Landscape Maintenance Equipment Emissions and Children's Health

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QUIET COMMUNITIES

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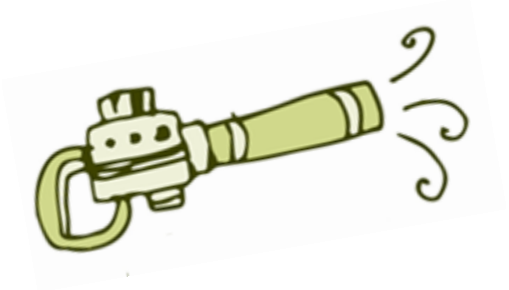
Background :
Gasoline-Powered Landscape Maintenance Equipment (GLME)*



- GLME emits toxic and carcinogenic pollution known to cause and contribute to disease.
- GLME is used increasingly in neighborhoods, parks and other public spaces, and around schools
  - In close proximity to children
  - Often out of compliance
- This is an **avoidable** public health problem.

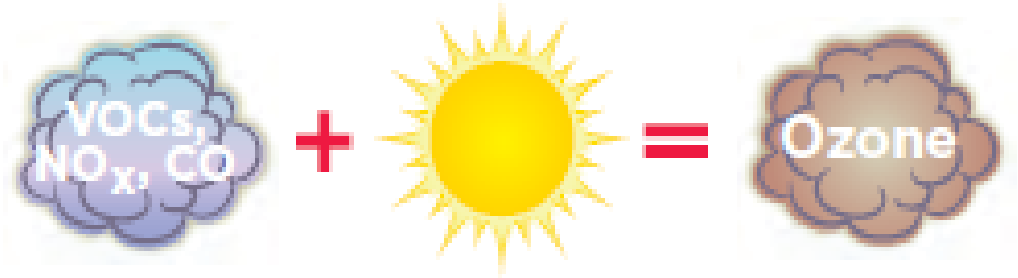
*Leaf blowers and vacuums, trimmers, edgers, brush cutters, mowers.

GLME Air Pollutants

- Volatile organic compounds (VOCs) from burned and unburned fuel
  - Toxic, carcinogenic
  - Combine with nitrogen oxides in the air to form ground-level ozone (smog)
- Nitrogen oxides, carbon monoxide, carbon dioxide*
- Benzene,1,3 butadiene, acetaldehyde, formaldehyde**
- Polycyclic aromatic hydrocarbons
- Fine particulate matter (PM 2.5)

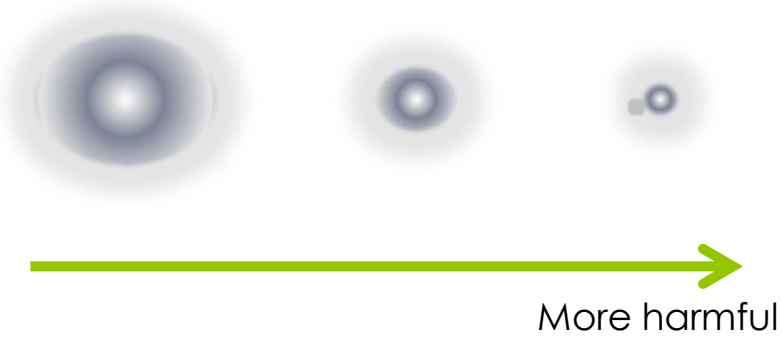
*Considered by EPA to be "Criteria Pollutants": harmful to public health and the environment
**Considered by EPA to be "Hazardous Air Pollutants": cause or may cause cancer or other serious health effects

