

# Health Impacts of Gas-Powered Leaf Blowers

**Norwalk, CT**

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Icahn School  
of Medicine at  
**Mount  
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# Acknowledgements



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New York State **Children's**  
**Environmental Health Centers**



# Air Pollution from 2-stroke engines

Benzene\*

Formaldehyde\*

1,3-butadiene\*

Hydrocarbons/PAHs

Acetaldehyde

Particulate matter\*\*

NO<sub>2</sub>\*\*

CO\*\*

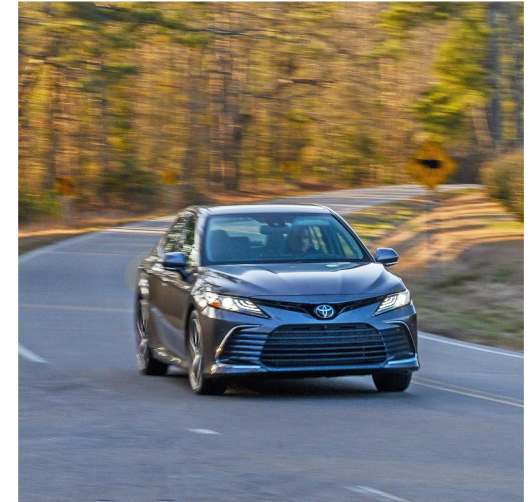
Ozone\*\*

CO<sub>2</sub>



1 hour

=



15 hours/1100 miles

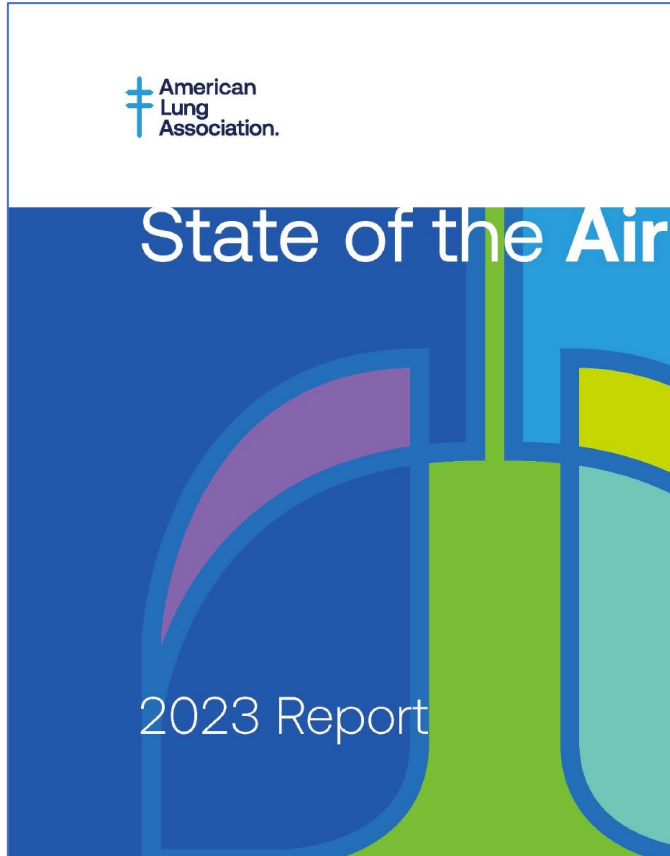
\*Known human carcinogen

