

*Reducing the Effects of Environmental
Tobacco Smoke in Massachusetts*

Where There's Smoke, There's Disease: *Reducing the Effects of Environmental Tobacco Smoke in Massachusetts*

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The recommendations found in this report are those of the ETS Task Force and do not reflect the opinions of the Massachusetts Department of Public Health.

Reducing the Effects of Environmental Tobacco Smoke in Massachusetts

EXECUTIVE SUMMARY

It has long been understood that active smoking increases an individual's risk for a variety of diseases including cancer, chronic obstructive pulmonary disease, and heart disease. More recent studies now show that the effects of smoking are not limited to individuals who smoke, but also extend to those who breathe the smoke released into the air from burning cigars and cigarettes. Nonsmokers exposed to environmental tobacco smoke (ETS) inhale many of the same toxic compounds as active smokers. Very often, people are exposed to ETS involuntarily.

Recent estimates suggest that ETS exposure in Massachusetts results in between 900 and 1,500 deaths annually, several hundred cases of low birth weight, 200 to 300 cases of hospitalization for bronchitis, several hundred new cases of asthma or increased severity, and tens of thousands of physician visits for middle ear infections and related disorders.

The Task Force on ETS has reviewed the scientific evidence on the adverse effects of ETS and has reached the following conclusions:

1. There is little disagreement about the fact that ETS adversely affects human health. Disagreement, where it exists, centers on how bad the adverse effects may be, not on whether or not they exist.
2. There is consistent credible evidence that ETS exposure is associated with a wide range of adverse health effects including asthma, emphysema, middle ear infections, heart disease, and lung cancer. The effects of ETS are not limited to the respiratory system.
3. ETS exposure has cumulative effects over time—those exposed over a long period of time are at a higher risk than those exposed for a shorter duration.
4. The effects of ETS affect multiple organs and organ systems. Therefore, studies that have focused on single disease entities rather than on multiple organ systems, have tended to underestimate adverse health consequences of ETS.
5. Children are especially vulnerable to the adverse health effects of ETS exposure because they are still developing physiologically and they cannot advocate for smokefree environments for themselves.

All of these findings suggest that it is incumbent on the Commonwealth to act on behalf of individuals who are involuntarily exposed to ETS to protect them from its toxic effects.

Further, public opinion in Massachusetts favors restrictions to reduce ETS and this opinion is growing stronger. In a 1996 survey, 60.5% of nonsmoking and smoking adults reported favoring formal policies to limit ETS, up from 58.2% in 1995.

To that end, the Task Force recommends the active pursuit of the following:

At the local level:

1. Pursue intensive sustained efforts to regulate involuntary exposure to ETS.
2. Commit resources to strengthen the enforcement of regulations already in place at the state and local level.
3. Extend protections for state and municipal workers to include protection from involuntary exposure to ETS in state or municipal vehicles.
4. Encourage smokers to quit smoking if, for no other reason, than to protect other family members from incidental exposure to ETS. While the Task Force is adamantly opposed to regulating private behavior in the home, it feels strongly that the Commonwealth has an obligation to encourage its citizens to alter behaviors that may have adverse consequences for them and others.

At the state level:

1. Explore the use of the State Sanitary Code's provisions regulating food establishments as a vehicle to address ETS exposure of workers and patrons.
2. Ensure that protections from ETS are extended to those under state care.
3. Consider regulations to adjust health, workman's compensation, and fire insurance rates paid by businesses that do not protect their workers from ETS to reflect the added expenses associated with ETS exposure.

ETS exposure is a major source of illness, disability, and premature death in Massachusetts. It is an exposure that is easy to identify and control through education and the implementation of simple policy initiatives. While Massachusetts faces many intractable problems in protecting and promoting the health of its citizens, ETS should not be one of them.

PREFACE

Massachusetts has successfully implemented innovative programs to reduce harm caused by passive and active smoking. Perhaps most notable is Question 1, a ballot petition approved by Massachusetts voters in November, 1992. Question 1 increased the tax on each pack of cigarettes from 26 to 51 cents.¹ Proceeds have helped establish the Massachusetts Tobacco Control Program which has been responsible for a wide range of control efforts:

- A statewide mass-media anti-smoking campaign.
- Funding and technical support for local boards of health and youth programs to promote policies that reduce public exposure to ETS and restrict youth access to cigarettes.
- Support to health education programs, primary care providers, and other services to help current smokers quit and prevent nonsmokers from starting.

Since the establishment of the Massachusetts tobacco control program, the number of cigarettes purchased in Massachusetts has declined substantially. The number of adult cigarette purchases declined 19.7% from 1992 to 1996 (per capita consumption fell from 117 to 94 packs) compared to a 6.4% decline during 1990-1992.

In May of 1998, The Medical Foundation was asked by the Massachusetts Department of Public Health to conduct a critical review of the scientific literature on the effects of ETS. This report presents the results of that effort. It has been developed for health professionals, elected officials, and civic and business leaders concerned about involuntary exposure to ETS.

During the Summer of 1998, The Medical Foundation convened a Task Force and a panel of expert reviewers, composed of scientists and policy experts familiar with the ETS literature and existing regulations (see attached list). The Task Force and its expert reviewers have guided the content and focus of this report throughout its development and have ensured an accurate presentation of the facts. The Task Force has also developed recommendations to reduce involuntary exposure to ETS in Massachusetts. In doing so, the Task Force indicated areas in which involuntary ETS exposure continues to pose a health risk to Massachusetts citizens and considered the efficacy of ETS control measures already in place.

¹ Harris JE. Connolly GN. Brooks D. Davis B. Cigarette smoking before and after an excise tax increase and an anti-smoking campaign - Massachusetts, 1990-1996, MMWR 1996; 45: 966-970.

Numerous reviews have been released exploring the nature and extent of adverse health effects associated with the exposure to ETS. Four of the most exhaustive are reports by the U.S. Surgeon General (1986),ⁱ the National Research Council (1986),ⁱⁱ the United States Environmental Protection Agency (1992),ⁱⁱⁱ and the California Environmental Protection Agency (1997).^{iv} Each of these reports was the product of extensive literature reviews to determine the extent of the relationship between ETS exposure and adverse health effects. This report summarizes these reports and highlights more recent studies as appropriate. Rather than reproduce the work of these distinguished groups, the Task Force has attempted to address what is significant about ETS exposure in terms of the impact on citizens of the Commonwealth and implications for those who make policy.

Part 1 of this report provides a background of what ETS is and how it is studied and summarizes the scientific evidence linking ETS to a variety of health effects. Part 2 provides a brief synopsis of the measures which are already in place to reduce involuntary exposure in Massachusetts, indicates locations where citizens continue to be involuntarily exposed, and makes policy recommendations to further reduce levels of tobacco smoke in the environment.

The Committee wishes to express its appreciation for the work of Tony Palomba of The Medical Foundation for his assistance in the execution of this complex project. We especially want to thank Joanne Barker for her skill as a writer and editor of the final document.

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ⁱ U.S. Department of Health and Human Services. (U.S. DHHS 1986) *The Health Consequences of Involuntary Smoking. Report of the Surgeon General*. DHHS Pub No (PHS) 87-8398. Public Health Service, Office of the Assistant Secretary of Health, Office of Smoking and Health.

ⁱⁱ National Research Council. (NRC, 1986) *Environmental Tobacco Smoke: Measuring Exposures and Assessing Health Effects*. Washington, DC: National Academy Press.

ⁱⁱⁱ U.S. Environmental Protection Agency. (U.S. EPA, 1992) *Respiratory Health Effects of Passive Smoking: Lung Cancer and Other Disorders*. United States Environmental Protection Agency. Office of Research and Development. Washington, DC.

^{iv} California Environmental Protection Agency. (CA EPA 1997) *Health Effects of Exposure to Environmental Tobacco Smoke. Final Report*. Berkeley California: California Environmental Protection Agency. Office of Environmental Health Hazard Assessment.

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INTRODUCTION

Since 1964, when the first Report of the Surgeon General established the adverse health effects of cigarette smoking,¹ scientific evidence has accumulated linking smoking to a wide range of diseases including a variety of cancers, chronic obstructive pulmonary disease, and cardiovascular disease. Infants of women who smoke during pregnancy are at an increased risk of low birthweight and/or death, both before and after birth.

