Leaf Blowers and Health

Summary Report

Prepared for the Town of Lincoln Board of Health by the Leaf Blower Study Committee

February 2014

Contents

Introduction

- Leaf blowers, especially gas-powered, are a major point source for high level noise and ground level pollution, known to cause disease.
- In Lincoln, increasing dependence on leaf blowers for cleanup and routine maintenance is exposing some residents to high level noise and exhaust pollutants -- sometimes on a daily basis for hours at a time.

*Our focus is mainly on gas-powered leaf blowers which emit exhaust pollutants and more noise than electric blowers.

Introduction (2)

- The Lincoln Leaf Blower Study Group (LLBSG) is investigating the potential health impacts of increasing leaf blower noise and pollution in Lincoln.*
- The health findings presented in this summary report were derived mainly from scientific and medical consensus statements, guidelines, and review articles from medical societies, government agencies, and established experts.

Introduction (3)

- We are asking the Board of Health and health advisors to validate our findings and inform our recommendations to Town Meeting 2014.

Materials Provided for Review

- This summary presentation
- Source materials (in binder)*
- Sample of Lincoln videos (electronic links)

* Largely consensus statements, guidelines, and review articles from medical societies, government agencies, and established experts; and related educational materials

Leaf Blower Overview

Leaf Blower Basics

- Largely 2-stroke engines**
  - No emissions controls
  - Inefficient burning of fuel*
  - Highly polluting
- Grades
  - Commercial (3−6 hp)
  - Residential (1−3 hp)
- Physical configuration
  - Handheld
  - Backpack (commercial)
- Air jet velocity=150-280 mph

*2-stroke engines account for 95% of lawn/garden equipment emissions according the US EPA's National Emissions Inventory.
** *The burning of lubricating oil and the exhaust of un-burnt fuel in a 2-stroke engine makes it much more polluting than a 4-stroke engine of similar power.*

Leaf Blower Noise

- Noise levels in decibels (dB)*
  - 100−115 dB
  - 65−75 dB at 50 ft
  - Higher levels with >1 machine
    - Exceeds noise safety standards set by WHO and US EPA
- Noise characteristics
  - Pure tone (narrow frequency) component
  - Frequent throttling up and down
  - Chronic, prolonged duration
  - Carries over long distances
  - Penetrates walls/windows

**The decibel scale is logarithmic. Each 10 point increase in dB level represents a 10-fold increase in noise level; ambient noise in a quiet area is generally in the range of 40−45 dB.*

Leaf Blowers and Air Pollution

- Volatile organic compounds (VOC)
  - Benzene
  - 1,3 butadiene
  - Acetaldehyde
  - Formaldehyde
- Nitrogen oxides (NOx)
- Carbon monoxide
- Carbon dioxide
- Hydrocarbons
- Particulate matter

HAPs*

- Toxic
- Carcinogenic

and/or

- Ozone-forming

*Hazardous air pollutants (HAPs) are defined by the US EPA as pollutants that cause or may cause cancer or other serious health effects. See http://www.epa.gov/ttn/atw/pollsour.html; Small particles are formed by a mix of components, eg, acids, organic chemicals, metals, soil, dust.
Key Sources: American Lung Association; US EPA, etc.

Small lawn/garden engines: A major contributor to emissions

- In the United States, 2010:
  - VOCs: 515,000 tons
  - NOx: 121,000 tons
  - PM2.5*: 25,000 tons
  - PM10*: 26,000 tons
- Account for 5%–10% of total US emissions of carbon monoxide, carbon dioxide, nitrogen oxides, hydrocarbons and PM2.5.

NOx: Nitrogen oxides; PM: particulate matter; PM2.5: ≤2.5 µm in diameter; PM10: ≤10 µm in diameter; VOC: volatile organic compounds

*Sources: Michaels H, US EPA. NONROAD Overview presented at the 2012 International Emission Inventory Conference, 2012. *US EPA 2005 data in* Volckens J, Olson DA, Hays MD. Atmospheric Environment 2008;42:1239-48.

Head to Head: Leaf Blower vs Truck – Emissions Results from an AAA Test Lab

6,200-pound, 400+ hp 2011 Ford F-150 SVT Raptor

vs

Hand held, 2-stroke leaf blower

- Hydrocarbon emissions from 30 minutes of running a 2-stroke leaf blower = 3,900-mile drive in a Ford Raptor.
- The 2-stroke leaf blower generates 23x CO and ~300x more non-methane hydrocarbons vs the Raptor.