\*\*Criteria Air Pollutant

<https://ww2.arb.ca.gov/resources/fact-sheets/sore-small-engine-fact-sheet>

150.4 million Americans owned a leaf blower in 2020

# Fairfield County: the Dirtiest Air in the State



## State of the Air: Fairfield County

Ozone	Particle Pollution	
	24-Hour	Annual
<b>F</b>	<b>C</b>	<b>Pass</b>

**38 Orange Days**

Unhealthy for sensitive groups

**9 Red Days** Unhealthy

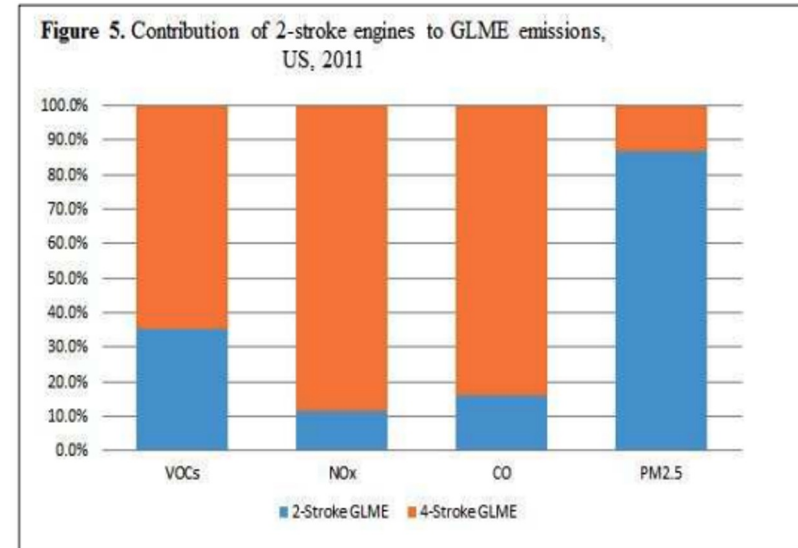
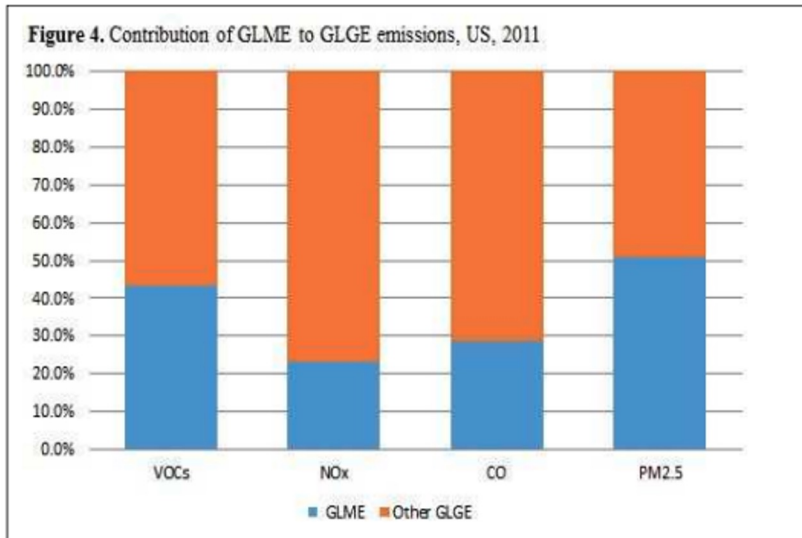
**6 Orange Days**

Unhealthy for sensitive groups



# Two-stroke nonroad engines: a major source of air pollutants

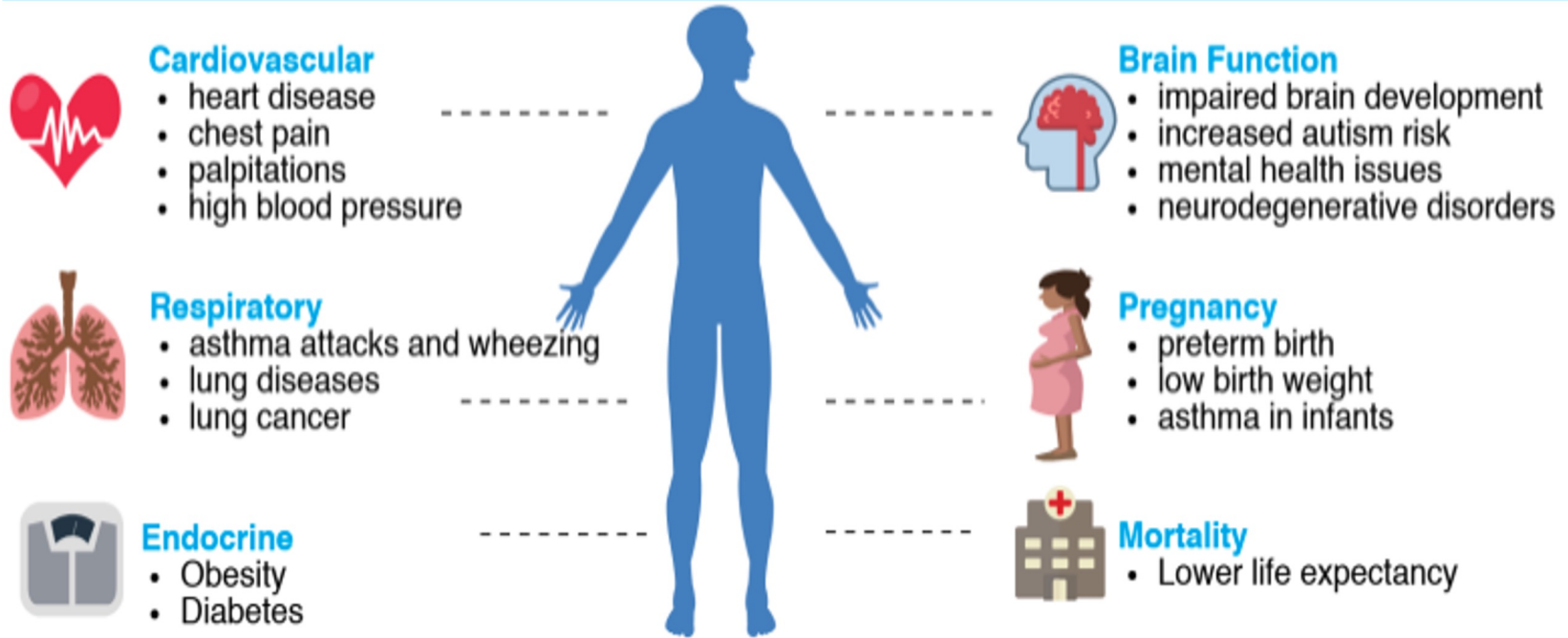
27M tons of pollutants emitted by 121M lawn and garden equipment items (GLGE)