More recent studies now show that the effects of smoking are not limited to the individuals who smoke, but also extend to those who breathe the smoke released into the air from burning tobacco products in enclosed spaces. Nonsmokers who are exposed to ETS inhale many of the same toxic compounds as active smokers. Very often, unlike those who actively decide to smoke, people are exposed to ETS involuntarily.

How Does ETS Exposure Impact Human Health?

Present evidence suggests that exposure to ETS increases the incidence of the following conditions:

- Low birthweight among infants born to women exposed to ETS during pregnancy
- Sudden infant death syndrome (SIDS)
- Acute lower respiratory tract infections in children younger than 18 months
- Exacerbation of asthma in children
- Decreased lung development in children
- Middle ear infections in children
- Respiratory symptoms and chronic obstructive pulmonary disease in adults
- Fatal and nonfatal heart disease
- Lung cancer

In addition to the outcomes listed above, ETS is suspected to increase the risk of several additional disorders, however, the evidence currently available is not extensive enough to prove a causal association (a brief explanation of the epidemiological methods used to investigate ETS' effects in humans is provided in Part 1 of this paper). This report focuses on effects for which existing evidence adequately suggests a causal relationship.

Continuous exposure to ETS throughout the life of an individual appears to take its toll; it is probable that lifetime exposure results in adverse outcomes on multiple organ systems and predisposes the individual to additional illness. Overall, young children whose organ systems are in the process of developing are most susceptible to the respiratory effects of ETS. Adults and children with certain disorders including asthma, recurrent bronchitis, emphysema, and heart disease should not be exposed to ETS as it can exacerbate underlying conditions. Senior citizens, already at an increased risk of pneumonia, heart disease, and lung disease, face additional risk when exposed to ETS.

PART 1: SUMMARY OF THE SCIENTIFIC EVIDENCE

1. BACKGROUND

What is ETS?

ETS is a complex mixture of more than 4,000 compounds generated during the burning of tobacco products. The smoke from a smoldering cigarette between puffs is called sidestream smoke (SS) and is the principal contributor to ETS. Mainstream smoke (MS) is the smoke exhaled by the smoker.²

Although the same toxic compounds present in mainstream smoke are also in sidestream smoke, they are emitted in different amounts because of the different combustion conditions. Much less oxygen is present when SS is formed producing a higher concentration of many chemicals than in MS. For example, the ratio of benzene (an organic carcinogen) in SS compared to the amount in MS is approximately ten to one. ETS contains more than 40 compounds that have been identified as known or probable carcinogens, substances that cause cancer. Some carcinogens are present in SS at ratios of 30-1 to 100-1 compared to MS.^{3,4} The following is a sample of some of the chemicals found in ETS and their effects:

Chemicals found in ETS	Effects
Acrolein, crotonaldehyde, and hydrogen cyanide	Interfere with the lungs' ability to expel foreign particles such as those found in smoke.
Ammonia, formaldehyde, and sulfur dioxide	Can make it even harder for people with existing respiratory disorders such as asthma, cystic fibrosis, or emphysema to breathe.
Carbon monoxide, carbon disulfide, lead, nicotine, cadmium, and toluene	Have a toxic effect on fetal development.
Benzene, formaldehyde, and hydrazine	Known or probable human carcinogens (3 of more than 40).
Arsenic and chromium	Metals known to be carcinogenic to humans following inhalation.
Polycyclic aromatic hydrocarbons, including benz[a]pyrene and dibenz[a]anthracene	Carcinogens created by the burning of tobacco. ^{5, 6, 7, 8}

How is ETS Exposure Studied?

The effects of ETS can and have been studied in terms of their impact at the molecular, cellular, and organ system levels. Furthermore, studies have also looked at the impact of ETS on genetic material. However, much of the attention has focused on the impacts on a population-wide basis through the use of epidemiological studies. While previous reviews have included studies of the impact of ETS at the molecular and cellular levels, the Task Force limited its review predominantly to studies conducted in human populations in community settings, i.e., epidemiological literature.

Epidemiological studies generally compare two groups, one group that is exposed (i.e., to ETS) and a group that is not exposed. The occurrence of a particular outcome or disease is then measured in each group. If a number of studies show that disease occurs more frequently in the exposed group compared to the nonexposed group, it is possible to infer that the exposure is somehow associated with the outcome. Conversely, if the outcome is observed less frequently in the exposed group, investigators may conclude that the exposure has a protective effect. For example, a lower incidence of heart disease would be expected in a group of individuals who eat a low (vs. a high) cholesterol diet.

The existence of a cause-effect relationship can only be reasonably assumed if numerous studies show similar results. Further, the studies must adhere to rigorous standards and eliminate the possibility that the results are due to chance or systematic defects in the design and execution of the study itself. If a study produces results on the basis of chance, subsequent studies will probably not achieve the same results.⁹

Because there is widespread exposure to ETS and it is difficult to find a truly unexposed group in the general population, epidemiological studies attempt to compare individuals with higher ETS exposure to those with lower exposures. For example, a number of studies compare women who have never smoked and are married to smokers with comparable women married to nonsmokers.¹⁰

Measurement Methods

A variety of methods are used to measure ETS exposure. Because a number of ETS-related health disorders develop over a period of decades—chronic obstructive pulmonary disease, cancer, and coronary heart disease—it is important to determine how long study subjects have been exposed to ETS and to what extent over the course of their lives. Questionnaires can determine subjects' long-

term exposure; however, questionnaires are dependent on the accurate recollections of the participants. This tends to reduce a study's ability to accurately measure relationships between purely passive exposure and health effects.

Measurements of indoor concentrations of ETS, personal monitors, and biomarkers of ETS can gauge short-term exposure, however, these too have limitations. Logistically, these methods are too expensive to use over a number of years or decades. A substance commonly measured in the blood, urine, or saliva is cotinine, a metabolite of nicotine. While its presence can confirm that nicotine has been absorbed into the system, it does not definitively indicate that other components of ETS have been absorbed. Many of the newer studies use multiple sources of information and screening to increase measurement accuracy.¹¹

Another concern in conducting scientific studies of ETS exposure is the presence of hidden factors that may have contributed to the development of disease. For example, as a group, people who eat a high fat diet may smoke more, have lower socioeconomic status, and consume more alcohol than people who eat a low fat diet. High quality studies can control for these factors, allowing researchers to determine the existence of an independent relationship between fat and various adverse health effects. Studies with this ability to control for these types of hidden factors have been given more weight in epidemiological literature reviews.¹²

Weight of the Evidence

While the nature of scientific studies, particularly epidemiological studies, almost always precludes drawing definitive conclusions of cause and effect, *the weight of evidence on ETS points overwhelmingly in one direction—people exposed to ETS have higher rates of disease*. If these findings were simply a matter of chance, some studies would show ETS as having beneficial health effects, for example, fewer cases of asthma among exposed groups. This has not been the case. Despite some disparity in the extent of the effects measured in studies of ETS, the weight of the overall evidence leaves little room for doubt that ETS exposure increases the incidence of several diseases.

A limited number of reviews of the literature on ETS have concluded that exposure does not impair health. An investigation of this apparent disparity was reported recently in the *Journal of the American Medical Association*.¹³ The investigators found only one factor to be a predictor of a review article's conclusion that passive smoking is not harmful to health: the author's affiliation with the tobacco industry. Affiliation with the tobacco industry was defined as an author's known receipt of funding from or participation in events sponsored by the

tobacco industry. Of 106 review articles, 39 (37%) concluded that passive smoking is not harmful to health. Of these, 29 (74%) were written by authors

affiliated with the tobacco industry.¹⁴ In general, studies that fail to find an association between ETS exposure and adverse health outcomes tend not to have been well designed and/or have not controlled for confounding factors.

