

# Cardiovascular Disease and Airport Noise Exposure Project 03

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## Linkage to AEE Roadmap

- Health Impacts of Aviation Noise
  - To investigate the risks of cardiovascular outcomes associated with noise-related exposures

## Goal of the Project

- Aims to evaluate the relationship between aircraft noise exposure and cardiovascular health by linking with existing national longitudinal health cohorts – Nurses' Health Study (NHS)/Health Professional Follow-up Study (HPFS) – for which detailed individual data and high geographical resolution are available.

# Schedule and Status



- March 2015: Obtain noise estimates
  - Received 2000, 2005, 2010, 2015 data
  - Awaiting 1995 data; resolving noise modeling-related issues
- November 2016: Link noise exposure with cohort data
  - New projected date: June 2017
- January 2017: Determine relevant cardiovascular outcomes
  - Completed
- March 2017: Determine number of participants residing near airports and develop analysis plan of noise-health
  - Determined based on 2009 noise data
  - Developed/presented/obtained approval for two analysis plans – (1) Noise-hypertension and (2) Noise-cardiovascular disease.
- March/April 2017 -Develop/select survey questions on environment, noise perception, sleep disturbance
  - In progress

# Approach and Accomplishments



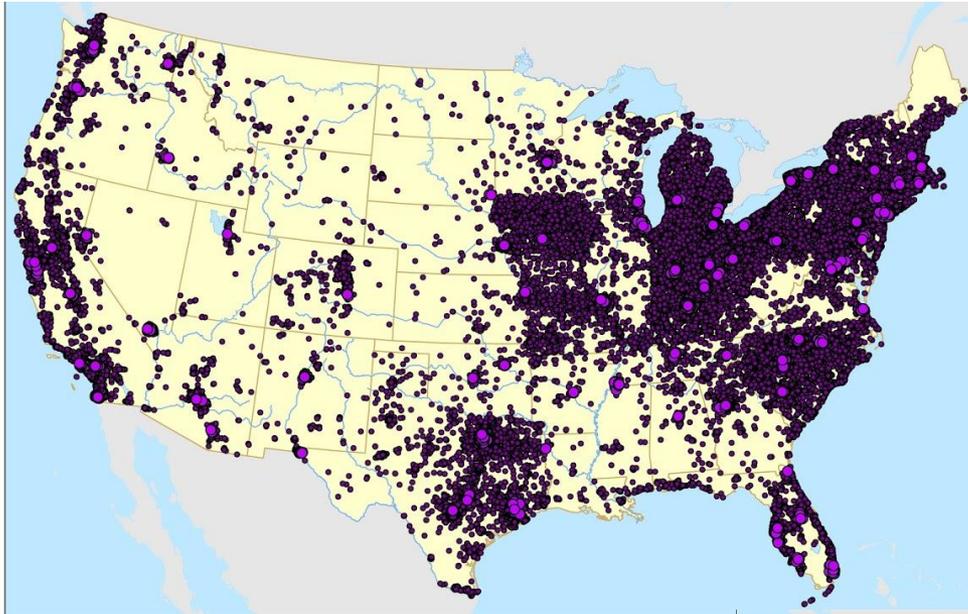
- Completed procedural steps related to accessing NHS/HPFS data for linkage with noise data
  - Obtained human subjects approvals from Boston University and Brigham & Women's (Harvard)
  - Developed/obtained approvals for noise-health analysis:
    - Relation of noise to hypertension
    - Relation of noise to cardiovascular disease (CVD)
  - Determined number of participants living near airports
  - Determined number of participants with cardiovascular outcomes
- Coordinated with FAA regarding noise data
  - Entered into a Data Use Agreement
  - Obtained and linked test noise data (2009)

# Study Population: NHS, NHSII, HPFS



- **Nurses' Health Study**
  - Began 1976, includes 121,701 women, registered nurses living in 11 populous states at enrollment
  - At noise study baseline (1995) - 96,000 alive and free of CVD
- **Nurses' Health Study II**
  - Began 1989, includes 116,430 women, registered nurses living in 14 populous states at enrollment
  - At noise study baseline (1995) - 115,000 alive and free of CVD
- **Health Professional's Follow-Up Study**
  - Began 1986, includes 51,529 men
  - Dentists, pharmacists, optometrists, osteopath physicians, podiatrists, and veterinarians throughout the US
  - At noise study baseline (1995) - 50,000 alive and free of CVD
- **Biennial follow-up with mailed questionnaires**
  - Each collects information on risk factors (e.g. diet, physical activity, smoking, hormone use) and occurrence of diseases