*Banks and McConnell 2015 National Emissions from Lawn and Garden Equipment*  
<https://www.epa.gov/sites/default/files/2015-09/documents/banks.pdf>



# Health Effects of Air Pollution



6.5M deaths/year globally  
200,000 deaths/year US



# Who is Most Affected?

## People who work outdoors

Jobs where there is high exposure to contaminated air



## People with pre-existing conditions

Respiratory issues, cardiovascular, & mental health



## Frontline Communities

Low-Income, communities of color are disproportionately exposed to air pollution



## Pregnant women



## Infants and young children



## Older adults & the elderly

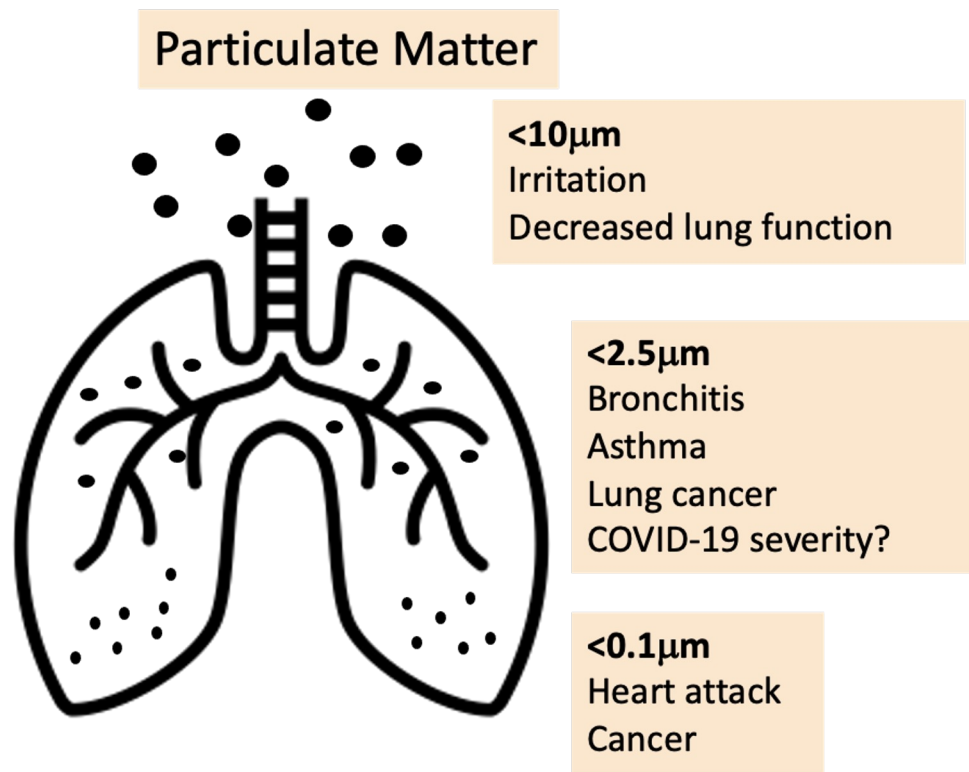


# Air Pollution and Children's Health

- Contributes to **1 in 10 deaths** of children under 5 years
- Leads to impaired **brain development** and cognition
- Impaired **lung function**

Joint effects of ambient and household air pollution contribute to:

- **600K deaths** in children under 15
- **50% of lower respiratory infections** in children under 5





# Small non-road sources of pollution impact health

Of 100,000 deaths attributed to PM2.5 from human activity each year **1,400 are attributed to lawn and garden equipment** use.