Prevalence of Exposure

Time spent in both the home and the workplace contribute significantly to ETS exposure. In Massachusetts, between 1993 and 1996, the average number of hours people reported being exposed to ETS in a week at work declined (from 4.6 to 2.3) while the average number of hours of exposure at home increased (from 4.5 to 5.5).¹⁵ According to the Centers for Disease Control and Prevention, nine out of ten nonsmoking Americans are exposed to ETS.¹⁶ The groups with the highest exposures to ETS were reported to be:

- Children
- Non-Hispanic blacks
- Males

Forty-three percent of children in the U.S. ages two months to 11 years old live in a home with at least one smoker and 37% of adult nonsmokers live in a home with a smoker or report exposure to ETS in the workplace.¹⁷

Exposure in the Workplace

A measurement of ETS taken in 25 worksites around Massachusetts showed that workplaces that ban smoking have significantly lowered their levels of ETS compared to workplaces with no restrictions. Workplaces that limit smoking to separate enclosed areas reduced ETS levels somewhat but not as much as complete bans.¹⁸

The Occupational Safety and Health Administration (OSHA) has established levels of cancer risk. By OSHA standards, a significant risk is classified as the risk that one out of 1,000 people will develop cancer.¹⁹ Average levels of ETS measured in workplaces that allow smoking exceeded these established levels as a significant cancer risk. In order to protect workers from hazardous substances found in ETS, the National Institute of Occupational Safety and Health (NIOSH), recommended in 1991 that workplaces eliminate ETS from the air workers breathe using a combination of smoking bans, smoking cessation services, and incentives/disincentives to discourage smoking.²⁰

Massachusetts: Decreasing Smoking Rates

In Massachusetts, 21.7% of adults reported smoking in 1995. This placed the Commonwealth slightly below the national average of 22.4% in a range of 13.2-27.8%.²¹ Active smoking in Massachusetts continues to decline; by 1997, the percent of self-reported smoking adults dropped to 20.6%.²² Smoking rates decline with increasing age and higher education levels (Tables 1 and 2).

Table 1. Percent of adult smokers by age

	18-24 years old	65 or older
% who smoke	33.0%	10.8%

Table 2. Percent of adult smokers by number of years of education

	less than 12 years	16 or more years
% who smoke	30.3%	12.4%

Within racial/ethnic groups, Hispanic adults report the highest smoking rates, while African American adults report the lowest (Table 3).²³

Table 3. Percent of adult smokers within racial/ethnic groups

	Hispanic	White	African American
% who smoke	30.1%	20.9%	16.1%

Developments on the National Level

Recent developments on the national level have, at least temporarily, raised questions on the EPA's classification of ETS as a Group A (known human) carcinogen and the FDA's authority to regulate tobacco products.

Although scientific validity should not normally fall under judicial review, two Federal judges have recently ruled on the EPA's 1992 report on ETS.²⁴ On July 17, 1998, Judge Osteen of the U.S. Federal District Court in North Carolina vacated the EPA's 1992 finding of ETS as a Group A (known human) carcinogen. Soon afterwards, on August 3, 1998, Judge Mishler of the U.S. Federal District Court in the Eastern District of New York ruled that the classification of ETS as a carcinogen is beyond dispute.²⁵ Neither court's decision questions the EPA's authority to research and classify toxic substances such as benzene, chromium, or

arsenic as Group A (known human) carcinogens. Each of these components and many others are found in ETS.

On August 14, 1998, a three-judge panel of the U.S. Court of Appeals for the Fourth Circuit brought into question the FDA's jurisdiction in regulating tobacco products. The decision has been stayed pending appeal.

Judicial rulings aside, numerous scientific studies and reviews confirm the EPA's 1992 classification of ETS as a carcinogen, including reports by the Surgeon General (1986), National Research Council (1986), and the California EPA (1997). The evidence from multiple other sources reveals that ETS is a harmful substance which leads to increased rates of cancer remains strong. Further, the effects on respiratory and cardiac health have not been disputed, nor has the significance of ETS exposure on children's health.

2. THE LIFETIME EFFECTS OF ETS EXPOSURE

The majority of scientific data and reviews of ETS literature describe the health effects of ETS exposure in terms of discrete, individual diseases. Scientific research generally studies single outcomes; therefore, relationships among conditions or the fact that individuals may suffer from multiple effects remains largely unaddressed. However, it is probable that many individuals exposed to ETS over their lifetimes experience multiple adverse health outcomes, many of which predispose them to additional effects. For example, young children exposed to ETS develop respiratory infections such as pneumonia and bronchitis more often than nonexposed children; multiple respiratory infections make children more vulnerable to asthma and, ultimately, more likely to develop chronic obstructive pulmonary disease (COPD) in adulthood.

As people age, the effects of exposure accumulate. People with a lifetime of exposure to ETS are at far greater risk for ischemic heart disease and heart failure, pneumonia, emphysema, and cancer than those with less extensive exposure.

As a consequence, the ETS Task Force has adopted a lifetime approach in summarizing the scientific data on ETS. Beginning with effects on the developing fetus and very young infant, this report discusses important health effects of exposure in childhood and later adult conditions affecting adults including heart disease, COPD, and cancer.

Newborns and Infants: Developmental Effects

Epidemiological evidence indicates that children born to mothers who smoke during pregnancy are more often born premature or at a low birthweight as compared to children born to mothers who don't smoke. Low birthweight increases the risk of multiple complications including sudden infant death syndrome (SIDS). Further, infants exposed to ETS in the home more often die of SIDS.²⁶

Low Birthweight

Low birthweight describes babies born underweight or less than 5 pounds 8 ounces (2,500 grams). Low birthweight occurs when a fetus does not grow appropriately in the womb and is born small for gestational age or is born prematurely.²⁷ Low birthweight increases the chance a child will die during infancy; places infants at greater risk of respiratory illness, heart problems, liver dysfunction and anemia; and increases the likelihood of physical deformity and mental disability.²⁸ Low birthweight affects 6-7% of the births in the United States.

Infants born to women who smoke during pregnancy typically weigh 150-200 grams less at birth and are twice as likely to be of low birthweight than infants born to nonsmokers.²⁹ Information continues to accumulate regarding the association between ETS exposure and birth outcomes. A mother's ETS exposure during pregnancy appears to have an effect that is similar, but smaller in magnitude, than active smoking. Epidemiological evidence suggests that as a group, nonsmoking women exposed to ETS during pregnancy give birth to infants weighing 25 to 50 grams less than infants born to nonsmoking mothers who are not exposed to ETS.³⁰ A recent study showed a 140% increase in the number of infants who were small for gestational age born to nonsmoking women exposed to ETS during pregnancy compared to nonsmoking women not exposed to ETS, even when other factors such as alcohol consumption were taken into account.³¹

Even though ETS exposure seems to reduce birthweight to a small degree, from a public health standpoint, this is a detrimental effect. Low birthweight places infants with other health problems at higher risk for additional adverse outcomes.³² By increasing the number of children born at low birthweight, ETS has a major impact on the population as a whole.

- Each year, an estimated 9,700 to 18,600 cases of low birthweight are associated with ETS exposure.³³
- In Massachusetts, 230 to 420 estimated cases of low birthweight annually are associated with ETS exposure.³⁴

Sudden Infant Death Syndrome (SIDS)

SIDS is the sudden and unexplained death of an infant who is less than one year old. Thus far, it is not clear whether infants are at an increased risk of SIDS if their mothers are exposed to ETS during pregnancy. However, infants born at a low birthweight are more likely to die of SIDS than infants born at normal weight.

Infants exposed to ETS by a mother who smokes during pregnancy (in utero) or following birth in the home are more likely to die of SIDS. Infants exposed to ETS both in utero and following birth have a 200% greater risk of SIDS and infants exposed only after birth a 100% greater risk than infants not exposed at all.^{35, 36}

It has been estimated that 50-58% of SIDS cases in the U.S. may be attributed to ETS exposure.³⁷ However, the 1992 recommendation by the American Academy of Pediatrics that healthy children be positioned on their backs for sleep has contributed to a decline of 20-30% in the number of SIDS deaths since 1992.^{38, 39} Therefore, this number may need to be reconsidered.

Each year, an estimated 1,900 to 2,700 deaths nationwide and 20 deaths from SIDS in Massachusetts are attributable to ETS exposure.⁴⁰

Children: Respiratory Health Effects

Of all the health consequences associated with ETS, respiratory health appears to be impacted most profoundly, with children less than 18 months old the most vulnerable group.