Details at http://www.insideline.com/features/emissions-test-car-vs-truck-vs-leaf-blower.html.
Photos at: http://www.insideline.com/features/photos/emissions-test-car-vs-truck-vs-leaf-blower-gallery.html.

Amount of Leaf Blower Particulate Matter*

Leaf Blower: Estimated Particulate Emission Factors (median, lbs/hour)

	Paved Roadway	Shoulders	Curbs/Gutters
TSP	0.56	11.74	11.95
PM10	0.11	2.23	2.27
PM2.5	0.05	1.06	1.08

**Particulate matter may contain animal fecal matter, fertilizers, pesticides, herbicides, allergens (fungal spores, pollen), diesel soot, brake dust, rubber tire particles, toxic metals (eg, arsenic, chromium, lead, mercury).*

PM: particulate matter; PM2.5: ≤2.5 µm in diameter; PM10: ≤10 µm in diameter TSP: Total Suspension Particulates
Derived from Table 5, p 22 in *A Report to the California Legislature on the Potential Health and Environmental Impacts of Leaf Blowers. California Environmental Protection Agency, Air Resources Board, Mobile Source Control Division, February 2000.*

Noise and Health

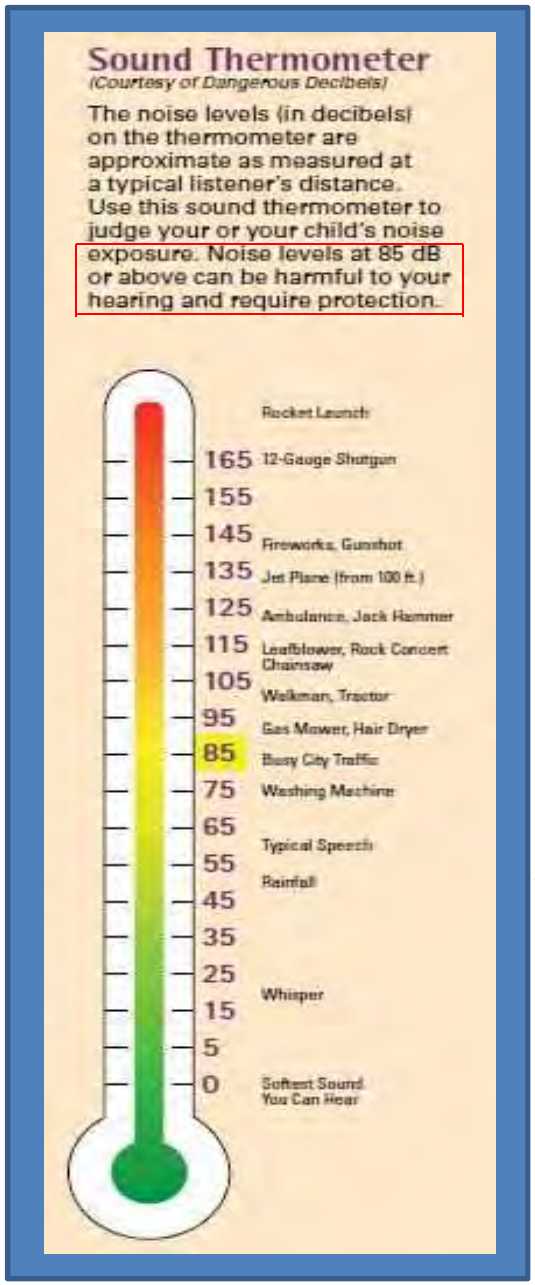
Although specific clinical studies are lacking, leaf blower noise is recognized as a source of adverse health effects

- American Speech-Language-Hearing Association*
- Children's Environmental Health Center*
- Children's Environmental Health Network*
- National Institutes of Health*
  - NIDCD
  - NICHD
- Noise Pollution Clearinghouse*
- The National Academy of Engineering*
- US Environmental Protection Agency*

NICHD: National Institute of Child Health and Human Development; NIDCD: National Institute for Deafness and other Communication Disorders

*Organizations specifically highlighting leaf blower noise as a source of adverse health impacts.

The EPA's Sound Thermometer



Definition of harmful noise

Leaf blower noise levels

Harmful to hearing

WHO/EPA Community daytime standard

Sources: US Environmental Protection Agency. *Noise and Its Effects on Children. Information for Parents, Teachers, and Childcare Providers.* Office of Air and Radiation, Washington, D.C. EPA-410-F-09-003, November 2009. http://www.epa.gov/air/noise.html; WHO Guidelines for Community Noise, 1999.