GLME Exhaust Emissions



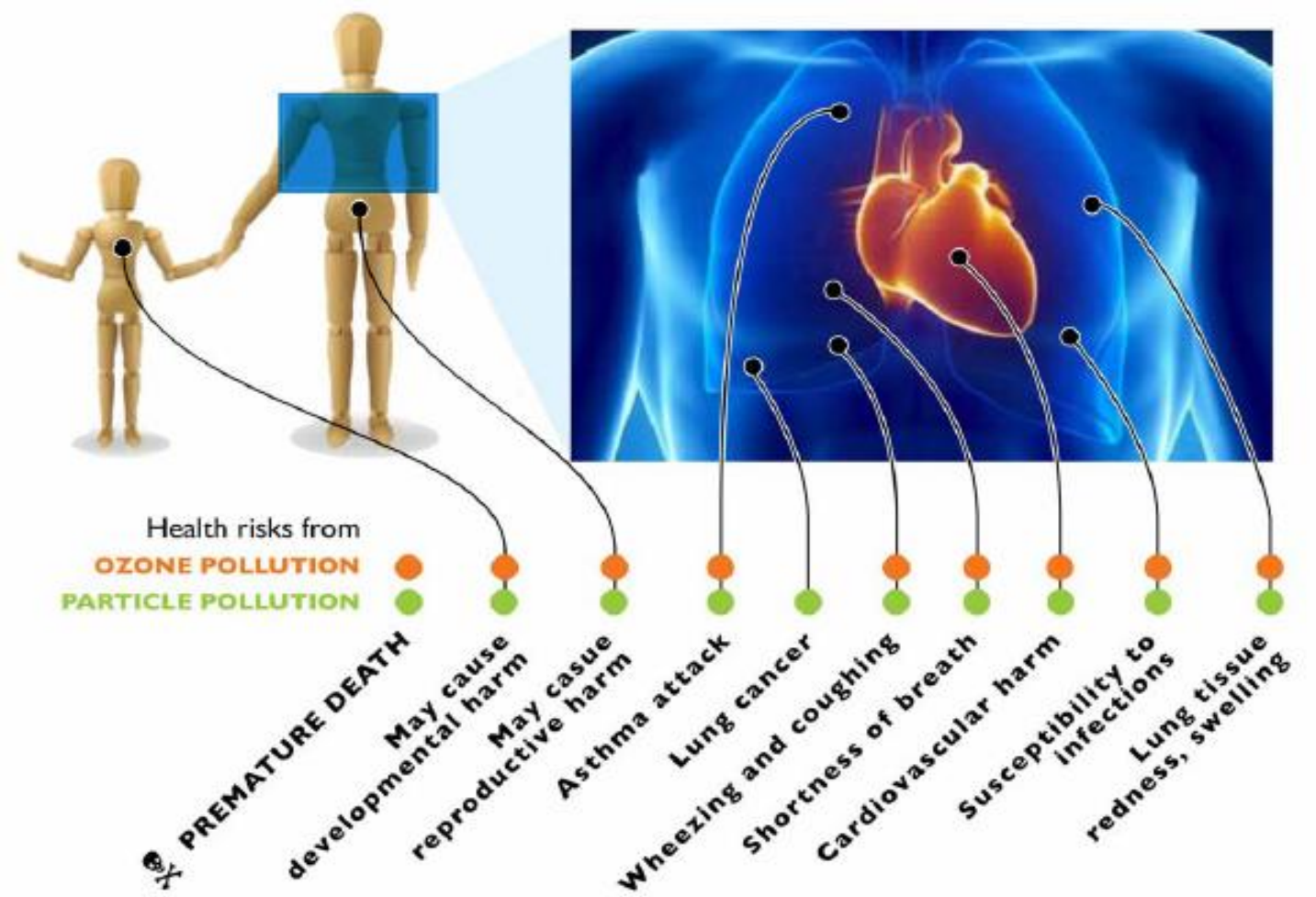
Ozone

Fine Particulates



Ozone and particle pollution threaten the health of millions of Americans. **-- American Lung Association**

Health Effects



Source: American Lung Association

Children are Especially Vulnerable

- Higher respiratory rate
  - Breathe more air per pound body weight than adults
- Smaller than adults, lower to the ground
- Organs still developing
  - Brains, lungs, kidneys
  - "Window of vulnerability"
- More time outdoors
  - Warmer months particularly
  - Times when GLME most in use

Study Goal

- Estimate the volume of harmful exhaust emissions from GLME and better understand the potential health risks to children.

