

Investigating Unsafe Housing as a Factor that May Dispose Women to Preterm Birth

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SUMR Scholars Symposium

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Presentation Goals

- ▶ Investigate how environmental factors (e.g., housing quality and income) are related to pregnancy outcomes (specifically preterm birth)
- ▶ Discuss how the quality of housing may contribute different information than simply income alone in affecting the possibility of preterm birth as a pregnancy outcome
- ▶ Visualize the distribution of income, unsafe housing and preterm birth in the Philadelphia area
- ▶ Share my reflections

Project Overview

- ▶ The purpose of the project was to understand the relationship between the condition of the housing occupied by the mother and pregnancy-related conditions and complications
- ▶ We investigated the proximity between unsafe housing and location of women with adverse pregnancy outcomes (preterm birth)
- ▶ The project focused specifically on housing and preterm birth, as a developmental end point

What is Preterm Birth?

Preterm Birth

Your Baby Grows Throughout Your Entire Pregnancy

You may feel ready to meet your baby, but your baby may not be ready to meet the world.

Important developments happen throughout pregnancy, including in the final months and weeks.



**35 weeks
Pregnant**
It's too early...

Your baby's brain needs more time to grow and develop.

Preterm Birth



**37 weeks
Pregnant**
Almost there...

Your baby's brain, lungs, and liver are still developing.

"Term" Birth



**39 weeks
Pregnant**
You made it!

If you have a healthy pregnancy, wait at least 39 weeks until delivery. Let your baby come naturally, on his or her own time.

Preterm Birth

ships

PRETERM BIRTH

A baby is born preterm, when it is born **before 37 weeks of gestation.**

DEPENDING ON THE LENGTH OF PREGNANCY, IT IS DIFFERENTIATED:

- extremely preterm:** less than 28 weeks of pregnancy
- very preterm:** 28 to 31 weeks of pregnancy
- Moderate to late preterm baby:** 32 -37 weeks of pregnancy

40 WEEKS

1 baby in 10 is affected by preterm birth

Prematurity can affect health throughout the whole life

REGULAR FOLLOW-UP ASSESSMENTS ARE IMPORTANT

PREMATURITY is the main cause of death under 5 years

Babies born preterm face higher risks of poorer long-term neurodevelopmental outcomes
e.g. cerebral palsy, visual and hearing impairments and mortality

THE EARLIER a baby is born **THE HIGHER** is the risk for poorer long-term outcomes

not every preterm born baby has a poor long-term outcome

This project has received funding from the European Union's horizon 2020 research and innovation programme under grant agreement number 633724. Editing and design: **EFCUNI**

March of Dimes Uses a 5-Grade Scoring System for Preterm Birth

		Grade	Preterm birth rate range Scoring criteria
Best	A	Preterm birth rate less than or equal to 8.1% Score less than or equal to 0.0	
	B	Preterm birth rate of 8.2% to 9.2% Score greater than 0.0, but less than or equal to 1.0	
	C	Preterm birth rate of 9.3% to 10.3% Score greater than 1.0, but less than or equal to 2.0	
	D	Preterm birth rate of 10.4% to 11.4% Score greater than 2.0, but less than or equal to 3.0	
Worst	F	Preterm birth rate greater than or equal to 11.5% Score greater than 3.0	

Preterm Birth Varies Across the US

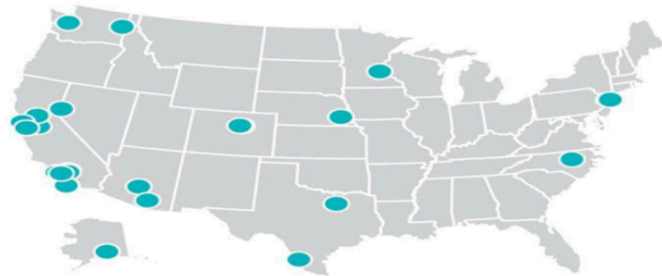
Preterm birth rates in 100 U.S. cities

For the first time, March of Dimes ranked 100 U.S. cities by the frequency of preterm birth for mothers who live there. Officials say knowing the local rates helps doctors find solutions for women and babies in their areas.