Young children exposed to ETS become ill with lower respiratory infections (LRIs) more often than children who are not exposed. Further, growing up in medium and highly polluted areas combined with ETS exposure seems to contribute to more frequent respiratory disorders in children.⁴¹ Exposure to ETS is associated with a variety of childhood respiratory disorders:

- Decreased lung development
- Lower respiratory infections (pneumonia, bronchitis) in very young children
- Asthma exacerbation
- Middle ear infections^{42, 43, 44, 45}

Decreased Lung Development

Scientific evidence has accumulated slowly regarding the impact and significance of ETS exposure on lung development in children. Maternal smoking during pregnancy and ETS exposure during the first 18 months of life appears to result in reduced lung function in infants, which may increase the occurrence and persistence of respiratory illnesses later in childhood.⁴⁶ Increased susceptibility to respiratory infection or delayed developmental effects following exposure to maternal smoking before birth are thought to be responsible for the decrease in lung function found in children exposed to ETS.⁴⁷

Decreased lung function related to passive smoking may persist into adulthood.⁴⁸ Although the absolute magnitude of the difference in lung function between exposed and nonexposed children appears to be small, some children's lungs may be more affected than others'. Even these small differences might be important for children who become active smokers as adults.⁴⁹

Lower Respiratory Infections

LRIs include bronchitis and pneumonia. LRIs are one of the top reasons for preventable hospitalizations of children in Massachusetts.⁵⁰ It appears that children exposed to higher levels of ETS experience more respiratory illness than children

who are not exposed. Children who attend day care appear to be less susceptible to LRIs, possibly because day care provides time away from home for children whose parents smoke. Conversely, low birthweight makes infants more susceptible to ETS-related LRIs.⁵¹ Children exposed to ETS experience 150-200% more acute lower respiratory disease than children who are not exposed.^{52, 53, 54}

- In children under 18 months old, an estimated 150,000 to 300,000 cases of lower respiratory infection nationwide and 3,400 to 6,900 cases in Massachusetts are attributable to exposure to ETS each year.⁵⁵
- Very young children who are exposed to tobacco smoke are hospitalized for severe bronchitis or pneumonia 20 to 40% more often than children not exposed.⁵⁶ Each year, an estimated 7,500-15,000 hospitalizations nationwide and 170 to 350 hospitalizations in Massachusetts are attributable to ETS.⁵⁷

LRIs can have lifetime significance. Acute respiratory illnesses during childhood can have long-term effects on lung growth and development, and may increase the susceptibility of the lungs to the development of chronic obstructive lung disease in adulthood.⁵⁸

Asthma Exacerbation

Asthma is a major chronic condition of childhood and accounted for approximately \$6.2 billion in health care expenditures nationwide in 1991.⁵⁹ According to estimates of the National Center for Health Statistics for 1994, 98,382 children in Massachusetts had asthma.ⁱ In 1996, asthma led to 7,368 preventable hospitalizations among Massachusetts children between 0-17 years old.⁶⁰ African-Americans and urban Hispanics of Puerto Rican ancestry seem to have higher rates of asthma and more severe symptoms than other racial groups.⁶¹

Asthmatic children exposed to maternal tobacco smoke experience more prevalent airway inflammation, visit emergency rooms for asthma attacks more frequently, and need more medication to treat asthmatic episodes.⁶² Repeated LRIs increase the risk that a child will develop asthma.⁶³

An estimated 200,000-1,000,000 children with asthma nationwide and 9,300-23,000 children in Massachusetts have worse and more frequent attacks each year from exposure to ETS.⁶⁴

ⁱ *Asthma* is a chronic respiratory condition in which the airways become inflamed or constricted and partially restrict air as it travels into and out of the lungs. Physical stimuli, including mold, dust mites, cockroaches, and ETS can trigger airway constriction. Typical symptoms of asthma include cough, chest tightness, difficulty breathing, and wheezing.

Asthma Induction

The relationship between ETS exposure and new cases of asthma in children is not entirely clear, although evidence supporting an association continues to grow in strength. Studies thus far have demonstrated children with some or all of the following risk factors are more likely to have asthma than children with fewer or none of these factors: a parent with asthma, low income, a mother who smoked while pregnant, and exposure to ETS.⁶⁵

Studies to date have observed a 40% higher incidence of asthma in children exposed to high levels of ETS than in those not exposed. An estimated 8,000 to 26,000 new cases of childhood asthma nationwide and 186 to 600 new cases in Massachusetts could be attributed to ETS exposure each year.

Middle Ear Infections

Middle ear infections are the most common type of childhood illness, resulting in visits to the pediatrician⁶⁶ and surgery for young children.⁶⁷ An ear infection is caused by fluid leaking into the middle ear and becoming infected, causing pain and fever. If an ear infection progresses, it places a child at risk of meningitis and mastoiditis and can result in hearing loss.⁶⁸

Children under two years of age who are exposed to ETS in the home experience more frequent middle ear infections and are at 11% greater risk of middle ear disease than children who are not exposed.⁶⁹

Middle ear infections associated with ETS exposure resulted in an estimated 0.7 to 1.6 million physician visits nationwide and 15,000 to 36,000 physician office visits in Massachusetts each year.

Adults: Respiratory Health Effects

Adults are also vulnerable to respiratory disorders stemming from ETS exposure. It appears that some adults with asthma have more frequent and more severe asthma attacks when exposed to ETS. Regular long-term exposure to ETS increases the incidence of chronic bronchitis and emphysema among nonsmoking adults. Among adults, senior citizens are the most vulnerable adult age group.

Asthma Exacerbation

ETS exposure may increase the incidence and severity of symptoms in adults with asthma; however, current scientific evidence has not adequately examined the effect to conclusively determine the existence or magnitude of an association.

Although current data are limited, it appears that some adult asthmatics are especially susceptible to ETS exposure; exposure to ETS results in worse control of asthma including more frequent and more severe attacks within this group.⁷⁰ One study of adult asthmatics found that exposure to ETS more than doubled the likelihood of moderate or severe shortness of breath. Adults with asthma experienced 61% more days when asthma restricted their activities compared to those not exposed.⁷¹ Another study found that adults regularly exposed to ETS were more likely to have physician-diagnosed asthma than those not exposed.⁷² In Massachusetts, according to estimates from the National Center for Health Statistics, 236,843 adult citizens of Massachusetts had asthma in 1994.

If ETS does increase the occurrence and severity of attacks for adults with asthma, exposure will have more far reaching effects on populations with higher rates of asthma. Higher rates of asthma and greater severity have been observed among African-Americans and urban Hispanics of Puerto Rican ancestry.⁷³

Chronic Obstructive Pulmonary Disease

Chronic obstructive pulmonary disease (COPD) is a progressive, irreversible condition characterized by chronic bronchitis and emphysema.ⁱ Although all adults experience a gradual reduction in lung capacity each year, those with COPD lose lung function more quickly and die earlier than people with healthy lungs. In 1996, COPD accounted for 3,456 hospitalizations in Massachusetts.⁷⁴ COPD was the fourth leading cause of death in the United States in 1995.⁷⁵

Active smoking accelerates the yearly loss of lung function by approximately 30-40%.⁷⁶ Although the link between ETS exposure and adult COPD remains unclear, evidence supporting a link is growing stronger. Adults 40-69 years of age regularly exposed to ETS in the home or in the workplace seem to experience a loss of lung function at a quicker rate than those not regularly exposed.⁷⁷ Adults exposed to ETS more often suffer from chronic bronchitis and emphysema than nonexposed adults.^{78,79} Environmental factors associated with poverty⁸⁰ and childhood respiratory infections may also increase the risk for COPD in nonsmokers.^{81, 82}

ⁱ *Chronic bronchitis* results when too much mucus is secreted into the lungs and leads to the lungs becoming inflamed and infected. People with chronic bronchitis have a constant, hacking cough and an increase in difficulty getting enough air when they breathe.

Emphysema is a breakdown in lung structure and deteriorating elasticity. Although people with emphysema can breathe in, they lose their ability to breathe out and each breath traps a bit of air in their lungs. COPD is usually a combination of bronchitis and emphysema.

Coronary Heart Disease

Coronary heart disease manifests itself in a variety of ways including myocardial infarction, angina pectoris, and sudden unexpected death.ⁱ A causal association between coronary heart disease and active smoking is well established.⁸³

The weight of available evidence supports a causal association between ETS exposure and coronary heart disease mortality in nonsmokers.^{84,85} ETS exposure may have both short and long-term effects on the heart.⁸⁶ People who have never smoked and are regularly exposed to ETS are found to have coronary heart disease about 20-30% more often than those not exposed.^{87, 88, 89, 90}

An estimated 35,000 to 40,000 deaths from cardiovascular disease nationwide⁹¹ and 800 to 1,400 deaths in Massachusetts are attributable to ETS exposure each year.⁹²

Cancer

Overall cancer death rates for smokers are about two times higher than that of nonsmokers.⁹³ Nonsmokers who are exposed to tobacco smoke are exposed to the same toxic elements of tobacco smoke as smokers,⁹⁴ although ETS has a higher ratio of many carcinogens than inhaled smoke. Particle sizes also are smaller in ETS and therefore more easily absorbed into the system.

