

15<sup>th</sup> March 2024

RE: YSE EJ Health Fellowship Progress Report

Dear YSE EJ Health Fellowship Committee,

Below is final report for the research titled: Residential Energy Efficiency Effects on Philadelphian Indoor Rodent Exposure. The research aimed to advance the cause of distributive energy justice in Philadelphia by examining how disparities of those who live in extreme energy inefficient housing are at increased risk of contracting life-threatening pathogens and developing chronic pulmonary diseases. Notably the project aims had to shift as entering homes proved to be difficult. After reassessing the scope of the project, we **1) modeled neighborhood energy efficiency effect on outdoor rodents and 2) collected rodents' occurrence and pathogens data as it relates to neighborhood energy burden.**

The primary research conducted in 2022-2024:

1. Creating an agent-based model ABM to showcase how energy retrofitting homes would reduce rodent populations.
2. Complete the submission of the ABM to the journal Environmental Research Letters.
3. Complete empirical data collection within neighborhoods (i.e., trapping small mammal).
4. Necropsying rodents for their tissue to conduct molecular analysis.

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Our model showed each increase in the number of efficient homes at the start of the model, which mimics a single large retrofitting strategy, equated to a proportional reduction in rodent populations ( $p < 0.001$ ), a trend that persisted in each neighborhood. The duration of retrofitting also impacted rodent populations with increased duration leading to smaller rodent populations ( $p < 0.001$ ). Duration affected rodent populations persisted across neighborhoods. Supplementary results show how rodent populations change specifically from year to year. As expected, our third hypothesis, which involved active retrofitting or conventional single-home energy efficiency, demonstrated a significant reduction in the rodent population. However, this effect was observed only in the neighborhoods of Olney and Cobbs Creek, which are notably smaller with less greenspace than the Chestnut Hill neighborhood.

During empirical data collection we were able to amass 52 scat samples and 13 small mammal specimens. We also collected local data on litter levels. We plan to return in 2024 for more whole specimen collection. We are currently processing the samples from 2023 for pathogen DNA and RNA.

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Moving forward, our goals for the phase of the project are as follows:

1. Finish analyzing the empirical data for disease abundance and prevalence.
2. Write and submit the article to a Q1 journal.
3. Continue empirical data collection.
4. Share our finished projects with community partners.
5. Plan a predictive model to broadcast what likely abundance of small rodents are across Philadelphia using our empirical data.

We thank the YSE EJ Health Fellowship for the funds to conduct our research and look forward to sharing the results of our scoping trip and the next steps. Please let our team know if the committee has any follow-up questions or if additional clarification is needed.

Sincerely,

Gabriel I. Gadsden