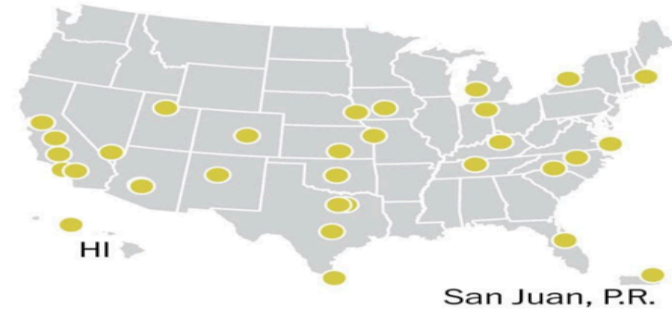
● **A:** four cities with a preterm birth rate of 8.1% or less



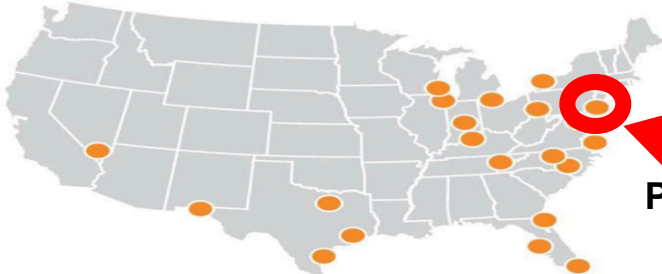
● **B:** 26 cities, 8.2 to 9.2%



● **C:** 32 cities, 9.3 to 10.3%

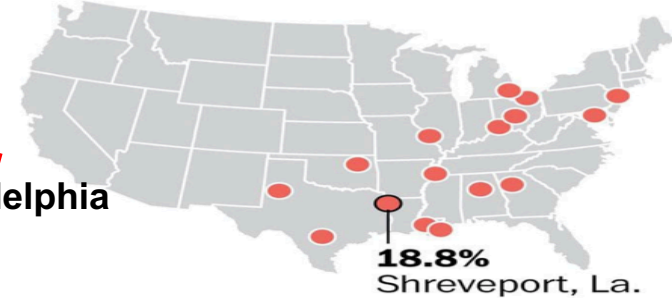