*Thakrar et al. 2020 Reducing Mortality from Air Pollution in the United States by Targeting Specific Emission Sources. Environ. Sci. Technol. Lett. 2020, 7, 639–645.*

Personal air monitoring showed **operator exposures above National Ambient Air Quality Standards** for PM2.5 and CO (EPA Small Engine Exposure Study)

*Baldauf et al. 2006 Air contaminant exposures during the operation of lawn and garden equipment. J. Exp. Sci. and Environ. Epi (2006) 16, 362–370*

Workers using 2-stroke chain saws are exposed to carcinogens (e.g. benzene, 1,3-butadiene) at **levels that may increase cancer risk**.

*Frank N. Dost. Toxicology and potential health risk of chemicals that may be encountered by workers using forest vegetation management options. Part I, Risk to workers associated with exposure to emissions from power saws.*



# Air Pollution & Older Populations

Exposure to low levels of PM<sub>2.5</sub>, ozone, and nitrogen dioxided associated with **pneumonia, heart attack, stroke, AF in elderly**

*Yazdi et al. 2021. Long-Term Association of Air Pollution and Hospital Admissions Among Medicare Participants Using a Doubly Robust Additive Model. April 20, 2021 Circulation. 2021;143:1584–1596. DOI: 10.1161/CIRCULATIONAHA.120.050252*

Short-term exposure to **PM<sub>2.5</sub> increases stroke risk** in patients with pre-existing conditions (AF, hypertension, high cholesterol)

*Meng et al. 2022. Short-term effect of PM2.5 on stroke in susceptible populations: A case-crossover study. Int. J. of Stroke. Vol. 18. Issue 3 <https://doi.org/10.1177/1747493022111>*

PM<sub>2.5</sub> and NO<sub>2</sub> are associated with **increased risk of dementia and AD.**

*Shi et al. 2021. A national cohort study of long term air pollution exposure and incident dementia in older adults in the US. Nature Comm. 12: 6754.*



Common noises can be loud.



<https://www.cdc.gov/vitalsigns/pdf/2017-02-vitalsigns.pdf>





AMERICAN PUBLIC HEALTH ASSOCIATION

*For science. For action. For health.*

## Noise as a Public Health Hazard

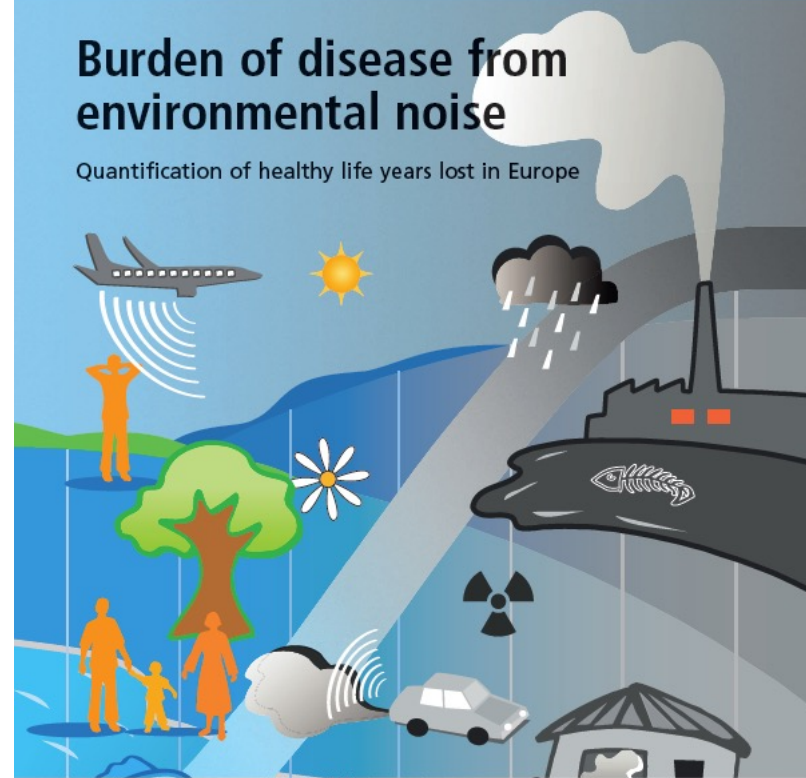
Date: Oct 26 2021 | Policy Number: 202115