WHO: Community Daytime Noise Guidelines

Environment	LAeq (dB)*
General outdoor	55
Outdoor living areas	50-55
Dwellings, indoors	35
School, outdoor playground	55
Indoor, school	35

**LAeq is an average decibel value measured over time, eg, 16 hours for daytime, 8 hours for night, shorter periods for discrete episodes. Guideline values are the level at which the lowest adverse health effect is experienced (Source: WHO Guidelines for Community Noise)*

Source: *Guidelines for Community Noise*. Berglund B, Lindvall Tm Schwela DH(Eds). Geneva: World Health Organization, 1999.

Noise and Adverse Health Effects

Children and elderly are most vulnerable

- Hearing loss
- Tinnitus
- Cardiovascular effects*
- Immune system suppression
- Stress hormone release
- Sleep disturbance
- Impaired childhood development
- Impaired cognition
- Mental health problems
- Reduced work and school productivity
- Reduced quality of life

**Hypertension, myocardial infarction, ischemic heart disease.*
Key Sources: World Health Organization. Burden of Disease from Environmental Noise: Quantification of Healthy Life Years Lost in Europe. 2011; American Speech-Language-Hearing Association, Audiology Series; Home, Community, and Recreational Noise; American Psychological Association; Noise Pollution Clearinghouse; Hammer M et al. Environ Health Perspect 2014;122:115-119.

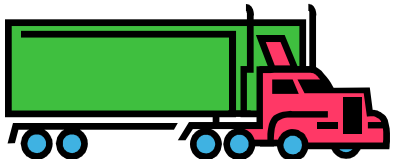
Examples: Adverse effects of air traffic noise

- Long term aircraft noise
  - Cardiovascular disease (hypertension, myocardial infarction, ischemic heart disease)
  - Increased cardiovascular hospital admissions with increase in each incremental 10 dB exposure
- Episodic aircraft noise produced harmful effects for many days, even in sleeping subjects (HYENA study)*
  - blood pressure spikes
  - increased pulse rates
  - vasoconstriction
  - stress hormone release

*HYpertension and Exposure to Noise Near Airports

Sources: Babisch W, Noise Health. 2006;8:1-29; Correia et al. *BMJ* 2013;347:f5561

Examples: Adverse effects of road traffic noise

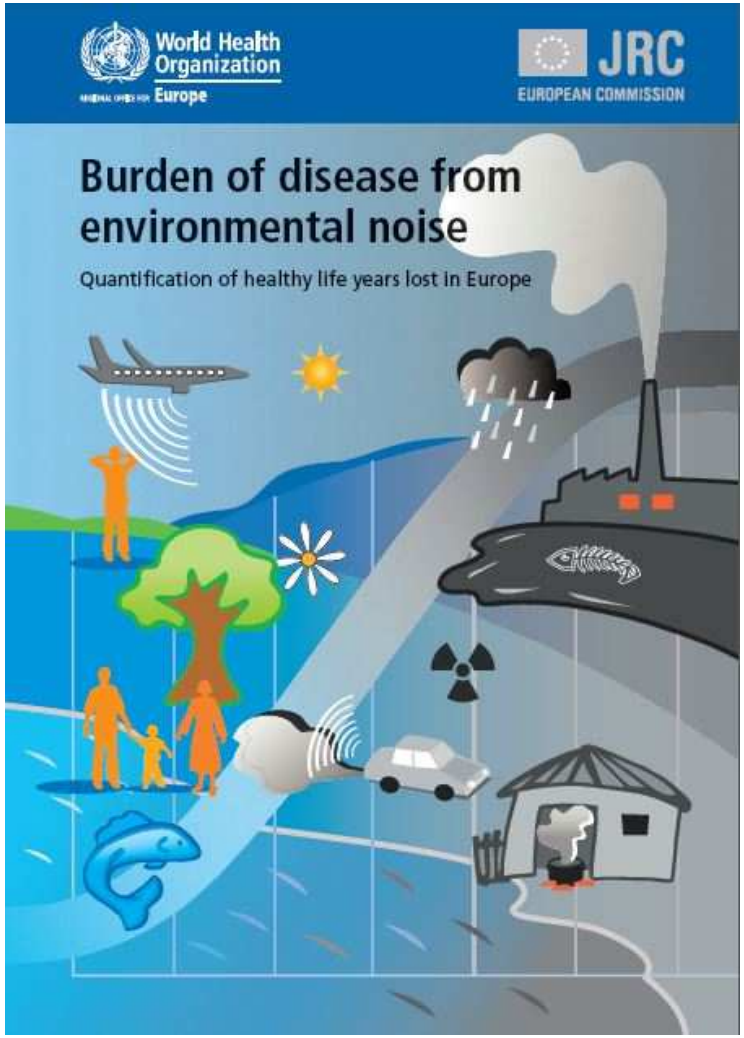


- Road traffic noise is associated with hypertension and cardiovascular disease.
- Road traffic noise is associated with annoyance.
- There is evidence of an association between noise level and diabetes.
- Older age emphasizes effects.