# Results: Participants

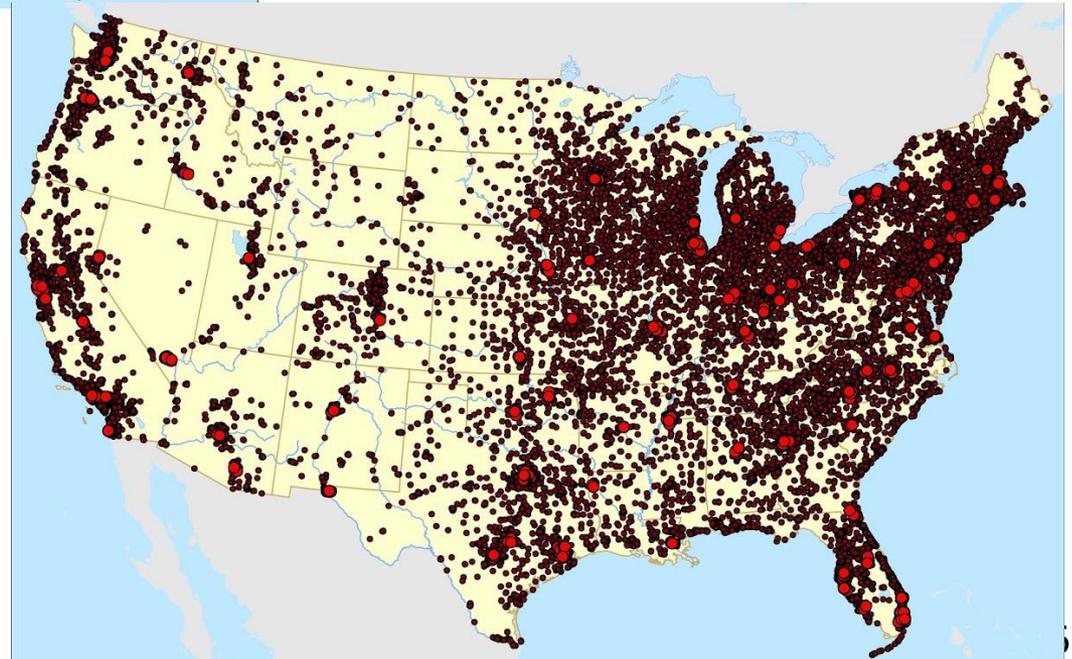


Exposed to  $\geq$  DNL 45 dB  
(2009)

← NHS: 5,666  
NHS II: 5,802

Exposed to  $\geq$  DNL 45 dB  
(2009)

→ HPFS: 2952

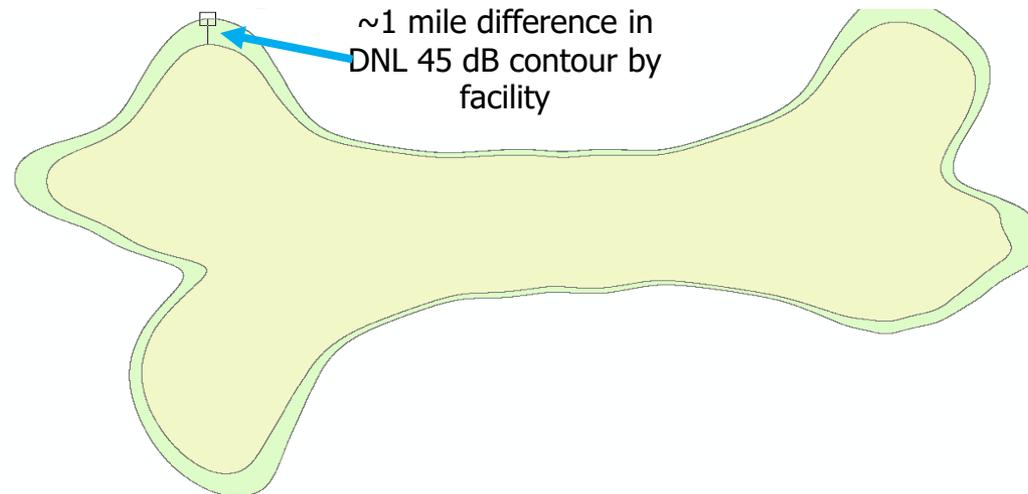


# Results: Noise Modeling

- Differences in AEDT modeling procedures by Volpe and Wyle

| AEDT Modeling Procedures with Differences                            |
|--|
| Operation Records (cut off procedures)                               |
| Meteorological Conditions (airport-specific vs. standard atmosphere) |
| Grid Size (dynamic vs. manual)                                       |
| Grid Resolution  |

- If high correlations between estimates at an address that has systematic bias - easy to address.
- Bias that differs by location - more problematic.



# Summary



- Summary statement
  - We will evaluate the health effects of aircraft noise exposure in two companion cohorts with 1) participant-level exposures, 2) systematically ascertained, physician-reviewed outcomes, and 3) individual-level risk factors.
- Next steps
  - Obtaining 1995 noise data and resolving issues related to differences in model parameters selected by Volpe vs. Wyle
  - Linking noise exposure with cohort data
  - Performing analysis to evaluate associations between noise and health
- Key challenges/barriers
  - Obtaining 1995 noise data.
  - Creating correction factor to address differences in noise modeling output by facility (Volpe vs. Wyle).

## Publications

- N/A

## Contributors

- BUSPH: Junenette Peters, Jonathan Levy
- Harvard: Francine Laden, Jamie Hart

- Babisch W, Kim R. Environmental Noise and Cardiovascular Disease. In: WHO European Centre for Environmental Health, ed. *Burden of disease from environmental noise: Quantification of healthy life years lost in Europe*. Copenhagen: World Health Organization; 2011:15-44.
- Colditz GA. Nurses' Health Study: demonstrating the impact of research, and adapting new measures and approaches to increase relevance and effect of cohort studies. *Public Health Res Pract*. 2016;26(3):e2631628.
- Colditz GA, Manson JE, Hankinson SE. The Nurses' Health Study: 20-year contribution to the understanding of health among women. *J Women's Health* 1997;6:49-62.
- Correia AW, Peters JL, Levy JI, Melly S, Dominici F. Residential exposure to aircraft noise and hospital admissions for cardiovascular diseases: multi-airport retrospective study. *BMJ*. 2013;347:f5561.
- Hansell AL, Blangiardo M, Fortunato L, et al. Aircraft noise and cardiovascular disease near Heathrow airport in London: small area study. *BMJ* 2013;347:f5432.

# Collaboration



- Between Noise PIs
  - Pennsylvania State University with NIH funding
  
- With Advisory Board
  - Wyle
  
- Other
  - Volpe Transportation Center
  - *Potential*: Project 17 (Aircraft Noise and Sleep Disturbance)