Key Words: Occupational Health And Safety, Environment



## Burden of disease from environmental noise

Quantification of healthy life years lost in Europe



# Noise is Pollution

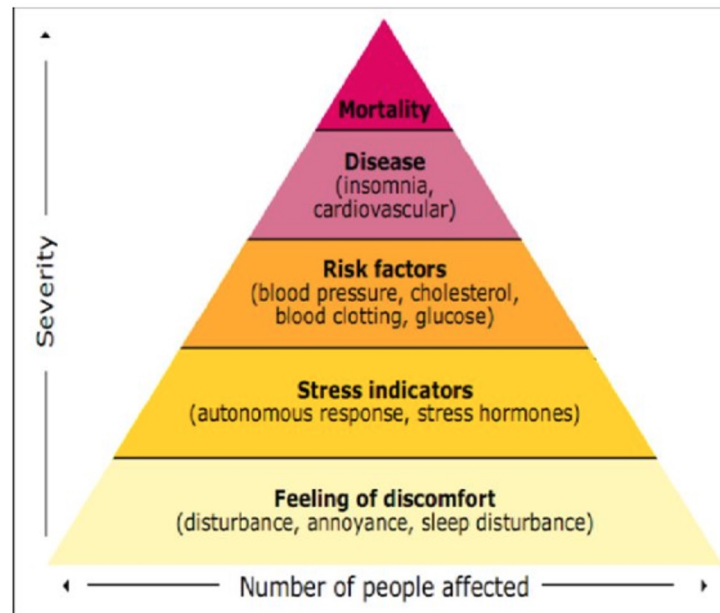
## Annually:

- 1-1.6M healthy life years (DALYs) lost due to health effects of noise
- 45,000 DALYs lost due to cognitive impairment in children

**Vulnerable groups:** pregnant women, infants, children, workers, elderly

## Health outcomes:

- Hearing loss
- Impaired balance
- High blood pressure & CVD
- Stress
- Anxiety & depression
- Impaired focus and learning
- Sleep loss



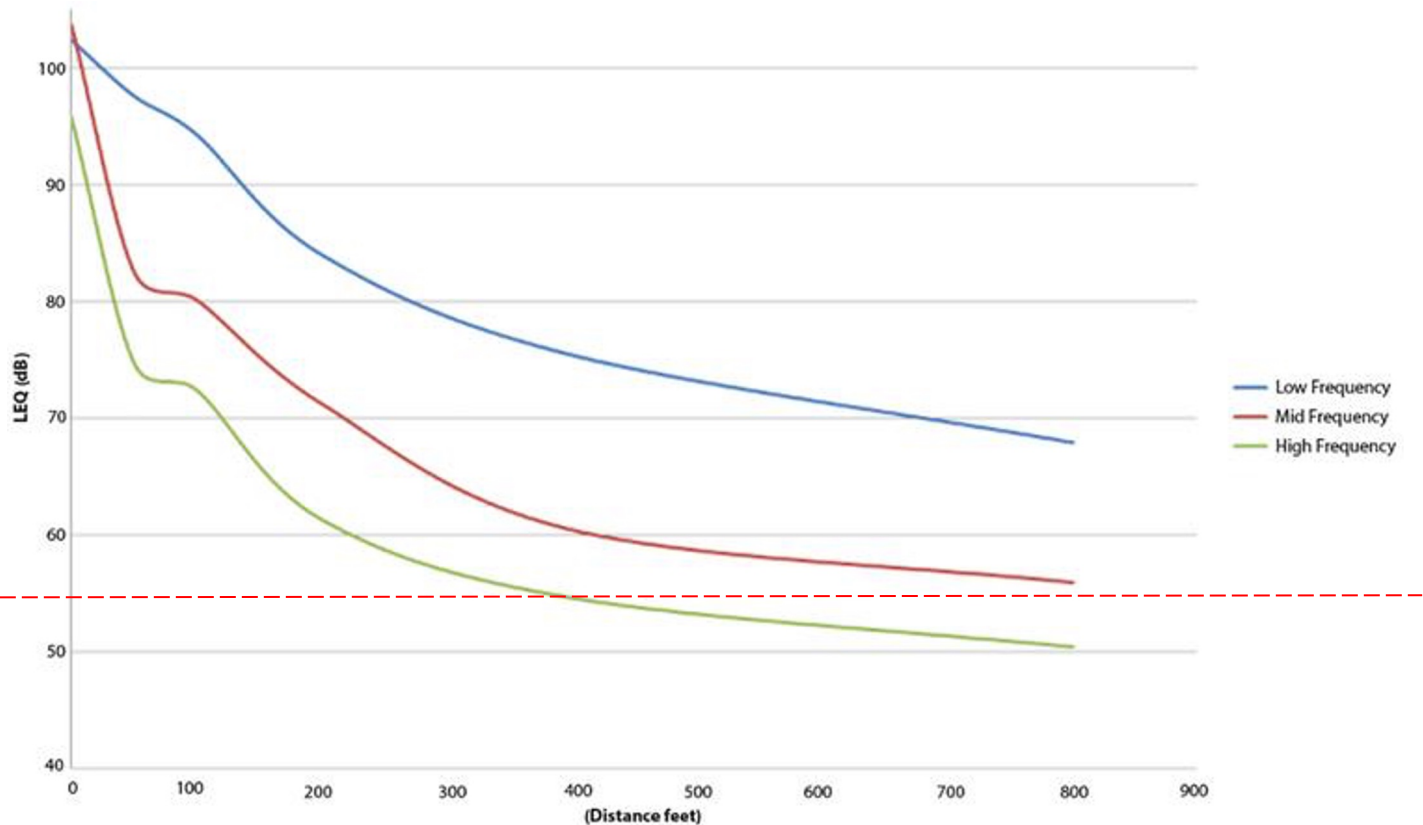
Wolfgang Babisch. *The Noise/Stress Concept, Risk Assessment and Research Needs*. *Noise Health*. 2002;4(16):1-11.