Babisch W. Noise Health. 2008 Jan-Mar;10(38):27-33; Van Kempen E, Babisch W. J Hypertens. 2012 Jun;30(6):1075-86*Burden of Disease from Environmental Noise: Quantification of Healthy Life Years Lost in Europe*. Copenhagen: World Health Organization, 2011.

Europe has been more progressive about noise policy than the US

From traffic noise alone, Western Europeans lose more than one million healthy life years annually as a result consequence of noise-related disability and disease: ischemic heart disease, cognitive impairment of children, sleep disturbance, tinnitus and annoyance. Among environmental hazards, only air pollution causes more damage.



Source: *Burden of Disease from Environmental Noise: Quantification of Healthy Life Years Lost in Europe*. Copenhagen: World Health Organization, 2011.

Noise as a Public Health Problem in the USA

- Recent articles suggest renewed attention is being paid to noise as a health problem in the US.
  - 104 million people estimated to be exposed to continuous average 24 hour noise > 70 dB
  - Exposure to noise levels common in US may have severe health consequences for much of the population.
- The most recent newsletter from Harvard School of Public Health highlights the adverse effects of noise on health, including leaf blower noise.

Sources: Hammer M et al. Environ Health Perspect 2014;122:115-119. Secrets of Sound Health, Harvard School of Public Health, Winter 2014 newsletter.

Sample: Recent Scientific Articles on Noise and Health

Basner M, Babisch W, Davis A, et al. Auditory and non-auditory effects of noise on health. *Lancet* 2013 Oct 29. [Epub ahead of print]

Correia AW, Peters JL, Levy JI, et al. Residential exposure to aircraft noise and hospital admissions for cardiovascular diseases: multi-airport retrospective study. *BMJ*. 2013 Oct 8;347:f5561.

Crombie R, Clark C, Stansfeld SA. Environmental noise exposure, early biological risk and mental health in nine to ten year old children: a cross-sectional field study. Environ Health. 2011;10:39.

Floud S, Blangiardo M, Clark C, et al. Exposure to aircraft and road traffic noise and associations with heart disease and stroke in six European countries: a cross-sectional study. Environ Health. 2013 Oct 16;12:89.

Hart JE, Rimm EB, Rexrode KM, et al. Changes in traffic exposure and the risk of incident myocardial infarction and all-cause mortality. Epidemiology. 2013 Sep;24(5):734-42.

Kälsch H, Hennig F, Moebus S, et al, on behalf of the Heinz Nixdorf Recall Study Investigative Group. Are air pollution and traffic noise independently associated with atherosclerosis: the Heinz Nixdorf Recall Study. Eur Heart J. 2013 Nov 4. [Epub ahead of print]

Stansfeld S, Crombie R. Cardiovascular effects of environmental noise: research in the United Kingdom. Noise Health. 2011;13:229-33.

van Kamp I, Davies H. Noise and health in vulnerable groups: a review. Noise Health. 2013;15:153-9.

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Air Pollution and Health

The Hazards of Leaf Blower Pollutants are Well Documented

- American Lung Association*
- American Heart Association/American Stroke Association
- Children's Environmental Health Center*
- Federal Interagency Forum on Child and Family Statistics
- NIEHS, National Institutes of Health
- US Environmental Protection Agency*
- World Health Organization

*Organizations that have explicitly warned against use of gas-powered lawn equipment.

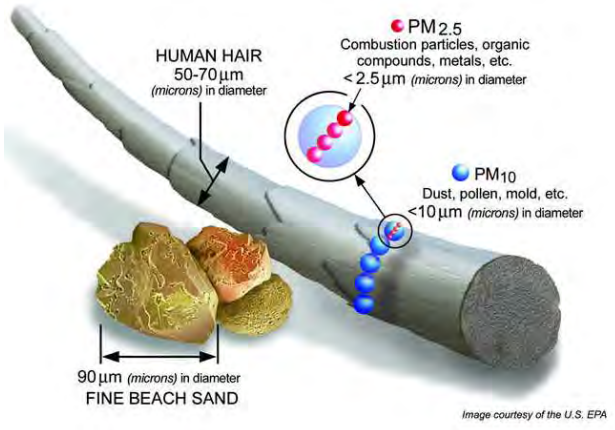
NIEHS: National Institute of Environmental and Health Sciences