Lung Cancer

The Surgeon General (1986) and the National Research Council (1986) concluded that exposure to ETS can cause lung cancer in adult nonsmokers. The U.S. EPA conducted a weight of evidence analysis for lung cancer hazard identification and based on its review:

- Classified ETS as a Group A (known human) carcinogen.
- Estimated that approximately 3,000 lung cancer deaths per year among U.S. nonsmokers can be attributed to ETS exposure.

Following the release of its 1992 report, the U.S. EPA's conclusions regarding ETS and lung cancer risk were criticized for methodological concerns raised by

ⁱ When *myocardial infarction* (a type of heart attack) occurs, circulation to the heart becomes blocked or too weak to carry sufficient blood. Clusters of tissue in a portion of a person's heart die when the blood supply is cut off.

Angina pectoris is chest pain that is a warning sign of partial blockage of the coronary arteries and reduced oxygen to the heart muscle. Angina pectoris may precede myocardial infarction.

Sudden unexpected death (SUD) is most often the result of the electrical impulses that cause the heart beat to become irregular. SUD occurs with no previous symptoms, as exemplified by the death of Reggie Lewis.

the studies reviewed in the report.⁹⁵ However, three large population-based studies published since 1991 confirmed and extended the results of the U.S. EPA report. These studies observed that nonsmokers exposed to ETS developed lung cancer 19% more often than those not regularly exposed.^{96, 97, 98, 99}

It also appears that longer periods of exposure correlate to higher risk for lung cancer. In one study, women with 48 or more years of ETS exposure developed lung cancer 74% more often than women with no ETS exposure. Women who reported they had been exposed to ETS since childhood were 225% more likely to develop lung cancer than women who had not been exposed.¹⁰⁰

An estimated 3,000 deaths from lung cancer nationwide¹⁰¹ and 70 deaths in Massachusetts are attributable to ETS exposure each year.¹⁰²

Other Cancers

Evidence of a link between ETS and cancers other than lung is presently inconclusive. The strongest evidence links exposure to ETS and increased risk for nasal sinus cancers in nonsmoking adults. Cervical cancer, adult brain cancer, and cancers of the bladder, breast, and stomach have been studied, but have not produced conclusive results.¹⁰³

3. SUMMARY

It has long been understood that active smoking increases an individual's risk for a variety of diseases including cancer, COPD, and heart disease. More recent studies now show that the effects of smoking are not limited to individuals who smoke, but also extend to those who breathe the smoke released into the air from burning tobacco products. Nonsmokers exposed to ETS inhale many of the same toxic compounds as active smokers. Throughout a person's life, ETS has been demonstrated to have repeated negative impacts on health, increasing the risk for a number of diseases and health conditions.

- Infants exposed before birth to ETS are at an increased risk for low birthweight. Low birthweight increases the risk of sudden infant death syndrome (SIDS), LRIs, and decreased lung function.
- Infants exposed to ETS either by mothers who smoke during pregnancy or by household smoke following birth are at an elevated risk of SIDS.
- Very young children exposed to ETS experience more frequent cases of lower respiratory infections (LRIs) including bronchitis, and pneumonia. Chronic LRIs in very young children increase the risk of asthma, decreased lung function, and chronic obstructive pulmonary disease in adulthood.
- ETS exposure is associated with increased episodes and increased severity of asthma attacks in children who have the disease. ETS may also cause more children to develop asthma.
- Children exposed to ETS at home are at an increased risk of middle ear disease which places them at risk of meningitis, mastoiditis, and possible hearing loss.
- Maternal smoking has been shown to reduce lung function in young children. Although the absolute magnitude of the difference may be small, decreased lung function related to passive smoking may persist in adulthood.
- Exposure to ETS results in less adequate control of asthma, including more frequent and more severe attacks for some adult asthmatics.
- ETS exposure contributes to the development of chronic obstructive pulmonary disease (COPD) in adults.
- Exposure to ETS increases the risk for nonfatal and fatal coronary heart disease.
- ETS has been classified as a Group A (known human) carcinogen with a known association with increased risk of lung cancer. In addition, more than 40 compounds identified as known or probable carcinogens are found in ETS.

Table 4: Estimated Annual Morbidity and Mortality in Nonsmokers

Associated with ETS Exposure^{i,ii}

Condition	in the U.S.	in Massachusetts
Low birthweight	≈ 9,700 – 18,600 cases	230 – 420 cases
Sudden Infant Death Syndrome (SIDS)	≈ 1,900 – 2,700 deaths	20 deaths
Bronchitis or pneumonia in infants less than 18 months old	150,000 to 300,000 cases 7,500 to 15,000 hospitalizations	3,400 – 6,900 cases 170 – 350 hospitalizations 3 – 5 deaths
Asthma exacerbation among children	400,000 to 1,000,000 children affected	9,300 – 23,000 children affected
Asthma induction in children	8,000 to 26,000 new cases	180 – 600 new cases
Middle ear infection	0.7 to 1.6 million physician office visits	15,000 – 36,000 physician office visits
Coronary heart disease	35,000 to 62,000 deaths	800 – 1,400 deaths
Lung cancer	3,000 deaths	70 deaths

ETS exposure must be seen as an especially important public health issue for children. First, because young children's respiratory systems are in a stage of development, they are particularly susceptible to long term harm from exposure to the toxic substances in ETS. Secondly, prevention of exposure to these substances at an early age can decrease an individual's lifetime risk of developing disease. Finally, children can not advocate for themselves and must depend upon adults to create a safe and healthy environment in which they can develop.

ⁱ National estimates derived from California Environmental Protection Agency. (CA EPA 1997) *Health Effects of Exposure to Environmental Tobacco Smoke. Final Report*. Berkeley California: California Environmental Protection Agency. Office of Environmental Health Hazard Assessment.

ⁱⁱ Testimony of JL Repace, MSc. Massachusetts Department of Public Health Hearing on proposed regulation on Testing and Reporting of Constituents of Cigarette Smoke: 105 CMR 665.000. September 22, 1998. Boston, MA.

PART 2: WHAT CAN BE DONE TO REDUCE INVOLUNTARY EXPOSURE TO ETS?

1. BACKGROUND

Public health officials, community groups and citizens throughout Massachusetts have taken significant steps to reduce involuntary exposure to ETS. The regulatory response at all levels of government, especially local and state levels, and the passage of Question 1 have all played a role in reducing the number of public places individuals are involuntarily exposed to tobacco smoke. Public opinion in Massachusetts favors restrictions to reduce ETS and is growing stronger. In a 1996 survey, 60.5% of nonsmoking and smoking adults reported favoring formal policies to limit ETS, up from 58.2% in 1995.¹⁰⁴

Local efforts

Local efforts to control involuntary ETS exposure enable communities to tailor solutions to the concerns of their populations. Municipalities involved in designing their own tobacco control strategies achieve a level of involvement and commitment to the issue that may not occur when regulations are handed down from the state or federal levels. The success of local tobacco control efforts is evident in the fact that the tobacco industry promotes state-level legislation in order to preempt more restrictive local regulations.^{105,106}

According to Massachusetts statutes, cities and towns have the authority to regulate local matters as long as the regulations do not contradict existing state laws.¹⁰⁷ Restrictions adopted by local Boards of Health as regulations, at town meetings as by-laws, and by city councils as ordinances reduce involuntary exposure in the workplace, municipal buildings, restaurants, and other public places.

Municipal Buildings

Between 1992 and 1997, 116 cities and towns enacted provisions banning smoking in municipal buildings. In 1997, the combined population of cities and towns with local regulations banning smoking in municipal buildings exceeded 2.9 million, slightly less than 50% of the entire population of the Commonwealth.¹⁰⁸ Many additional municipalities have adopted internal policies protecting their citizens from involuntary exposure to ETS in municipal buildings.

Workplaces

A survey conducted in Massachusetts showed that in 1996, the adult population was exposed to ETS at work an average of 2.3 hours a week, down from 4.6 hours in 1993.¹⁰⁹ In 1997, 65% of employees in Massachusetts worked in places that banned indoor smoking.¹¹⁰ Larger employers have most readily implemented voluntary smoking restrictions: a survey conducted in 1997 found 78% of Massachusetts' 3,000 largest employers have complete smoking bans, 20% allow smoking only in designated areas, and only 2% have no policy at all.¹¹¹

Restaurants

As of October 1998, 142 of the 351 municipalities in Massachusetts restricted smoking in restaurants to some extent¹¹² (Table 5). Roughly 40% of the Massachusetts population now lives in a city or town where ETS exposure in restaurants has been regulated. This number increases when taking into account the 113 towns in Massachusetts with populations under 5,000. The combined population of these small towns is approximately 245,000. Because most of these towns do not have restaurants within their limits—and those that do have only one or two—regulating smoking in restaurants is either not necessary or not as high a priority as in cities and towns with a large number of restaurants.

