Maryland SB658
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Position: Favorable

Thank you for this opportunity to testify. I - Neelakshi Hudda - am a Research Assistant Professor in Department of Civil and Environmental Engineering at Tufts University. I investigate the air quality and health effects of transportation emissions. In particular, I have nearly a decade of experience in characterizing the impacts of airport-related emissions on air quality in neighboring communities. I draw upon my own research and my knowledge of the field in providing this testimony.

In 2018, 10 million flights carrying one billion passengers flew into or out of airports in the United States (US).[1] Over the next 25 years, flight operations and enplanements in the US are projected to grow. These trends are of significance to the millions of people who live or work near airports and are regularly exposed to noise and air pollution originating from aviation activity.

Adverse effects of elevated noise exposures in near-airport communities are well established. Exposure to airport noise is associated with an increased risk of hypertension[2–6] in a dose-dependent manner[7,8] — meaning that the more noise people are exposed to, the higher their risk of hypertension. Research has shown that people living in communities around airports are more likely to be taking prescription anti-hypertensive medication[4,9,10] and have higher rates of cardiovascular disease[3,11], cardiovascular-disorder-related hospitalizations[12,13], and cardiovascular-disease-associated mortality[14,15]. There is also evidence for adverse birth outcomes[16], increased rates of hospitalization due to respiratory diseases[17] and learning deficits in children who live near airports.[18–20]

Adverse effects of airport-related emissions on ground-level air quality are under-recognized and under-estimated.

Starting in 2014, the impacts of aviation emissions on ground-level ambient ultrafine particle concentrations were found to extend over unexpectedly large areas near airports and in particular along flight paths.[21]

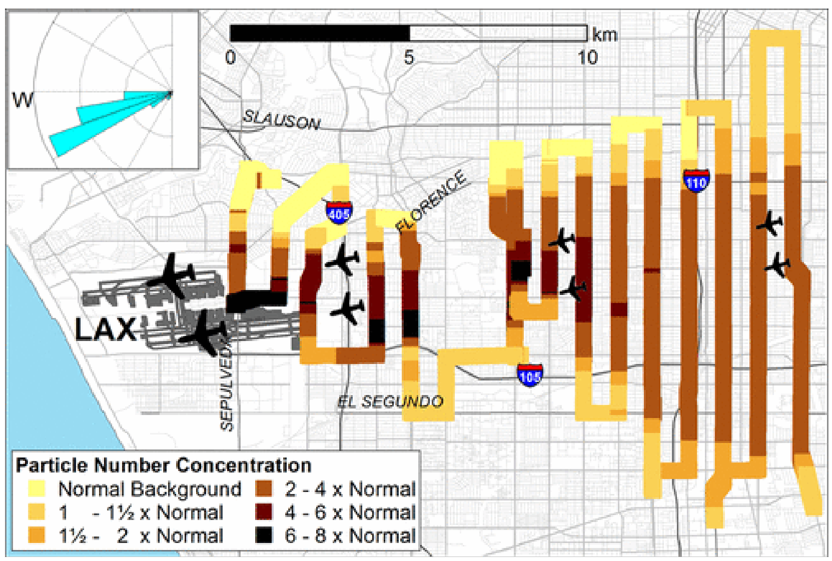

Figure 1: Pattern of elevated concentrations of ultrafine particles near LAX. Elevation in particle number concentrations comapred to normal backgound levels is visualized.

Since then many studies have demonstrated that aviation exhaust is the major source of ultrafine particle pollution in downwind communities. For example, elevated ultrafine particle concentrations were reported downwind as far as 4.5 miles of Logan Airport in Boston[22], 10 mile of SEATAC Airport in Seattle[23] and 12 miles of Los Angeles International Airport.[24]

Ultrafine particles that emitted at very high rates by jet aircraft[25] and are harmful to human health. Ultrafine particles are defined as particles with diameter <100 nm. They are a 100-times smaller than regulated PM_{10}. Due to their small size they can penetrate deeper into the lungs and move through the body to other organs including the central nervous system where they may cross the blood–brain barrier. They can also enter the brain through the nose and olfactory pathway. They are associated with increased rates of hypertension and cardiovascular morbidities.[26,27] Airport-related ultrafine particles may have a unique toxicity profile due to unburned lubrication oil present in jet exhaust.[28]

Exhaust from aircraft also contains substantial amounts of black carbon and nitrogen oxides, [25,29–31] that contribute to adverse cardiovascular effects.[21,24,32] Elevated levels of black carbon (a carcinogen) have been reported near airports[21].