Leaf blower emissions: an important source of ozone and particle pollution

"Ozone and particle pollution threaten the health of millions of Americans."
-- *State of the Air 2013*, American Lung Association

1. Toxic Exhaust and Ozone.
Ozone formed at ground level by gas exhaust in the presence of sunlight.

2. Particulate Matter Pollution. ***Small particles (PM2.5 and PM10) can lodge deep in the lungs and if small enough, enter the bloodstream.***



Even short term exposure to ozone has adverse health effects

EPA Concludes Ozone Pollution Poses Serious Health Threats

- Causes respiratory harm (e.g. worsened asthma, worsened COPD, inflammation)
- Likely to cause early death (both short-term and long-term exposure)
- Likely to cause cardiovascular harm (e.g. heart attacks, strokes, heart disease, congestive heart failure)
- May cause harm to the central nervous system
- May cause reproductive and developmental harm

—U.S. Environmental Protection Agency, *Integrated Science Assessment for Ozone and Related Photochemical Oxidants*, 2013. EPA/600/R-10/076F.

Even short term exposure to fine particulates has adverse health effects

EPA Concludes Fine Particle Pollution Poses Serious Health Threats

- Causes early death (both short-term and long-term exposure)
- Causes cardiovascular harm (e.g. heart attacks, strokes, heart disease, congestive heart failure)
- Likely to cause respiratory harm (e.g. worsened asthma, worsened COPD, inflammation)
- May cause cancer
- May cause reproductive and developmental harm

—U.S. Environmental Protection Agency, *Integrated Science Assessment for Particulate Matter*, December 2009. EPA 600/R-08/139F.

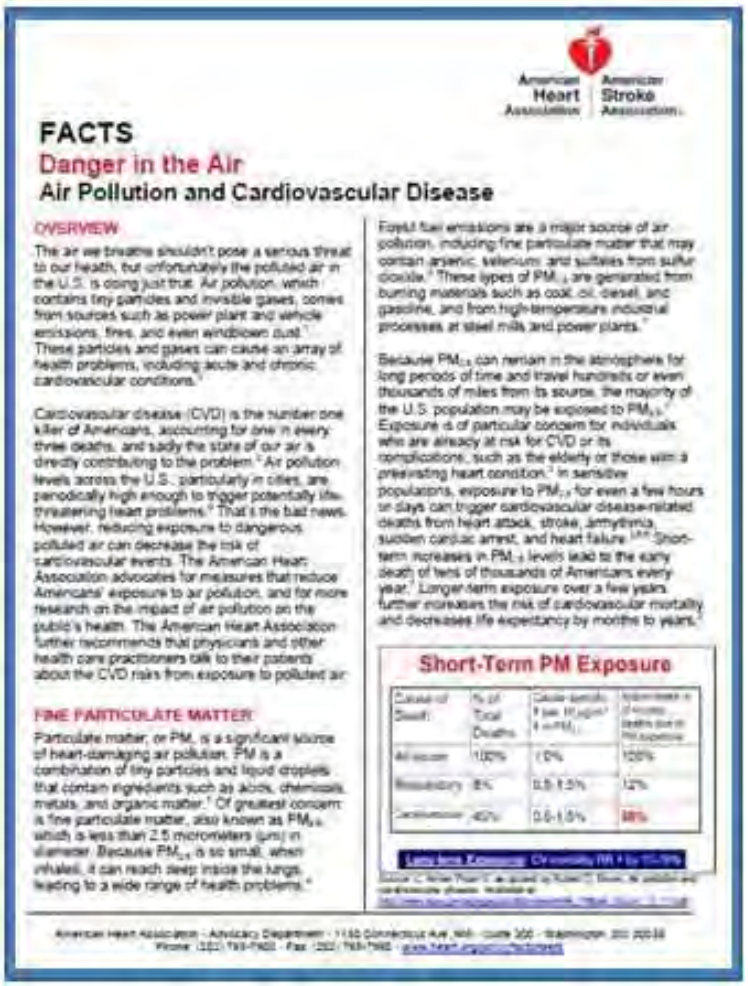
Most Vulnerable

- Children
- Elderly
- People with pre-existing conditions, eg, respiratory, cardiovascular

IARC/WHO Report, October 2013

Outdoor air pollution and particulate matter now both classified as *carcinogenic to humans* -- causing lung cancer and possibly other types of cancer.