Table 5: Summary of Massachusetts Local Ordinances with Respect to Restaurants & Bars^{113, 114}

Number	Restriction	Cities and Towns
15	Complete ban on smoking in all restaurants and bars.	Amherst, Arlington, Belmont, Boxborough, Chatham (eff. 1/99), Cohasset (eff. 1/99), Concord, Dover, Hingham (eff. 1/99), Lexington, Melrose (eff. 3/99), Montague, Stoneham, Wakefield, Wareham (eff. 1/99)
10	Complete ban on smoking in restaurants but not in bars.	Andover, Athol, Groton, Lee, Lenox, Marblehead, Plainville, Pittsfield, Stockbridge, Wayland, Westfield
17	Smoke free restaurants - variance given for smoking area if smoke can not circulate to any other section of the dining area.	Acushnet, Brookline, Chicopee, Foxborough, Marion, Needham, Newton, North Andover, Northampton, Sharon, Sudbury, Swampscott, Wayland, Wellfleet, Westminster, Westwood, Winchester
40	Smoking area allowed in restaurants if separated by a floor to ceiling wall and/or separate ventilation system.	Acton, Bedford, Belchertown, Canton, Chelmsford, Chilmark, Danvers, Deerfield, Easthampton, Fitchburg, Gardner, Greenfield, Groveland, Hamilton, Haverhill (50+ seats), Holden, Holyoke, Hopkinton, Leominster, East Longmeadow, Lynnfield, Medfield, Milford, Millis, Norfolk, Norwood, Orleans, Plymouth, Reading, Saugus (eff. 1/99), Sherborn, Southampton, South Hadley, Sunderland, Tewksbury, Westborough, Westford, West Springfield, West Tisbury, Wilbraham
4	Designated smoking area allowed in bar area only - neither ventilation nor physical separation required.	Boston, ⁱ Chelsea, Williamstown (50+ seats), Somerville (restaurant must apply for variance)
4	Smoke free requirement for restaurants of a certain size or smaller.	North Attleboro (< 25 seats), Falmouth and Sandwich (< 800 sq. feet)
1	Smoke free requirement for	Attleboro

ⁱ Over 1,400 restaurants in Boston are smoke-free because they have no liquor license, no bar area, or have voluntarily gone smoke free.

establishments that admit minors.

An additional 56 communities require restaurants to provide a no smoking section for their customers. The communities requiring a no smoking section are: Auburn, Beverly, Billerica, Blackstone, Bourne, Braintree, Brewster, Burlington, Cambridge, Clinton, Dedham, Dracut, Dudley, Egremont, Everett, Framingham, Franklin, Georgetown, Gloucester, Great Barrington, Harwich, Hull, Lanesborough, Lawrence, Littleton, Lowell, Malden, Mansfield, Marlborough, Mashpee, Medford, Methuen, Milton, Nahant, Natick, Newburyport, Norton, Norwell, Peabody, Provincetown, Quincy, Randolph, Revere, Rochester, Salem, Scituate, Sheffield, Southwick, Sterling, Stoughton, Walpole, Waltham, Watertown, West Boylston, Weymouth, and Willmington.

Other Areas

Brookline now prohibits smoking in taxi cabs to protect drivers and passengers from involuntary ETS exposure. The town of Sharon prohibits smoking on all public playgrounds and beaches.

State Laws and Regulations

By 1997, smoking was banned in all Massachusetts state buildings, including in the State House and state university buildings.¹¹⁵ The following is a compilation of other places in which involuntary exposure to ETS has been limited by Massachusetts law:

1. Public institutions of higher education that provide housing for students in dormitories must reserve a certain number of dormitory rooms for nonsmokers (M.G.L. C. 15A, SEC 16A) created 1987.
2. In a polling location during an election or during a town meeting, smoking is not allowed (M.G.L. C. 54, SEC 73) created 1913; amended 1946.
3. Public and private nursing homes must have designated no smoking sections in common areas, including lobbies, cafeterias, conference rooms, and employee lounges. Nursing home employees are prohibited from smoking in all patient care areas (M.G.L. C. 111, SEC 72) created 1987.
4. Within school buildings and facilities or on school grounds and school buses the use of any tobacco products is prohibited by anyone, including personnel. Students who disobey this rule face disciplinary proceedings, and possible suspension and expulsion from school (M.G.L. C. 71, SEC 37H) created 1993.
5. Forest land is protected from having any lit cigarette, cigar, match, live ash, or other fire placed upon it (M.G.L. C. 148, SEC 54) created 1930; amended 1952.

2. The passenger cabin or lavatory of an aircraft operating in the United States, the District of Columbia, Puerto Rico, or the Virgin Islands (USCS SEC 41706) “Federal Aviation Act” Amended 1994.

Where Are People Still Exposed?

The Task Force found that although Massachusetts and its cities and towns have implemented numerous restrictions and outright bans on tobacco smoke, involuntary exposure nonetheless exists in a number of areas:

- *Worksites that have not implemented smoking bans*—Smaller workplaces such as stores and garages are less likely than larger workplaces to regulate ETS levels.
- *Restaurants and bars*—For many restaurant and bar workers, involuntary exposure to ETS is a condition of employment. Bar employees are exposed to levels of ETS 3.9-6.1 times higher than the average levels found in offices.¹¹⁸
¹¹⁹ Restaurant employees are exposed to ETS at levels 1.6-2.0 higher than office levels.^{120, 121} Although ventilation and separately enclosed smoking areas may reduce the amount of exposure, customers who ask to sit in the nonsmoking section may breathe the smoke that circulates between smoking and nonsmoking sections.
- *Residential jobsites*—Residents and staff in residential settings—both privately and publicly operated—are involuntarily exposed to ETS generated by other residents or staff who smoke. These settings include nursing homes, rest homes, and other jobsites funded by state human service agencies.¹²²
- *Locations where regulations are not enforced*—Despite the existence of state laws and local provisions, involuntary exposure to ETS often continues on school grounds, public transportation, and other places where enforcement mechanisms are not sufficient to provide meaningful protection.
- *State and municipal vehicles*—Policies that prohibit smoking in state and municipal buildings do not cover state vehicles and rarely include municipal vehicles.
- *Private homes*—Despite reductions in the number of adult smokers in the Commonwealth, the home remains an important source of involuntary exposure, especially for children of smokers. This fact suggests the need for education to encourage voluntary smoking cessation without regulating private behavior.

What Can Be Done to Reduce or Eliminate Involuntary Exposure?

In order to reduce the negative impact of ETS exposure on both individual and public health, involuntary exposure to tobacco smoke should be eliminated.

However, some communities may not be immediately prepared for an outright ban. In these cases, incremental reduction may be most practical.

Because different situations call for different approaches, it is helpful to understand the pros and cons of various barrier and ventilation methods. There are roughly three levels of control for any airborne environmental contaminant including ETS. Ranked in order of effectiveness from most to least effective, the options are:

1. Elimination or substitution of the source.
2. Local ventilation and/or enclosure.
3. General dilution ventilation.¹²³

There are no guidelines delineating an acceptable level of ETS. A study by Repace and Lowrey¹²⁴ found that filtering and dilution would not adequately reduce exposure even in an office with moderate smoking. The Occupational Safety and Health Administration concluded that only bans and separately ventilated smoking rooms effectively reduce ETS exposure in the workplace.¹²⁵

Elimination or Substitution of the Source

The best and most effective option is to eliminate any hazardous substance completely. Bans on smoking effectively eliminate the source of exposure, are often feasible, and require only minimal direct costs for implementation. Some investigators have estimated that workplace smoking bans prompt approximately 5% of smokers to quit smoking. Those who do not quit smoke 10% less than they had before the ban.¹²⁶ Thus a doubly important service is provided through these approaches.