● **D:** 21 cities, 10.4 to 11.4%



Philadelphia

● **F:** 17 cities, 11.5% or greater

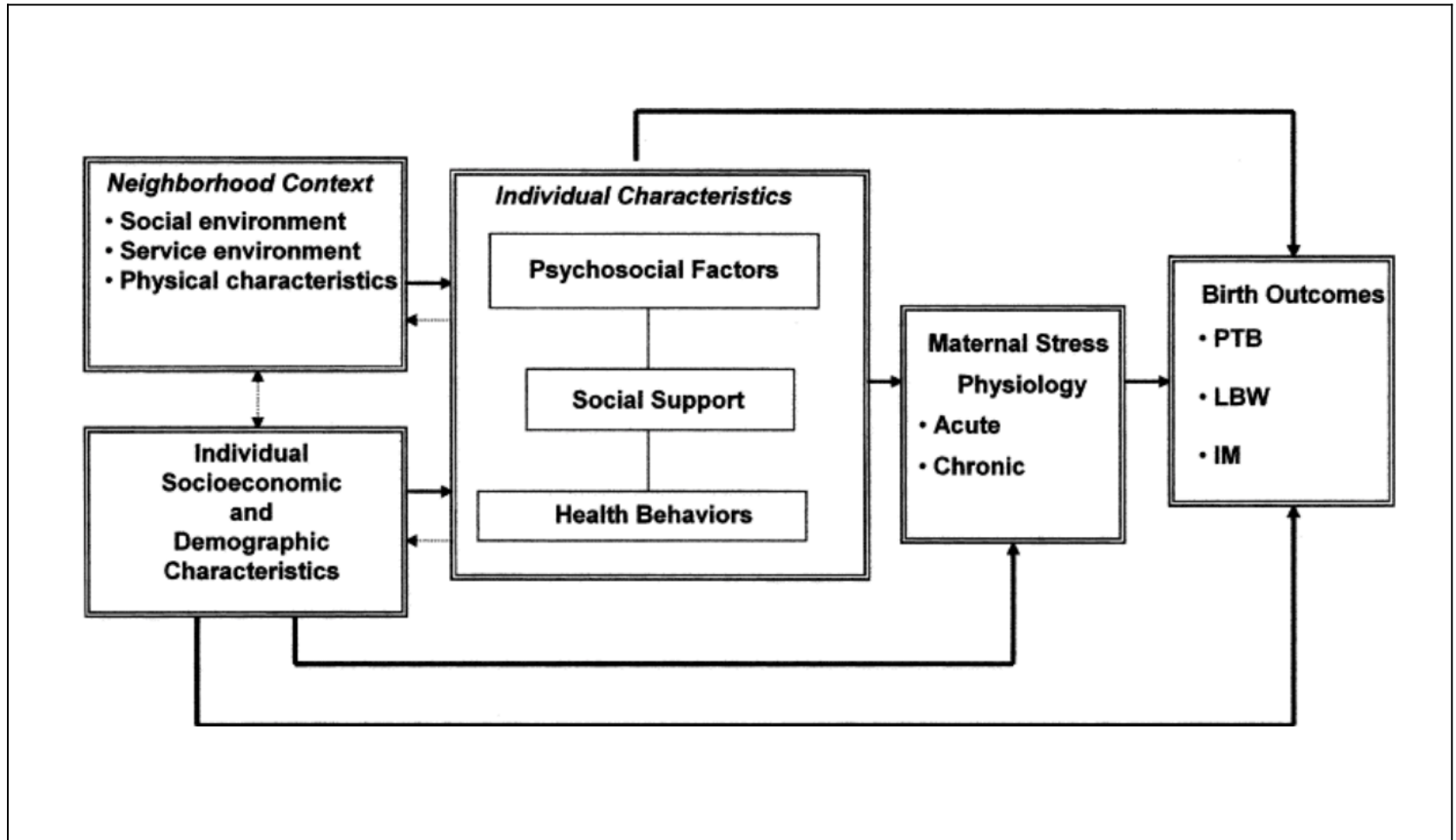


Preterm is less than 37 weeks gestation.

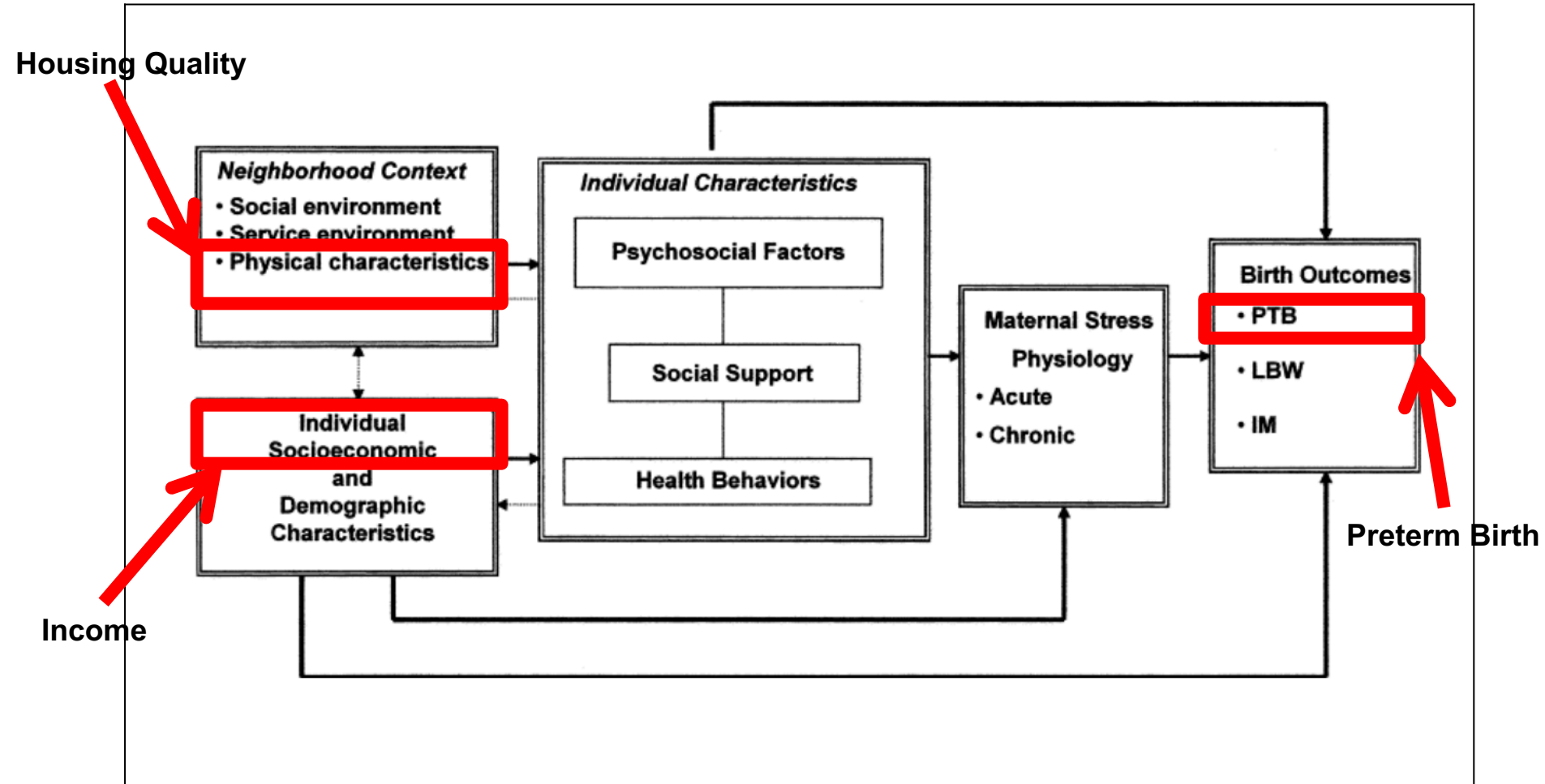
Source: National Center for Health Statistics and March of Dimes