Examples of ALA and AHA Materials



American Heart Association | American Stroke Association

FACTS

Danger in the Air

Air Pollution and Cardiovascular Disease

OVERVIEW

The air we breathe shouldn't pose a serious threat to our health, but unfortunately the polluted air in the U.S. is doing just that. Air pollution, which contains tiny particles and invisible gases, comes from sources such as power plant and vehicle emissions, fires, and even windblown dust.[1] These particles and gases can cause an array of health problems, including acute and chronic cardiovascular conditions.[1]

Cardiovascular disease (CVD) is the number one killer of Americans, accounting for one in every three deaths, and sadly the state of our air is directly contributing to the problem.[1] Air pollution levels across the U.S., particularly in cities, are periodically high enough to trigger potentially life-threatening heart problems.[1] That's the bad news. However, reducing exposure to dangerous polluted air can decrease the risk of cardiovascular events. The American Heart Association advocates for measures that reduce Americans' exposure to air pollution, and for more research on the impact of air pollution on the public's health. The American Heart Association further recommends that physicians and other health care practitioners talk to their patients about the CVD risks from exposure to polluted air.

FINE PARTICULATE MATTER

Particulate matter, or PM, is a significant source of heart-damaging air pollution. PM is a combination of tiny particles and liquid droplets that contain ingredients such as acids, chemicals, metals, and organic matter.[1] Of greatest concern is fine particulate matter, also known as $PM_{2.5}$, which is less than 2.5 micrometers (µm) in diameter. Because $PM_{2.5}$ is so small, when inhaled, it can reach deep inside the lungs, leading to a wide range of health problems.[1]

Fossil fuel emissions are a major source of air pollution, including fine particulate matter that may contain arsenic, selenium, and sulfates from sulfur dioxide.[1] These types of $PM_{2.5}$ are generated from burning materials such as coal, oil, diesel, and gasoline, and from high-temperature industrial processes at steel mills and power plants.[1]

Because $PM_{2.5}$ can remain in the atmosphere for long periods of time and travel hundreds or even thousands of miles from its source, the majority of the U.S. population may be exposed to $PM_{2.5}$.[1] Exposure is of particular concern for individuals who are already at risk for CVD or its complications, such as the elderly or those with a preexisting heart condition.[1] In sensitive populations, exposure to $PM_{2.5}$ for even a few hours or days can trigger cardiovascular disease-related deaths from heart attack, stroke, arrhythmia, sudden cardiac arrest, and heart failure.[1,2,3] Short-term increases in $PM_{2.5}$ levels lead to the early death of tens of thousands of Americans every year.[1] Longer-term exposure over a few years further increases the risk of cardiovascular mortality and decreases life expectancy by months to years.[1]

Short-Term PM Exposure

Cause of Death	% of Total Deaths	Excess Deaths per 1 µg/m³ Increase in $PM_{2.5}$	Increase in Deaths per 10 µg/m³ Increase in $PM_{2.5}$
All causes	100%	1.0%	10%
Respiratory	8%	0.5-1.5%	12%
Cardiovascular	45%	0.6-1.5%	18%

Lung Cancer: Chronically 1% to 15-20%

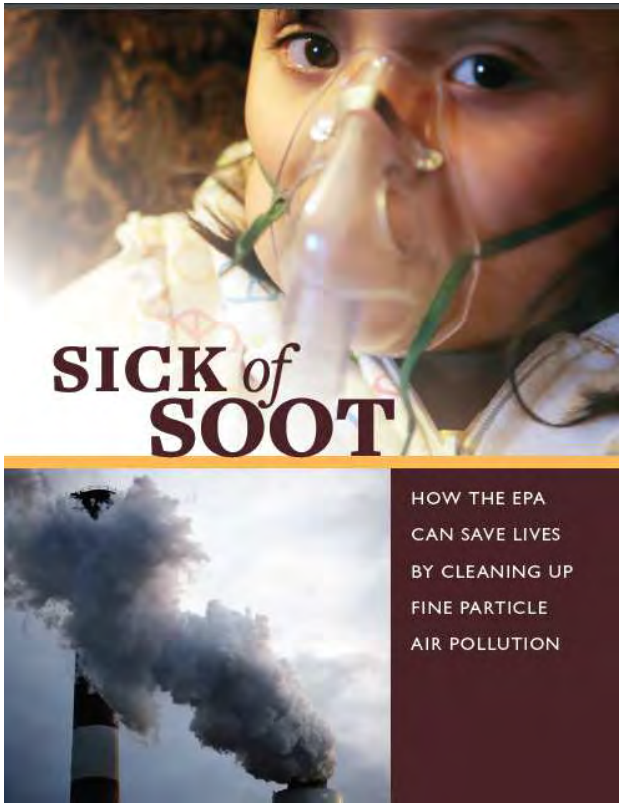
Source: C. Arden Pope III, et al., quoted in Robert D. Brook, et al., Air pollution and cardiovascular disease, Circulation