Methods

- Data sources
  - National Emissions Inventory 2011 and 2018 modeling platform (version 6) and Nonroad model
  - California Air Resources Board Emissions Inventory
- Analysis
  - Projected GLME emissions through 2018
  - 2-stroke engines as a source of emissions
- Metrics
  - Descriptive statistics

*Pollutants analyzed: Volatile organic compounds (VOC), individual VOCs (benzene, 1,3 butadiene, formaldehyde, acetaldehyde); Criteria pollutants: CO, NOx, PM10, PM2.5; Carbon dioxide (CO2)

Results

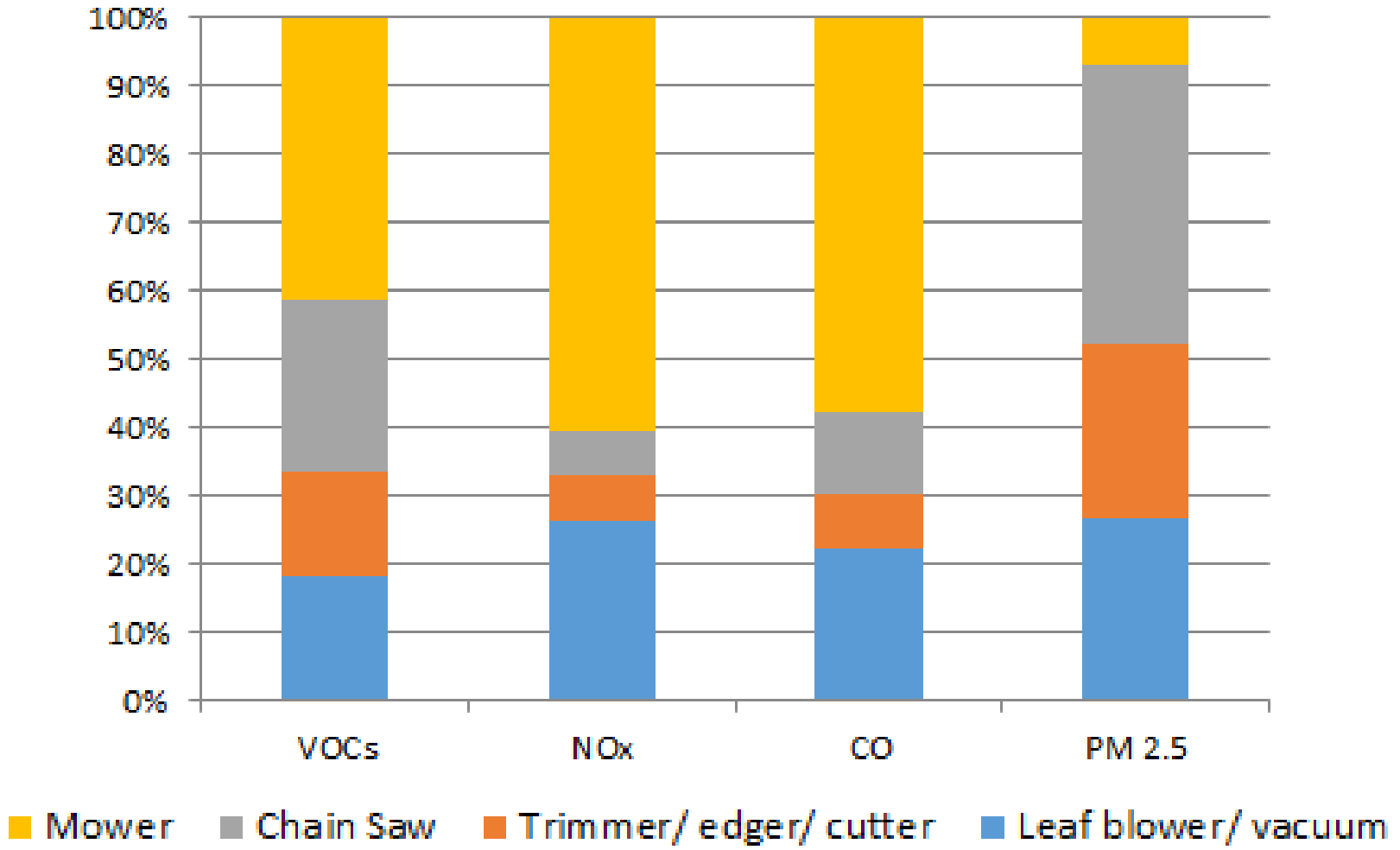
GLME Emissions: US, 2011
(Tons per year)