THE WASHINGTON POST

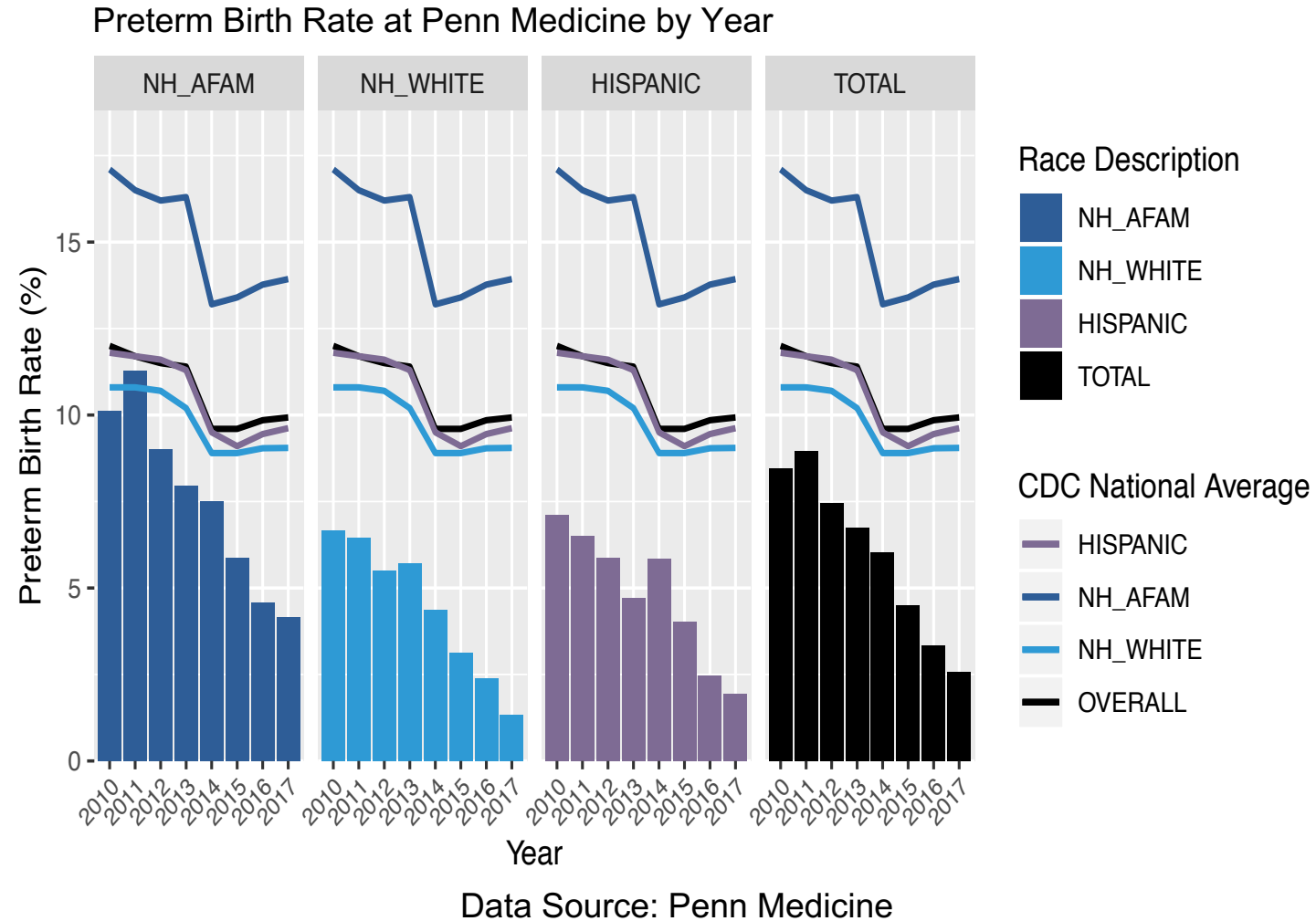
Birth Outcomes and the Environment



This Study Only Focuses on a Subset

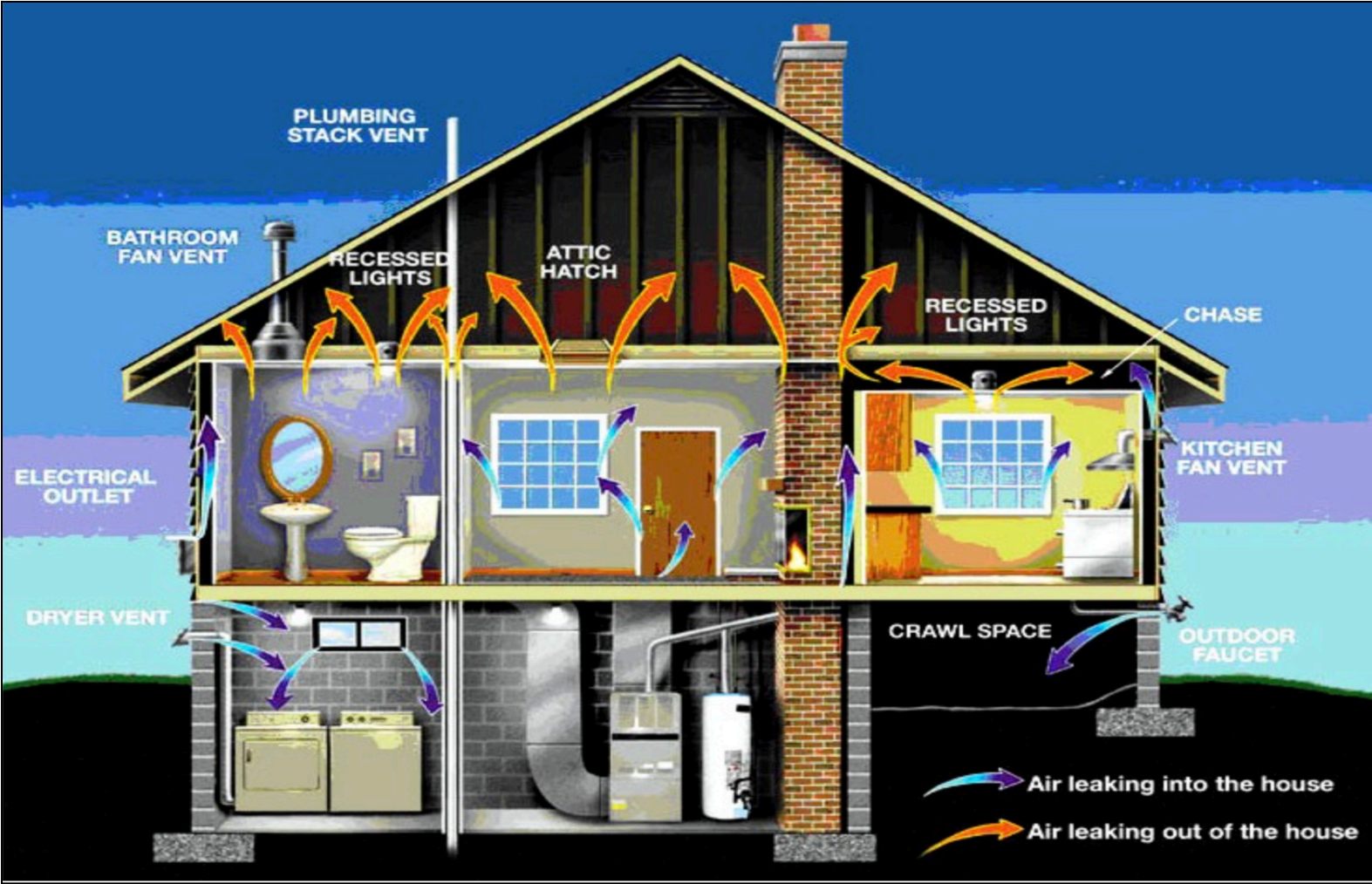


Preterm Birth Rates are Going Down Over Time



Our project seeks to understand if the condition of housing has any impact on a woman's risk of preterm birth

