Understanding why airport expansion is bad for your health

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AVIATION EMISSIONS

Aircraft engines produce:

**Pollutants:** Nitrogen Oxide, Sulfur Oxides, Carbon Monoxide, Hydrocarbons and Particulate Matter

Carbon Dioxide (CO₂)

Water Vapor
Emission Formation and Transformation

Pollutants formed in the combustion process are transformed when emitted into the environment into three zones.

1. Immediately after exiting the combustor within the engine.
2. Downstream from the engine in a hot exhaust plume.
3. After emissions have cooled and mixed with the ambient air to cool the gas stream.

Some gases, like heavy hydrocarbons, condense under these conditions to form aerosol particles. As emissions cool, some molecules undergo chemical reactions that also condense into particles.
Emission Formation and Transformation

• The resulting Particulate Matter (PM) can be solid or liquid and includes carbon in the form of soot, inorganic salts (like ammonium nitrate and ammonium sulfate) and heavy hydrocarbons that condense into aerosol particles.

• Most aviation-related PM that reaches airport communities are particle emissions released during ground operations and landing and takeoff.
Health Effects of Particulate Matter (PM)

The EPA indicates that the size of particles is directly linked to their potential for causing health problems. Small particles less than 10 micrometers in diameter pose the greatest problems, because they can get deep into your lungs, and some can even get into your bloodstream.
Exposure to PM or “soot”

EPA states on their website that exposure to such particles can affect both your lungs and your heart. Numerous scientific studies have linked particle pollution exposure to a variety of problems, including:

• **premature death** in people with heart or lung disease
• nonfatal **heart attacks**
• irregular **heartbeat**
• aggravated **asthma**
• decreased lung function
• increased respiratory symptoms, such as **irritation** of the airways, **coughing** or difficulty **breathing**.
The FAA states (Aviation Emissions Report 2015) that there are multiple health effects associated with exposure to PM, including impacts to the respiratory, cardiovascular and neurological systems. Smaller particles less than 2.5 micrometers in diameter, which are typical of aviation emission, tend to pose higher risk since they migrate deeper into the lungs and bloodstream causing cardiovascular effects and even affecting the nervous system.

Human exposure to small particles can aggravate heart and lung disease resulting in increased hospital admissions, emergency room visits, and absences from school or work. Older adults, children, and people with heart or lung disease are the most sensitive to exposure to PM.
Aircraft engines are not the only source of aviation emissions

Airport access and ground support produce similar emissions:

• Traffic to and from the airport
• Shuttle buses and vans for passengers
• Ground support equipment that services aircraft
• Auxiliary power units that provide electricity and air conditioning for aircraft parked
Air Pollution, heart disease and stroke

Effects May Be Immediate or Longer-Term
Acute short-term effects of air pollution tend to strike people who are elderly or already struggling with heart disease, said Dr. Luepker, who is also an epidemiologist.

For instance, someone with atherosclerosis, or build up of fatty deposits on the inner lining of the arteries, experiences immediate trouble when pollutants play a role in causing plaque in a blood vessel to rupture, triggering a heart attack.

“This kind of pushes them over the cliff,” Dr. Luepker said.

Studies have shown increases in deaths and hospitalizations when there are high concentrations of smog in Los Angeles, and research indicates this happens in other countries, too, Dr. Luepker said.

Pollution is also believed to have inflammatory effects on the heart, causing chronic cardiovascular problems.

Medical researchers are particularly concerned about pollution particles smaller than 2.5 microns, which are usually related to fuel combustion. Because they are so tiny, they aren’t easily screened and more readily enter the human body. They then begin to irritate the lungs and blood vessels around the heart. Data suggest that over time pollutants aggravate or increase the process of disease in the arteries.
American Heart Association

Everyday Life, Work Can Pose Pollution Risks

Though anyone can be exposed, people who live near road intersections or factories or who direct traffic are particularly at risk, Dr. Luepker said.

“Breathing in this stuff all the time, they seem to have increased problems,” he said.

Many factors contribute to heart disease, including your genes. But Dr. Luepker said growing medical evidence links air pollution and heart disease.

In 2004, the American Heart Association issued a scientific statement concluding that exposure to air pollution contributes to cardiovascular illness and mortality. A 2010 update elaborated on those risks.

Short-term exposure can increase the risk of heart attack, stroke, arrhythmias and heart failure in susceptible people, such as the elderly or those with pre-existing medical conditions, according to the statement.

The risk of death is greater from long-term exposure. Current science suggests air pollution facilitates atherosclerosis development and progression, said the scientific panel that worked on the statement. It also may play a role in high blood pressure, heart failure and diabetes.
**AHA Study**: Long term exposure to air pollution may harm your brain.

- Long-term exposure to air pollution is linked with brain shrinkage.
- A small increase in fine PM pollution was associated with hidden brain damage linked to impaired cognitive function.
- Fine particulate matter affects more people than any other pollutant, with chronic exposure causing the most deaths from serious disease, according to the World Health Organization (WHO). PM$_{2.5}$ may trigger disease because the particles penetrate into the alveoli of the lungs. Fine particulate matter can also contribute to the narrowing of arteries that supply blood to the brain.
Health impacts of aircraft noise

- Cardiovascular diseases
- Sleep disturbance
- Annoyance
- Psychological heath
- Impacts children’s cognition and learning

Noise

- Higher aircraft noise levels are associated with increased risk of high blood pressure, heart disease, heart attack, stroke and dementia.
- Long-term sleep disturbance is likely to increase the risk of higher blood pressure and cardiovascular disease. WHO recommends night
- Sleep disturbance from aircraft noise leads to next day fatigue, loss of productivity and can have major impacts on health and wellbeing. An aircraft noise event may lead to awakening or influence the time spent in different sleep stages which affects quality of sleep. WHO recommends that night noise should not exceed 40 dBA Lnight.
- A recent large study found that a 10dB increase in noise is associated with an 8.9% increase in the risk of depression.
New Haven Public Schools within 7 miles of Tweed
5 miles and 10 miles out from Tweed
Air Now showing the combined (PM & O₃) 5/2/18 without the additional air traffic
Air Now showing the combined (PM & O₃) 5/3/18 without the additional air traffic
Watch how the air quality changes along the I-95 corridor

May 2, 2018 click here

May 3, 2018 click here

https://airnow.gov/index.cfm?action=airnow.local_city&zipcode=06512&submit=Go
Websites used:

• https://www.faa.gov/regulations_policies/policy_guidance/envir_policy/media/Primer_Jan2015.pdf

• http://www.heart.org/HEARTORG/Conditions/More/MyHeartandStrokeNews/Air-Pollution-and-Heart-Disease-Stroke_UCM_442923_Article.jsp#.Wu5cna2ZNpc

• https://newsroom.heart.org/news/long-term-exposure-to-air-pollution-may-harm-your-brain?preview=f709


• https://airnow.gov/index.cfm?action=airnow.local_city&zipcode=06512&submit=Go