American Heart Association - Advocacy Department - 1150 Connecticut Ave, NW - Suite 300 - Washington, DC 20036
Phone: (202) 785-7900 - Fax: (202) 785-7950 - www.heart.org/policyhome

AHA: American Heart Association; ALA: American Lung Association

Sick of Soot: A Call to Action for the EPA

- The American Lung Association, Clean Air Task Force and Earthjustice call on he EPA to step up its PM 2.5 annual standards to prevent an estimated 35,700 premature deaths/yr
- Based on accumulating evidence on the deadly risks from short term and long term exposure to increases in particle pollution



ALA: American Lung Association
Sick of Soot. Prepared by the American Lung Association, Clean Air Task Force, and Earthjustice, 2011.

Examples of Air Pollution Statements Specific to Leaf Blower/Lawn Equipment

- **American Lung Association**: *Use hand-powered or electric lawn care equipment rather than gasoline-powered. Two-stroke engines like lawnmowers and leaf or snow blowers often have no pollution control devices…*
- **Children's Environmental Health Center, Mount Sinai Hospital:** *Leaf blowers create large volumes of airborne particulates…. Inhalation of these small airborne particles can provoke asthma and other respiratory diseases in children and can increase the severity of chronic lung disease in our elderly…In general, children are more vulnerable to such exposures…*
- **US EPA**: Lawn *equipment emits pollutants such as hazardous air pollutants, particle pollution, and volatile organic compounds [that] can contribute to health problems that may affect homeowners, their families, and the community… The chemicals in VOC can form ground-level ozone (smog) which can cause breathing difficulties, especially with those who are young, elderly, or have existing respiratory problems such as asthma.*

Sample: Recent Scientific Articles on of References on Air Pollution and Health

Correia AW, Pope CA 3rd, Dockery DW, Wang Y, Ezzati M, Dominici F. Effect of air pollution control on life expectancy in the United States: an analysis of 545 U.S. counties for the period from 2000 to 2007. *Epidemiology*. 2013 Jan;24(1):23-31.

Krishnan RM, Adar SD, Szpiro AA, et al. Vascular responses to long- and short-term exposure to fine particulate matter: MESA Air (Multi-Ethnic Study of Atherosclerosis and Air Pollution). J Am Coll Cardiol. 2012 Nov 20;60(21):2158-66.

Lepeule J, Laden F, Dockery D, et al. Chronic Exposure to Fine Particles and Mortality: An Extended Follow-up of the Harvard Six Cities Study from 1974 to 2009. *Environ Health Perspect* 2012;120:965–970.

Li S, Williams G, Jalaludin B, et al. Panel studies of air pollution on children's lung function and respiratory symptoms: a literature review. J Asthma. 2012 Nov;49(9):895-910.

Mehta AJ, Zanobetti A, Koutrakis P, et al Associations Between Short-term Changes in Air Pollution and Correlates of Arterial Stiffness: The Veterans Affairs Normative Aging Study, 2007-2011. *Am J Epidemiol*. 2014 Jan 15;179(2):192-9.

Mustafic H, Jabre P, Caussin C, et al. Main Air Pollutants and Myocardial Infarction
A Systematic Review and Meta-analysis. *JAMA*. 2012;307:713-721.

Rice MB, Ljungman PL, Wilker EH, et al. Short-term exposure to air pollution and lung function in the Framingham Heart Study. *Am J Respir Crit Care Med*. 2013 Dec 1;188(11):1351-7.

Situation in Lincoln: Need for Board of Health Evaluation

Leaf Blowers in Lincoln: A growing presence

- More and more leaf blowers are being used in Lincoln at commercial properties, residential developments, town lands, and individual homes
  - Increased dependence on contractors and commercial grade, gas-powered equipment
  - Owners/landlords often absent
  - Simultaneous use of multiple machines
  - Use of machines, number of machines, and time in operation often disproportionate to tasks
- Use has expanded from major cleanup to cleaning of gutters, sidewalks, parking lots, road shoulders, and snow

Lincoln Station: An Epicenter of Commercial Leaf Blower Activity

12+ Properties

- Densely populated, incl children, elderly, disabled
- No coordination of work schedules
- Lack of oversight
- No regulations
- Machines used regardless of need

144 Lincoln Rd, 3S Building, Cambridge Trust, Codman Estates, Doherty's Garage, Lincoln Woods, Mall at Lincoln Station, Peace Garden, Ridge Rd condos: lge, smalll, Ryan Estates, St Joseph's Church, Todd Pond condos

Lincoln Station*

- High dB noise from simultaneous use of machines
  - Decibel levels up to 85–90 dB recorded at commercial-residential property lines
  - 2–8 hours/day
  - 50% of days from September–early December, including weekends
- Substantial ground level air pollution in close proximity to humans
  - Strong gas fume odors
  - Thick dust plumes

Leaf blowers in Lincoln Station

*See videos showing recorded noise and dust at various properties.