Local Ventilation and/or Enclosure

If a ban is not possible, the next step is local ventilation, which can prevent smoke from getting into the general breathing space. Separately enclosed and ventilated smoking areas may be effective at isolating ETS but can be costly to construct and maintain and do not protect workers who must enter them, as in the case of many restaurant workers. Further, restricting smoking to separately enclosed areas may expose smokers and bar and restaurant workers to significantly higher concentrations of ETS.¹²⁷ To construct a truly separate smoking area, walls and doorways must completely enclose the area and the area must be served by a separate ventilation system. The HVAC system must supply 60 cubic feet per minute of fresh air per person and place the room under negative pressureⁱ relative

ⁱ In a room under negative pressure, any leakage of air through cracks flows into rather than out of the room.

to the rest of the building.¹²⁸ As a result of heating and cooling fresh/outdoor air, the cost of this option increases considerably.

General dilution ventilation

Presently, a few Massachusetts municipalities allow restaurants to have smoking areas separated from nonsmoking areas by only space. While this may be a first step toward implementing stronger restrictions, it is not effective at protecting workers and customers. A separate smoking section can be combined with some sort of ventilation that is intended to reduce levels of ETS and limit ETS levels in the nonsmoking section. Unfortunately, these systems can not adequately reduce ETS levels in either the smoking section or the nonsmoking section.

Ventilation options fall into two categories. One approach entails providing fresh outdoor air, combined with some recirculated air, as a means to dilute levels of ETS (see illustration). This type of ventilation can actually help to spread ETS to other parts of the building. The second approach is the use of filtering devices that recirculate all of the air that they filter. Air filters have been shown to be unable to reduce ETS contaminants below levels that the US EPA uses to gauge hazards at Superfund hazardous waste sites.¹²⁹ In addition, filtering systems range in cost from \$3,000 to \$4,500 for a medium-sized restaurant.

In conclusion, smoking bans are the most effective as well as the least expensive method of addressing ETS exposure. Bans are also the only method that can eliminate exposure to ETS. Separately enclosed and ventilated smoking areas are usually expensive to install and maintain, and do not protect workers. General dilution ventilation varies in effectiveness, but at best it reduces rather than eliminates exposure to ETS and at worst it may spread ETS throughout an establishment. Filtering devices can also reduce exposure, but not below levels that represent significant health risks. Furthermore, filtering may not remove all constituents of ETS and will not supply fresh air to the space. The least effective control measure is a smoking section without a physical barrier and without ventilation. Nonetheless, all of these measures provide protection, albeit very limited in some cases, compared to facilities with no controls.

2. RECOMMENDATIONS OF THE TASK FORCE

Rationale

The goal of this report is to provide guidance and direction to state and local policymakers seeking to address the problem of the adverse effects of involuntary exposure to ETS. Several key facts establish involuntary ETS exposure as an important public health threat and have shaped the Task Force's thinking in formulating these recommendations. These facts include:

- There is no disagreement that ETS exposure adversely affects human health. Debate instead centers only on the magnitude and severity of these effects.
- ETS is a major issue for children. Asthma, pneumonia, bronchitis, inner ear infections, and decreased lung development in children have all been linked to ETS exposure.
- ETS exposure is associated with increased rates of disease and death in adults already compromised by heart disease, emphysema, and asthma. Because diabetes and high blood pressure increase the risk of heart attack, exposure to ETS jeopardizes the health of individuals with these conditions as well.
- People at lower income levels are more susceptible to complications associated with ETS due to a generally higher frequency of disease, inadequate housing, and limited access to care.
- Refusing to restrict or ban smoking in some workplaces, i.e., restaurants with bars, and not others, prevents certain workers from receiving the same protections as those in smokefree settings.
- The tobacco industry has attempted to subvert the intent of local actions by pursuing statewide preemptive measures.
- There appears to be strong public opinion in favor of eliminating involuntary ETS exposure. The vast majority of people in Massachusetts (79%) do not smoke and many smokers support smoking restrictions.

The ETS Task Force has developed a series of policy recommendations that target a range of policy options rather than propose a comprehensive ban. The Task Force believes that this approach affords greater flexibility to state and local policymakers in addition to reducing the chance that preemption clauses and/or amendments could be used to weaken the policy's intended effect.

Principles

The Task Force adopted five general principles in developing its recommendations:

1. *Consistency on the state level:* As the Commonwealth pursues strategies to reduce involuntary ETS exposure statewide, it should apply equally stringent standards across state government. Building on the success with which tobacco smoke was eliminated in the State House, the Commonwealth should continue to examine smoking policies and procedures in the legislative, judicial, and executive branches of state government. The state should promote measures to protect workers and special populations over which it has responsibility from exposure to ETS.
2. *Enforcement:* Unless regulations prohibiting or restricting tobacco smoke are enforced, involuntary exposure to ETS continues. Every policy regulating ETS should include an enforcement plan designating the enforcing department or agency and the means by which enforcement will be carried out. This is especially true with state laws.
3. *Evaluation:* While introducing or enforcing regulations on involuntary ETS exposure, the Commonwealth should evaluate the effectiveness of programs it has implemented. Evaluation results should help ensure the designation of resources to effective programs.
4. *Long-term effectiveness:* Experience locally and nationally in developing regulations suggest that it takes time for communities to develop and implement effective control policies. The involvement of local citizens is a critical factor in ensuring a policy's success. Decision-making on the local level often requires education and time for community support to build. Because of this, many successful regulations have been made in incremental stages rather than all at once.
5. *Private behavior:* The Task Force is emphatically opposed to trying to regulate personal behavior in the privacy of the home. In the same spirit with which the Task Force recommends regulations of smoking to protect people from involuntary exposure to ETS in public places, we do believe, however, that the Commonwealth has an affirmative obligation to encourage its citizens to alter behaviors that may have adverse consequences for themselves and others. Every effort should be made to 1) inform the citizens of Massachusetts about the health dangers associated with ETS and 2) support citizens who want to quit smoking.

Guidelines

The Task Force has reviewed the guidelines established by the Massachusetts Coalition for a Healthy Futureⁱ to ensure that legislative efforts will advance rather than hinder efforts to control ETS exposure and has found them a worthwhile tool to help shape its recommendations. According to these guidelines, proposed state policy should:

- Reduce exposure to ETS.
- Use specific language to ensure the policy will not preempt any local regulations now or in the future.ⁱⁱ
- Provide for effective enforcement.
- Withstand legal and/or constitutional challenge.

ⁱ The Massachusetts Coalition for a Healthy Future (MCHF) represents the organizations which originally worked together to promote the successful passage of the Question 1 tobacco tax initiative campaign of 1992. The MCHF now works to promote the intent and spirit of Question 1.

ⁱⁱ Anti-preemption language developed by the Tobacco Control resource Center reads “Nothing in any of the sections of this Act shall be constructed to preempt that authority of any local government, board of health, health department, or any other health agency to promulgate, enact or enforce any law, ordinance, by-law, or regulation which requires a permit or license for the sale of tobacco products or which regulates the sale, distribution, or use of tobacco products.”

Recommendations

The Task Force recommends action in the areas of state and local policy, education, enforcement, and evaluation to reduce involuntary exposure to ETS.

Local Efforts

1. Support intensive and sustained community efforts

In light of the significant progress made within its cities and towns reducing ETS exposure, the Massachusetts Tobacco Control Program should continue and expand its support of local efforts. In addition to current efforts, the Task Force recommends Massachusetts municipalities receive further assistance in:

- Galvanizing community support.
- Utilizing public opinion polls.
- Addressing barriers to implementing and enforcing local ordinances.

Information on the cities and towns with restrictions already in effect and the impact of those restrictions should continuously be monitored, gathered, and disseminated to municipalities throughout the Commonwealth.

2. Enforcement

Regulations of ETS must be backed up with effective enforcement mechanisms. Local boards of health and authorized agents primarily enforce ETS control measures. However, if one company or establishment repeatedly violates a regulation, the local police departments and the state Department of Health should become involved. If necessary, the Attorney General should be called upon to help enforce ETS regulations as in the case of eliminating the sale of tobacco products to minors.

Local governments should receive support to ensure that regulations will be enforced. Without effective enforcement measures, regulations are meaningless. One area of immediate concern to many municipalities is lack of financial resources to require compliance with ETS regulations.

3. Education

a. Support programs that will reduce ETS levels in homes

The Task Force does not advocate restrictions on behavior in private settings however, it is impossible to overlook the importance of the home as a source of ETS exposure, particularly for children of smoking parents. Educational efforts targeted at smokers should suggest voluntary smoking restrictions in the home.