Charlotte Clark and Katarina Paunovic. *Int. J. Environ. Res. Public Health* 2018, 15, 285; doi:10.3390/ijerph15020285

WHO Burden of Disease from Environmental Noise, 2011.  
[https://www.euro.who.int/\\_\\_data/assets/pdf\\_file/0008/136466/e94888.pdf](https://www.euro.who.int/__data/assets/pdf_file/0008/136466/e94888.pdf)



# Low frequency noise from GLBs travels long distances



WHO Outdoor  
Daytime Level



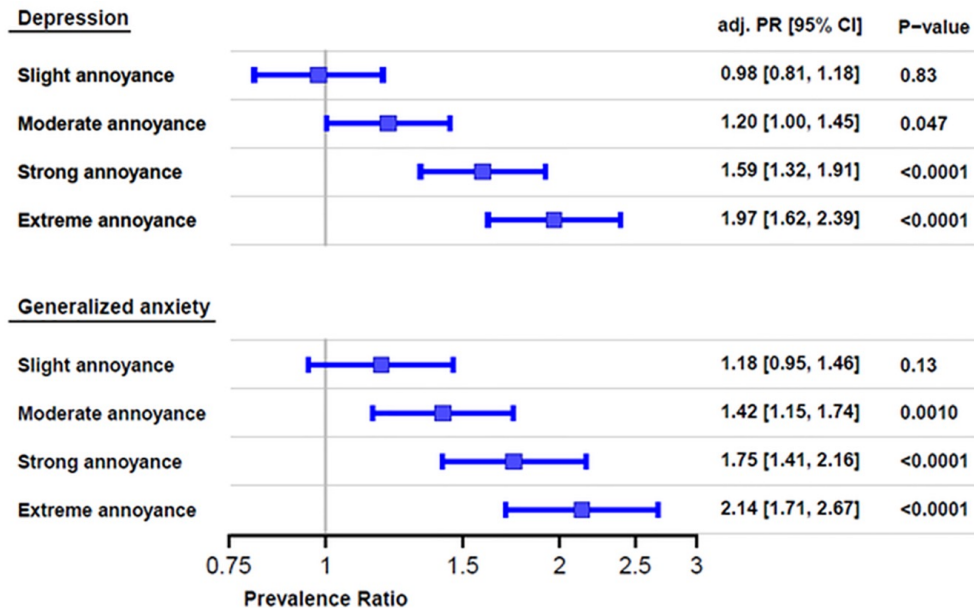
# Noise and Mental Health

## Gutenberg Health Study

N=15K

Validated likert scale for annoyance

Strong noise annoyance is associated with **2x prevalence of depression and anxiety**



Beutel ME et al. 2016 Noise Annoyance Is Associated with Depression and Anxiety in the General Population- The Contribution of Aircraft Noise. *PLoS ONE* 11(5): e0155357.

<https://doi.org.eresources.mssm.edu/10.1371/journal.pone.0155357>

Tortorella et al. 2022. New determinants of mental health: the role of noise pollution. A narrative review. *International Review of Psychiatry*, 34:7-8, 783-796, DOI: 10.1080/09540261.2022.2095200



