Project 03
Cardiovascular Disease & Aircraft Noise Exposure

Motivation and Objectives

Motivation

- Studying health effects of aircraft noise is important in policy models, but few U.S. studies exist.

Objectives

- Evaluate associations between aircraft noise and cardiovascular outcomes.
- Estimate population attributable risk.
- Specific: Evaluate associations between aircraft noise and risk (incidence) of hypertension.

Project Methods and Materials

- Leverage data from the Nurses' Health Studies (NHS and NHS II) and Health Professionals' Follow-up Study (HPFS) – longitudinal cohorts. Key attributes:
  - Large sample size and geographic distribution.
  - Individual data on traditional cardiovascular disease.
  - Systematically ascertained, physician-reviewed and adjudicated outcomes.
- Assign noise exposure to geocoded address over time.
  - Develop noise levels in multiple metrics, out to DNL 45 dB.
  - Calculate noise exposures at participant addresses over time.

Project Progress

- Assigned longitudinal aircraft noise exposure (DNL) to geocoded addresses.
- Performed analysis investigating DNL aircraft noise and self-report of hypertension.
- Converting additional noise metrics into useable format.

Lead investigator: J. Peters, Boston University SPH
Project managers: N. Sizov & M. Marsan, FAA

October 9-10, 2018

Results (Hypertension)

Population Characteristics

- Nurses' Health Study (NHS):
  - 121,700 married women, aged 30-55 years, for the follow-up period 1994-2007
- NHS II:
  - 116,430 women, aged 25-42 years, for the follow-up period 1995-2006

Outcome

- Self-reported hypertension (validation study showed high accuracy)

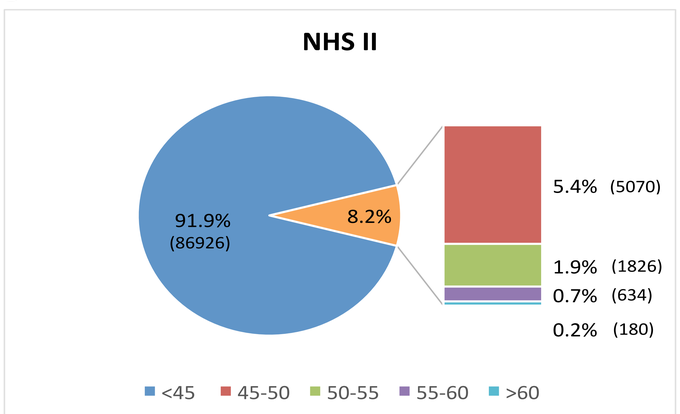
Inclusion Criteria

- No diagnosed hypertension at baseline.
- No missing noise or air pollution data.

Statistics

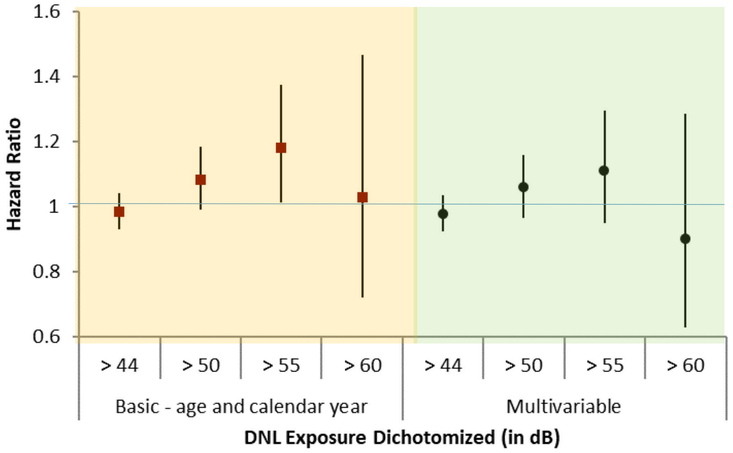
- Time-varying Cox proportional hazards model - accounts for changes in exposure (updated addresses) and risk factors over time
- Noise exposure levels were categorized (DNL >44, >50, >55, and >60 dB)
- Adjusted for:
  - Medication use, race, region, smoking history, area-level income, area-level housing value, air pollution, BMI, alcohol consumption, diet, menopausal status, family history of hypertension, physical activity, latitude, diabetes status

Figure 1. DNL distribution at baseline for NHS II



Results (cont.)

*Figure 2. Basic & all-variable hazard ratios (95% confidence intervals) for **categorized** DNL at 4 cut-points and incident hypertension for NHS II*



- Similar results were observed for NHS.

Conclusions

Discussion

- Incidence of hypertension increased with increased DNL, but statistically non-significant.
- Very few nurses exposed to >65 db; 0.1% and 0.2% exposed to >60 dB in NHS and NHS II, respectively.

Next Steps

- Test associations of incident hypertension with L_{eq}-day and L_{eq}-night
- Perform analysis in male cohort (HPFS)
- Perform meta-analysis with the three cohorts (NHS, NHS II and HPFS)

Key Barrier (Project)

- Converting noise data into useable formats

This work was funded by the US Federal Aviation Administration (FAA) Office of Environment and Energy as a part of ASCENT Project 3 under FAA Award Number: 13-C-AJFE-BU. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the FAA or other ASCENT Sponsors.