Unsafe Housing

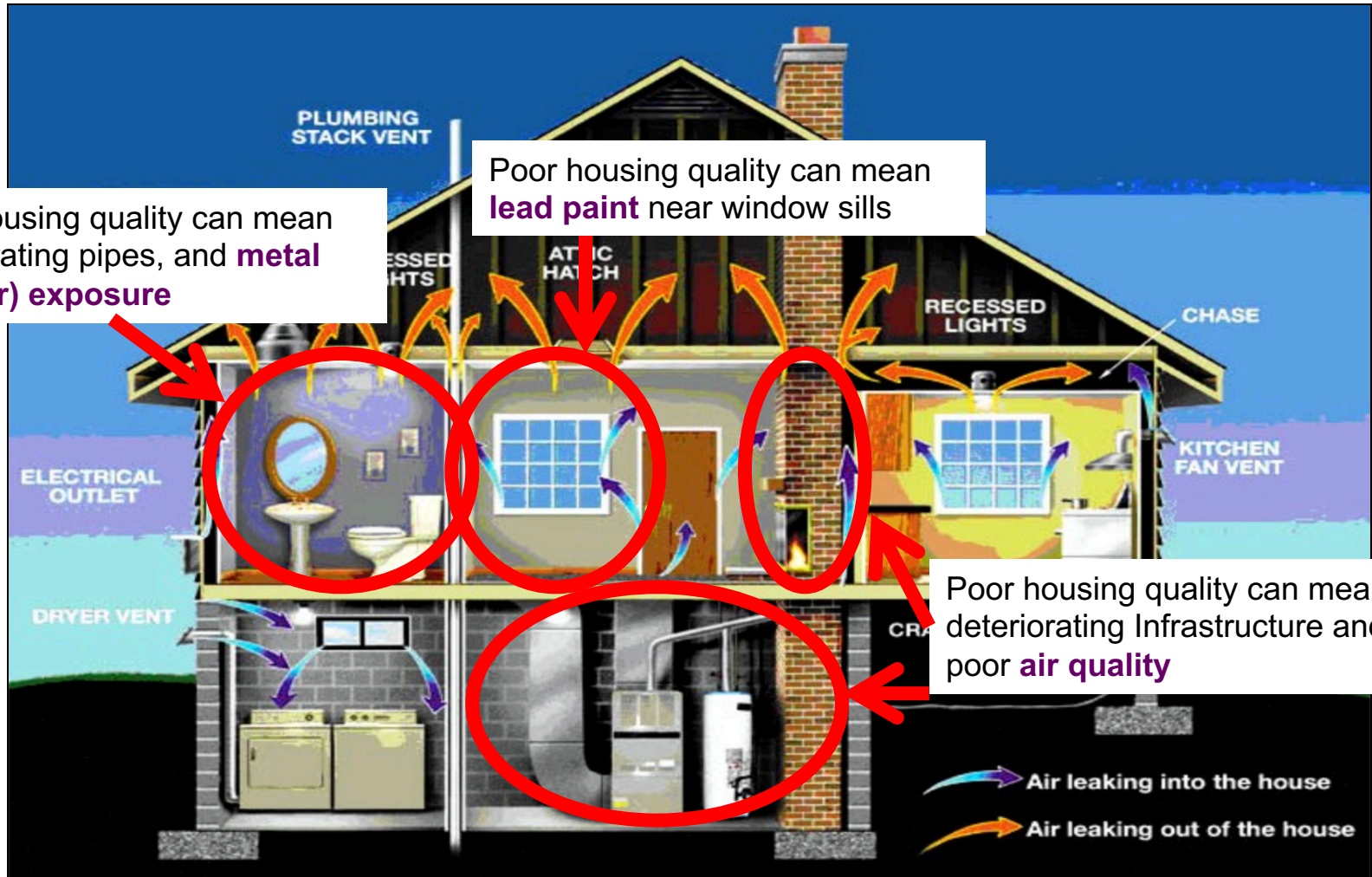


Unsafe Housing can Result in Different Exposures

Poor housing quality can mean deteriorating pipes, and **metal (copper) exposure**

Poor housing quality can mean **lead paint** near window sills

Poor housing quality can mean deteriorating Infrastructure and poor **air quality**



Prevent Lead Poisoning. Start Now.

Lead poisoning is caused by breathing or swallowing lead. Lead can pass from a mother to her unborn baby.

Too much lead in your body can:

- Put you at risk of miscarriage
- Cause your baby to be born too early or too small
- Hurt your baby's brain, kidneys, and nervous system
- Cause your child to have learning or behavior problems

Lead can be found in:

- Paint and dust in older homes, especially dust from renovation or repairs
- Candy, make up, glazed pots, and folk medicine made in other countries
- Work like auto refinishing, construction, and plumbing
- Soil and tap water

Contact your local health department to learn more.



Are You Pregnant?