# Noise and Cardiovascular Health

## Gutenberg Health Study

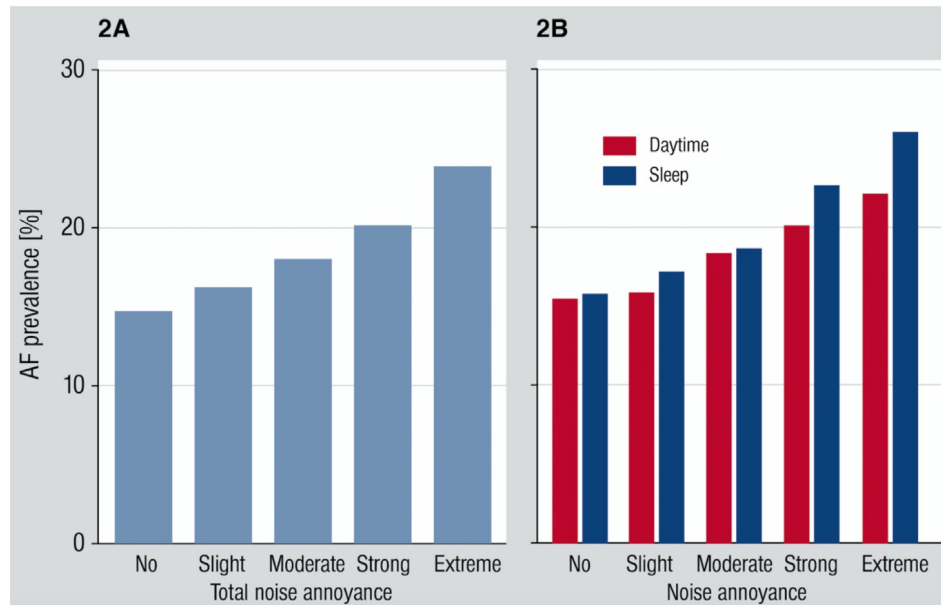
Annoyance from daytime neighborhood noise associated with **increased risk of atrial fibrillation**.

## Chicago Health & Aging Study

A 10dbA increase in noise associated with 1mmHg **increase BP and 20% increased risk of Rx-resistant hypertension**.

## Mass General Imaging Study

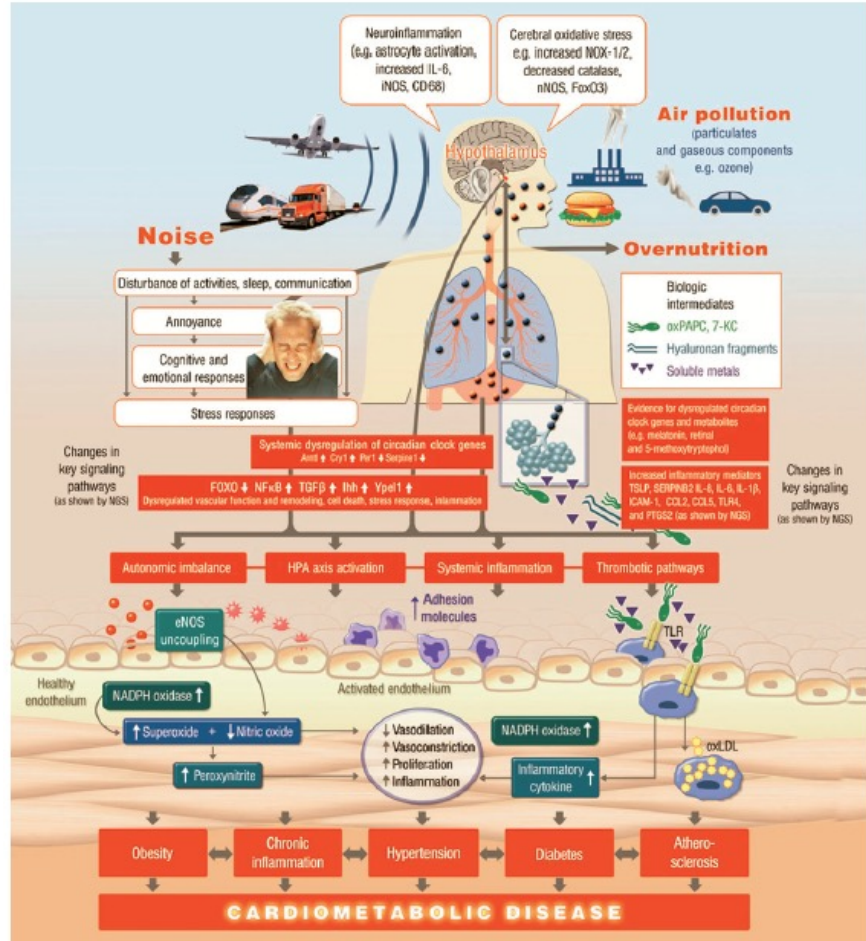
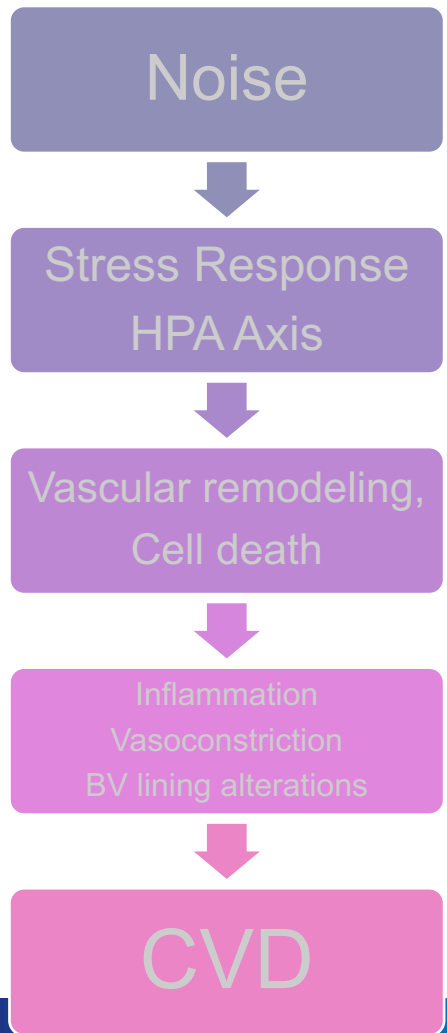
Noise > 55dB associated with increased stress activity in the brain and **major adverse cardiovascular disease event**



