1782
 Boston Public Health Commission Asthma Program, Margaret Reid (617) 534-5966
 Boston Public Health Commission Environmental Health Office,
 John Shea (617) 534-5966
 Chelsea Department of Health and Human Services, Luis Prado (617) 899 8266