Prevent Lead Poisoning. Start Now.

Lead poisoning is caused by breathing or swallowing lead. Lead can pass from a mother to her unborn baby.

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Preterm Birth



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Unsafe Housing



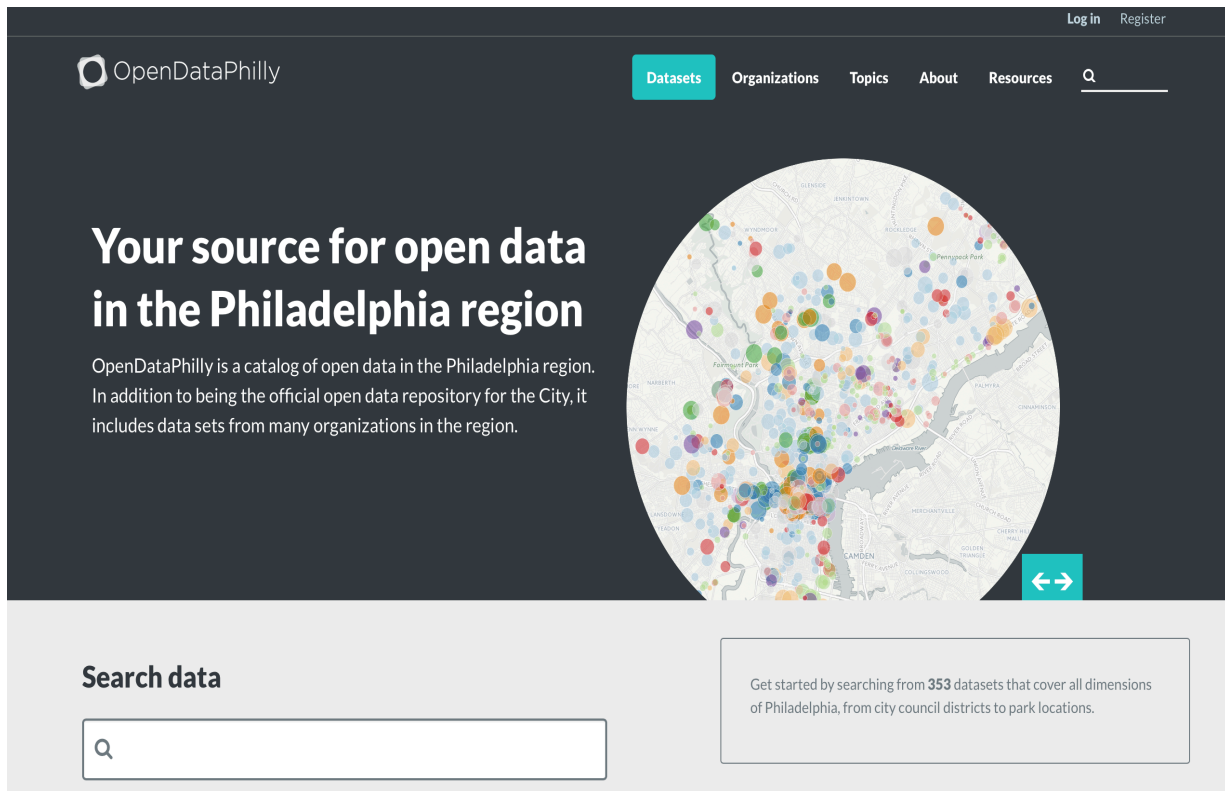
Contact your local health department to learn more.



How did we investigate this proximity
in location?
(Unsafe housing and preterm birth)

Methods

1. We only used data from Philadelphia, Penn Medicine
2. We incorporated data on housing quality from the Licenses and Inspections Code Violations dataset obtained from OpenDataPhilly



The screenshot shows the OpenDataPhilly website homepage. At the top right, there are links for "Log in" and "Register". The navigation menu includes "Datasets" (highlighted in teal), "Organizations", "Topics", "About", and "Resources", followed by a search icon and a search bar. The main content area features the OpenDataPhilly logo and the headline "Your source for open data in the Philadelphia region". Below the headline is a paragraph: "OpenDataPhilly is a catalog of open data in the Philadelphia region. In addition to being the official open data repository for the City, it includes data sets from many organizations in the region." To the right of this text is a circular map of Philadelphia with numerous colorful dots representing data points. A teal button with a double-headed arrow is positioned below the map. At the bottom left, there is a "Search data" section with a search input field containing a magnifying glass icon. At the bottom right, a text box states: "Get started by searching from 353 datasets that cover all dimensions of Philadelphia, from city council districts to park locations."