Key findings from research near two major airports in the US.

I want to briefly detail what we know about the air quality impacts and health effects from some recent work at two major airports in US: Los Angeles International Airport (LAX) and Logan International Airport (BOS). These findings are of great public health concern because higher levels of ultrafine particle are commonly found downwind of airports, affecting large densely populated residential areas. Before the pandemic, LAX supported ~1900 operations/day and BOS supported ~1000 operations/day. In comparison, Baltimore/Washington International Thurgood Marshall Airport (BWI) supported ~700 operations/day. Key findings are as follows:

1. **Airport-origin pollution is the major source of elevated ultrafine particle concentrations in communities downwind of LAX and BOS.**

   - Ultrafine particle concentrations in the geographic area around LAX were at least 100% higher than typical background as far as 12 miles downwind and were 500% higher within 5 miles of LAX. [24] The level of increase in ultrafine particle pollution near LAX is equivalent to that from 25% of all highways/freeways in Los Angeles county.

   - Similarly, at locations 2.5 miles and 4.5 miles from BOS, ultrafine particle concentrations were 100% and 33% higher, respectively, when winds were from the direction of the airport compared to other directions.[22] Further, ultrafine concentrations were positively correlated with flight activity and increased with increasing wind speed, suggesting that aircraft exhaust plumes were the likely source.

2. **Airport-origin ultrafine particle pollution penetrates into residences and impacts (outdoors and indoors) are the particularly large for homes under the flight trajectories.**

   - In 16 residences located in the greater Boston metropolitan area, the median concentrations of ultrafine particles were 70% higher when homes were downwind of the airport. [33]

   - At a residence under the flight trajectory of the most utilized runway near BOS, it was found that when the residence was downwind of the airport the concentrations of ultrafine particles, oxides of nitrogen (NO, NO_2 and NO_X), black carbon, and polycyclic aromatic hydrocarbons were 1.1- to 4.8-fold higher. In fact, NO2 concentrations at the residence exceeded those measured at regulatory monitoring sites in the area including one adjacent to an interstate highways.[34]

   - Further, the impacts were highest during landings: average ultrafine concentration was 7.5-fold higher from landings versus takeoffs on the closest runway. [34]

- Overall, 70% of ultrafine particle concentrations present outdoors were also present indoors, indicating there is substantial infiltration of aviation-origin emissions and building envelope does not provide protection from this air pollution. Infiltration resulted in indoor concentrations on ultrafine particles that were comparable to ambient concentrations measured locally on roadways and on interstate highways.[34]

- Similarly, at LAX the highest ultrafine particle concentrations were detected at locations under the landing jets and consisted mainly of ultrafine particles smaller than 40 nanometers.[35] The predominance of smaller sized particles in the impacted areas increased lung deposition fractions by 15-40%.[35]
  (The uniquely small size of particles associated with airport-origin air pollution was reconfirmed in Seattle under flight paths up to 10 miles downwind of Seatac.[23])

3. **<u>Airport-origin ultrafine particle pollution has adverse health effects, especially for vulnerable populations.</u>**

- An increased risk of pre-term birth was reported women who lived near LAX and were exposed during pregnancy to higher concentrations of ultrafine particles from aircraft.[36]

- An increased risk of malignant brain cancer residents was also found in people who lived near LAX and were exposed to higher levels ultrafine particulates from aircraft activity.[37]

- In a study of short-term effects, exposure to LAX-related ultrafine particles was associated with increased levels of IL-6 (a blood marker of inflammation) in adult asthmatics following mild walking activity.[38]

  (In study near Schiphol Airport (Amsterdam, The Netherlands), short-term exposures (five hours) to aviation-related ultrafine particles was also associated with decreased lung function in healthy young adults. [39])

  (Also, airport apron workers have also been identified as a neglected occupation setting for which health effects are not well understood.[40])

  (Studies that advance understanding of the chemical constituents and toxicity of pollutants ranging from ultrafine particles to the visible combustion or fuel residue commonly reported by near-airport residents are also critically needed.)

There is broad compelling evidence for adverse air quality and health effects in near-airport communities. But the findings from LAX and BOS underscore the importance of understanding the local impacts on air quality and health. ***The Maryland Aviation Infrastructure Impacts Commission to study the health and environmental impacts of commercial aviation*** **can provide critical guidance needed to support aviation operations while protecting the health of local communities.**

If you have any questions about this testimony, or need additional information, please do not hesitate to contact me at 617-627-3522 or via email at Neelakshi.Hudda@tufts.edu. Thank you for your consideration of this critical issue.

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