Smokers who want to quit need support in the form of more easily accessible smoking cessation programs and nicotine replacement therapy.

- Smoking cessation groups, already available through hospitals and health centers, should also be offered through workplaces.
- Nicotine replacement therapy should be covered by health plans.

b. Use media to increase awareness

Although Massachusetts' mass-media anti-smoking campaign has received national recognition, the campaign needs to 1) help people sort through conflicting information about the dangers of tobacco smoke and 2) provide guidance to citizens who wish to become involved in tobacco control at the local level. One case in point involves a Federal judge from North Carolina's vacating of the EPA's 1992 report. Media coverage of this motion has weakened the public's perception of ETS as a dangerous substance. Information explaining that decision and the fact that numerous other scientific studies support the conclusions of the EPA have not received comparable coverage in mainstream news. Public officials and community leaders must take affirmative steps to increase the availability of accurate information about adverse health effects associated with ETS exposure.

4. Research and evaluation

While promoting policy to reduce involuntary ETS exposure, communities should evaluate the effectiveness of programs they have implemented. The Task Force recommends that funds be designated to research and evaluate the effectiveness of ETS control strategies. The findings should promote the decision to continue and emulate programs of proven effectiveness while refining programs that have not achieved desired results.

5. Municipal vehicles.

On both the state and local levels, protections from involuntary exposure to ETS do not always extend to government owned and operated vehicles. Localities ought to review their policies and take action to protect their employees and other passengers in municipal vehicles from involuntary exposure to ETS.

State Policy

1. Consider using the Minimum Sanitation Standards for Food Establishments (Sanitary Code) to regulate involuntary exposure in restaurants.

ETS has been classified as a carcinogen and releases carcinogenic substances (i.e., benzene, formaldehyde, and arsenic) into the air people breathe. The Sanitary Code prohibits all poisonous or toxic materials. Although no cases in point presently exist, the Sanitary Code seems to prohibit the presence of ETS simply on

the basis of its known association with numerous adverse health effects and its strong link to lung cancer. Just as the Sanitary Code has been enforced to regulate the temperatures of hot water heaters in rental housing in order to protect children from being burned by hot water, it could also serve to regulate ETS exposure on the basis of its association with numerous adverse health effects.

The Sanitary Code requires all restaurants to hold a valid permit issued by the Board of Health (105 CMR 590.052 A1). Boards of Health have the authority to collect fines from establishments that fail to observe the established regulations. An interpretation of the Sanitary Code suggests that if a restaurant refuses to comply with an ETS regulation after a designated number of warnings and fines, the board may revoke or refuse to renew the establishment's permit, forcing its closure until the matter is resolved.

It is beyond the scope of this Task Force to fully address the nuances involved; however, we do recommend the State Sanitary Code be seriously reviewed as a possible vehicle for protecting citizens from involuntary ETS exposure in restaurants and public housing. The Task Force does not suggest that the Sanitary Code be amended, but rather, that it be applied as it is written to reduce involuntary exposure to ETS.

2. Ensure protection for those under state care and state employees.

The Task Force has identified four areas in which state policy should examine its procedures for protecting its employees and those in its care from involuntary ETS exposure.

a. Foster homes

As wards of the state, foster children should be protected from involuntary exposure to ETS to the greatest extent possible. However, prohibiting smoking in foster homes could lead to unintended harm if the already limited number of available foster families were further reduced as a result. Given that the state has assumed responsibility for foster children's well being and in recognition of children's particular susceptibility to adverse health effects of ETS, the issue of involuntary exposure in foster homes should be addressed. The committee recommends the following actions to reduce involuntary exposure while not compromising its foster program:

- Provide education on the effects of ETS exposure to each foster family and the importance of restricting smoking to outside areas or a designated room that can be separated by a door from the rest of the house.
- Provide smoking cessation services and nicotine replacement therapy to foster families.

b. State-run residences

A recent survey of residential settings funded by the Department of Mental Health (DMR) revealed that state-operated residences enforce stronger regulations controlling ETS than residences operated by private agencies under state contract.¹³⁰ In accordance with DMR Smoking Policy #94-1 issued in 1994, employees are prohibited from smoking inside residences and offices operated by the state. Residents who smoke are restricted to designated areas. Residences operated by private vendors, in contrast, report a wide variation in smoking policies, some being more and some being less restrictive than DMR itself. Information on smoking policies and practices in residences funded by other state human service agencies is even more limited.

The Task Force recommends that the state agencies review their policies to assure that clients and employees receive meaningful protections from involuntary exposure to ETS. Further, the Commonwealth should review its contractual policies with residential providers to assure that programs run by private vendors also afford employees and clients appropriate protections from involuntary ETS exposure.

c. State and public safety vehicles

Presently, state policy allows smoking in state vehicles if the smoker is alone in the vehicle or has the permission of the other people in the vehicle.¹³¹ However, any Massachusetts police officer hired after January 1, 1988 (M.G.L. C. 41 SEC 181A) may not smoke tobacco either on or off the job, although police officers hired before 1988 retain the right to smoke. Without a smoking ban in state vehicles, law enforcement officials hired after 1987 may be involuntarily exposed to the tobacco smoke of officials hired before 1988 while riding in state vehicles.

The Task Force recommends that protections from involuntary exposure to ETS extend to government owned and operated vehicles. Smoking should be banned in all state owned and operated vehicles.

3. Adjust insurance rates to cover costs incurred by involuntary ETS exposure

The adverse health effects imposed on employees involuntarily exposed to ETS and the increased safety risks created by smoking add to the cost of insurance. Employers who permit unrestricted smoking in work areas pose a higher cost risk for insurance companies. For the purpose of this policy recommendation, protection from involuntary ETS exposure is accomplished by a 100% smoke free workplace or by allowing smoking only in separately enclosed and ventilated smoking areas.

- a) *Workers Compensation Insurance:* Employers who do not protect their employees from ETS exposure should pay higher workers compensation premiums.
- b) *Fire Insurance:* Because smoking increases the incidence of structural fires and fire-related deaths, employers who allow smoking in the workplace should pay higher fire insurance premiums.
- c) *Health Insurance:* Without universal health insurance, many workers currently go to work with the dual disadvantage of 1) involuntary exposure to ETS in the workplace and 2) no health coverage. The Task Force endorses the concept of universal health coverage, but until the time of its passage, the Task Force recommends an interim policy by which employees exposed involuntarily to ETS in the workplace will have health insurance.

Employers (including restaurant owners) may either protect their employees from involuntary ETS exposure or provide health insurance for all employees, including full time and part time, nonsmoking, and smoking employees.

3. SUMMARY

Massachusetts has made considerable progress in reducing levels of involuntary exposure to ETS. Policies on the local and state levels create a broad base of protections from involuntary exposure. However, much remains to be accomplished.

Individuals continue to be involuntarily exposed to ETS in unregulated worksites, restaurants and bars, communities with no ordinances, state and municipal vehicles, and many state residential programs. Greater attention is needed to enforce existing regulations and make them more effective in reducing involuntary ETS exposure. This will require the commitment of additional resources.

Bans are more effective and cost less to implement than any other approach in preventing involuntary ETS exposure. Some communities may not be prepared for an outright ban. In these cases, incremental reductions may be the most practical way to reduce involuntary exposure.

This report aims to provide guidance and direction to state and local policymakers seeking to address the problem of the adverse effects of involuntary exposure to ETS. The Task Force has recommended action on local and state levels to reduce involuntary exposure to ETS and its impact on public health.

Local efforts should:

1. Support intensive and sustained community efforts.
2. Provide mechanisms for effective enforcement.
3. Provide education and support to reduce ETS levels in homes through voluntary smoking restrictions (i.e., outdoor smoking only) and help smokers quit.
4. Use media to help the public sort through conflicting information about the dangers of tobacco smoke.
5. Research and evaluate the effectiveness of ETS control strategies.

On the state level ETS control efforts should:

1. Use the Minimum Sanitation Standards for Food Establishments (Sanitary Code) to regulate involuntary exposure in restaurants.
2. Ensure protection for those under state care and for state employees.
3. Extend protections from involuntary exposure to ETS to government owned and operated vehicles.
4. Adjust insurance rates to cover costs incurred by involuntary ETS exposure.

Children, the elderly, people of low income, and people with certain disabilities are particularly susceptible to the adverse health effects from ETS exposure. It is incumbent upon the Commonwealth to protect these and all of its citizens from involuntary exposure.

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