Pollutant	2011
VOCs	267,772
NOx	21,565
CO	1,879,933
CO2	6,430,593
PM2.5	16,247

Commercial vs Residential GLME Emission Source, US, 2011

Type	% from Commercial
Leaf blowers/Vacuums	78%–94%
Trimmers/Edgers/Cutters	61%–70%
Chain Saws	77%–87%
Mowers	26%–48%

GLME Pollutants by Type of Machine, US, 2011



GLME Emissions: US, 2011–2018E*
(Tons per year)

Pollutant	2011	2018	% Change
VOCs	267,772	224,209	-16.3%
NOx	21,565	16,210	-24.8%
CO	1,879,933	1,697,199	-9.7%
PM2.5	16,247	17,763	9.3%
CO2	6,430,593	7,270,399	13.1%

*2018E: Emissions for 2018 estimated by US EPA.

GLME Emissions by Type of Equipment: US, 2011–2018E* (Tons per year)

Pollutant	Leaf Blowers/ Vacuums	Edgers, Trimmers, Cutters	Chain Saws	Mowers
VOCs	-0.8%	4.0%	8.7%	-45.7%
NOx	-32.6%	12.6%	16.4%	-30.1%
CO	0.1%	7.4%	8.5%	-19.6%
PM2.5	11.8%	11.8%	11.9%	-24.4%
CO2	11.4%	12.3%	12.2%	14.1%

*2018E: Emissions for 2018 estimated by US EPA.

Concerns are Growing

- CDC/NIOSH
- EPA/WHO
- American Academy of Pediatrics
- American Public Health Association
- Children's Environmental Health Network
- Harvard School of Public Health
- State Departments of Environmental Protection
- Medical Society of the State of NY
- California Air Resources Board

MSSNY Resolution -- 2016

- **RESOLVED, that the Medical Society of the State of New York call upon the New York State Department of Environmental Conservation and the manufacturers of the gas leaf blowers to develop guidelines that would dramatically reduce the toxic emissions and noise level of gas leaf blowers; and be it further**

- **RESOLVED, that the Medical Society of the State of New York also encourage that New York State and other governmental entities promote the use of non-polluting alternatives to gas leaf blowers; and be it further**

- **RESOLVED, that a copy of this resolution be transmitted to the American Medical Association for consideration at its House of Delegates**

Summary

- GLME is an important source of toxic and carcinogenic emissions known to cause health problems in children.
- 2-stroke engines emit the vast majority of PM2.5 and are commonly used around children.
  - Most comes from commercial equipment.
  - Levels of PM2.5 from these engines are projected to increase.
- Children exposed to these emissions are at special risk for adverse health outcomes.

Conclusions and Recommendations

- Public health and scientific organizations, and governmental agencies should increase public awareness of GLME as local sources of dangerous air pollutants for children.
- Clinicians, school and daycare administrators, and public health personnel should be aware of these risks, inform the public, and advocate for policy/regulatory changes.

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