Leaf blower noise and dust add to an existing base in Lincoln Station

- Fire sirens
- Ambulance sirens
- Trains
- Commercial trucks, garbage trucks
- Car traffic
- Railroad work
- Building and road repair, maintenance, and construction
- Tree work
- Air traffic

Lincoln's Residential Neighborhoods

- In some neighborhoods, residents are being exposed to frequent prolonged noise and pollution from leaf blowers
- More work by commercial contractors
- Owners may be absent from home – no oversight of contractors
- Manual methods (rakes, brooms) largely replaced by gas and electric powered machines
- Growing tendency to manicured look; "demon-ization" of leaves

Now

Then

Contractors do not comply with leaf blower guidelines

- Dust
  - Not for moving dusty materials
  - Don't point in direction of people or pets
  - Use at least 50 feet away from people
- Noise
  - Run blowers only at RPMs needed
  - No full throttle in residential areas
  - Don't use >1 blower at a time
- Time
  - No use late in the evening or early in the morning
- Other
  - No use on a ladder, roof, tree or other unstable surface

Sources: Manufacturer (ECHO, OPEI/Stihl) training materials

Regulations

MA DEP Regulations

Police, fire department, and board of health officials are authorized to enforce:

- Noise Control Regulation – 310 CMR 7.10
- Odor and Dust Control Regulation -- 310 CMR 7.09

MA DEP Noise Regulation: 310 CMR 7.10*

A source of sound will be considered to violate the DEP noise regulation if the source:

1. Increases the broadband level by more than 10 dB(A) above ambient, or

2. Produces a “pure tone” condition - when any octave band center frequency sound pressure level exceeds the two adjacent center frequency sound pressure levels by 3 decibels or more.

*The Lincoln Leaf Blower Study Group is working on ascertaining why leaf blowers may not be enforceable under this regulation.

MA DEP Dust Regulation

310 CMR 7.09

*Section (6): No person shall cause, suffer, allow, or permit the operation of mechanized street sweeping equipment that is not equipped with a suitable dust collection or dust suppression system which is maintained in good operating condition and is operated continuously while the street sweeping equipment is in use to prevent conditions of air pollution.

*According to discussions with a regional representative for the MA DEP, this is the section of the regulation used to enforce leaf blower restrictions.

From MA DEP presentation on air quality regulations*

This photo of Lincoln Station has been distributed nationally on the internet.

MA DEP Presentation . *Air Quality Nuisance Complaints: Dust, Odor and Noise*

Purposes of Lincoln's Zoning Bylaws

ZONING BY-LAW OF THE TOWN OF LINCOLN

SECTION 1 PURPOSES. The purposes of this Zoning By-law (the "By-law") are to promote and conserve the health, safety, morals, convenience and general welfare of the inhabitants of the Town of Lincoln ("the Town"), to lessen congestion in the streets, to lessen the danger from fire and natural disasters, to provide adequate light and air; to prevent overcrowding of land, to avoid undue concentration of population, to encourage the provision of housing for persons of all income levels, to preserve and increase the amenities of the Town, to conserve natural conditions and resources, to conserve and protect public and private water supply, to facilitate the adequate provision of transportation, drainage, schools, parks, open space and other public requirements, to conserve the value of land and buildings, including the prevention of blight, excessive noise and pollution of the environment, to preserve historic sites, to improve and beautify the Town by encouraging the most appropriate uses of land within the Town, including consideration of a comprehensive or master plan, if any, adopted by the Planning Board or a regional planning agency.

Summary

Summary

- Gas-powered leaf blowers generate noise in excess of established standards – international, domestic and local – and are commonly used for hours at a time in close proximity to people and homes.
  - The noise levels produced by leaf blowers have adverse health effects, including cardiovascular and CNS disturbances.
- Gas-powered leaf blowers produce large amounts of toxic exhaust and particulate matter; these substances are known to be toxic and carcinogenic.
  - Even short term exposure to these pollutants has been shown to have adverse health effects, particularly in vulnerable groups.
- Lincoln should take measures to ensure residents are protected from unhealthful levels of noise and pollution emanating from leaf blowers.