*Hadad et al. 2018 Annoyance to difference noise sources is associated with atrial fibrillation in the Gutenberg Health Study. Int. J. of Cardiology. 264:79-84. <https://doi.org/10.1016/j.ijcard.2018.03.126>*







Munzel 2020 Environmental Factors Such as Noise and Air Pollution and Vascular Disease. *Antioxidants & Redox Signaling*. Vol 33, No. 9 2020. DOI: 10.1089/ars.2020.8090

# Noise and Older Populations

## Chicago Health & Aging Project

- N=5227 >65
- Community noise was associated with worse global cognitive performance
- 10dBA increase in noise associated with:
  - 36% increased odds of mild cognitive impairment**
  - 29% increased odds of Alzheimer's disease**

Weuve et al. 2020. Long-term community noise exposure in relation to dementia, cognition, and cognitive decline in older adults  
<https://doi.org/10.1002/alz.12191>

## 2022 Meta-analysis on noise & dementia

9 studies show dose-dependent association between noise and dementia

Meng et al. Chronic Noise Exposure and Risk of Dementia: A Systematic Review and Dose-Response Meta-Analysis. *Front Public Health*. 2022; 10: 832881.doi: 10.3389/fpubh.





## Noise

### Did you know?

*Noisy environments can impact a child's learning. Very loud noises can lead to permanent hearing loss.*

### Action Plan

- Avoid loud volumes on portable electronic devices, especially when using headphones.
- Choose toys that have a volume control. Tape over the speakers of very loud toys.
- Don't use firecrackers.
- If using a white noise machine to help your infant sleep, do not place it near the baby and play it at a low volume.
- Use hearing protection for you and your family at events with loud music.
- Create a quiet environment for your child to read and do homework.

### Resources

Worried about your child's hearing? Speak to your child's pediatrician.

For tips on how to protect your child's hearing from the American Academy of Pediatrics, visit [healthychildren.org](https://www.healthychildren.org) and search "Protect Hearing."

For local resources concerning loud noises:

New York City	To make a complaint about noise coming from the street or sidewalk, call 311 or visit <a href="https://portal.311.nyc.gov">portal.311.nyc.gov</a> and search "noise complaint" to make a complaint about noise coming from the street or sidewalk
New Jersey	While New Jersey does not have a Noise Control Program to investigate complaints, there are options for residents with specific types of noise concerns: visit <a href="https://www.nj.gov/dep">nj.gov/dep</a> and search "Noise Information and Complaints"

For more information, visit [icahn.mssm.edu/research/pehsu/information](https://icahn.mssm.edu/research/pehsu/information)



<https://mountsinaiexposomics.org/about/>



<https://nyscheck.org/pehsurx/>

[more](#) →

Signature \_\_\_\_\_ Date \_\_\_\_\_



# Health effects: climate change



Extreme heat increases risk of illness and dehydration.



Poor air quality due to increased pollutants and pollen worsen asthma and other breathing and heart problems.



Warmer temperatures promote the growth of bacteria, viruses, and insects.



Extreme weather causes injuries, missed work and school, and mental health issues.



Food supply problems cause malnutrition.



# LEAVES ARE NOT LITTER

THEY'RE FOOD AND SHELTER FOR  
BUTTERFLIES, BEETLES, BEES, MOTHS, AND MORE.  
TELL FRIENDS AND NEIGHBORS TO JUST

## #LEAVETHELEAVES



Pollinator & biodiversity loss impacts human health through loss of:

- Food
- Medicine
- Building materials and shelter
- Carbon sinks



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# Learn More



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## Learning Hub



<https://mountsinaiexposomics.org/about/>

## Prescriptions for Prevention



<https://nyscheck.org/pehsurx/>



**Thank you**



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