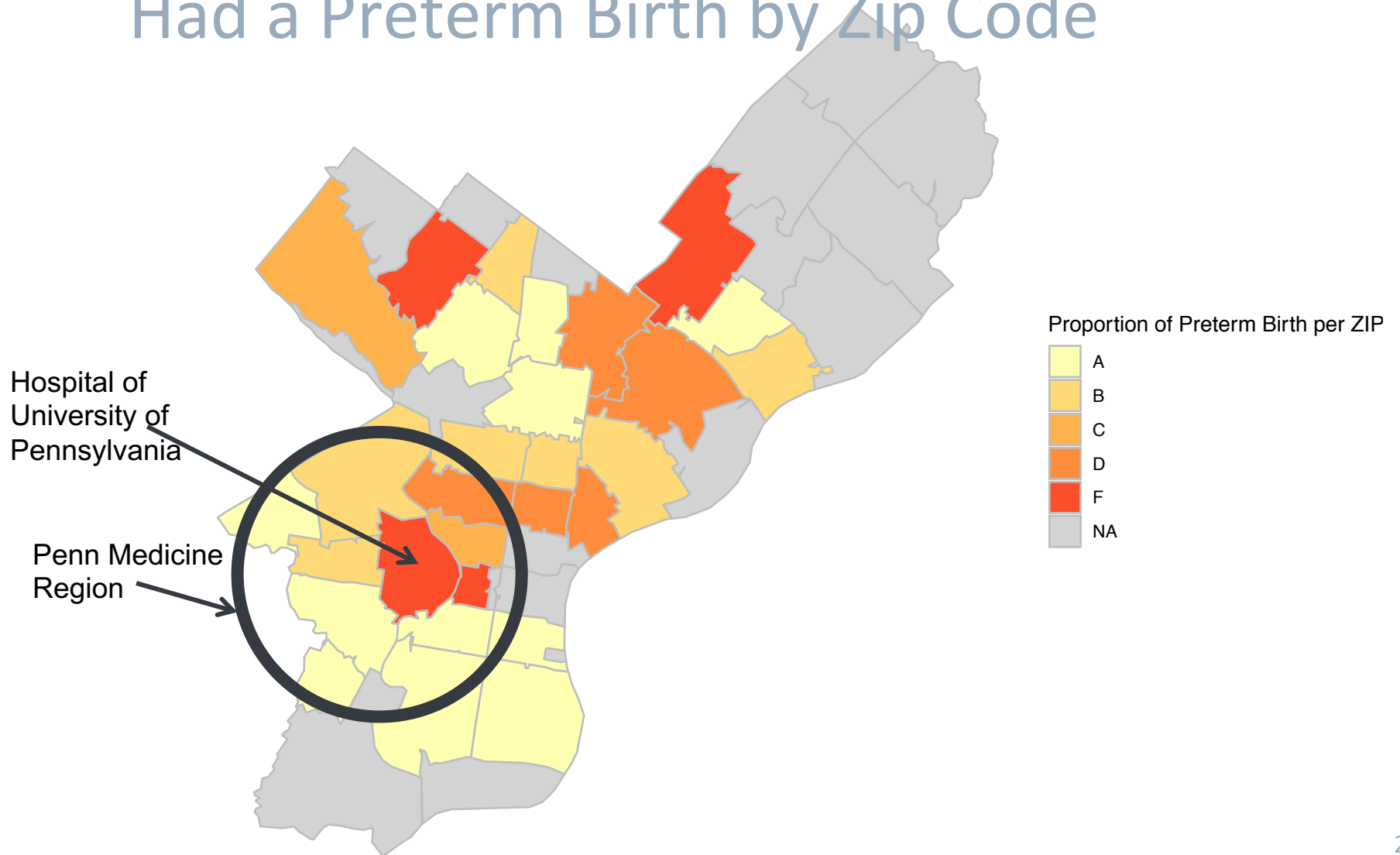
Methods Cont.

3. We also gathered data on income from unitedstateszipcodes.org
4. We investigated the correlation between preterm birth rates and income, and also imminently dangerous housing violations and unsafe housing violations.
5. We used the software language R to visualize communities and regions within the Philadelphia Area at risk for preterm birth and assessed statistical significance.

Results

- ▶ Our dataset contained 42,390 pregnancies where the mother lived in a Philadelphia zip code having a population greater than 20,000 individuals
- ▶ 3,861 pregnancies corresponded to mothers having had a preterm birth
- ▶ 10,909 pregnancies (25.73%) where the mothers lived in a zip code having a median income less than \$25,000

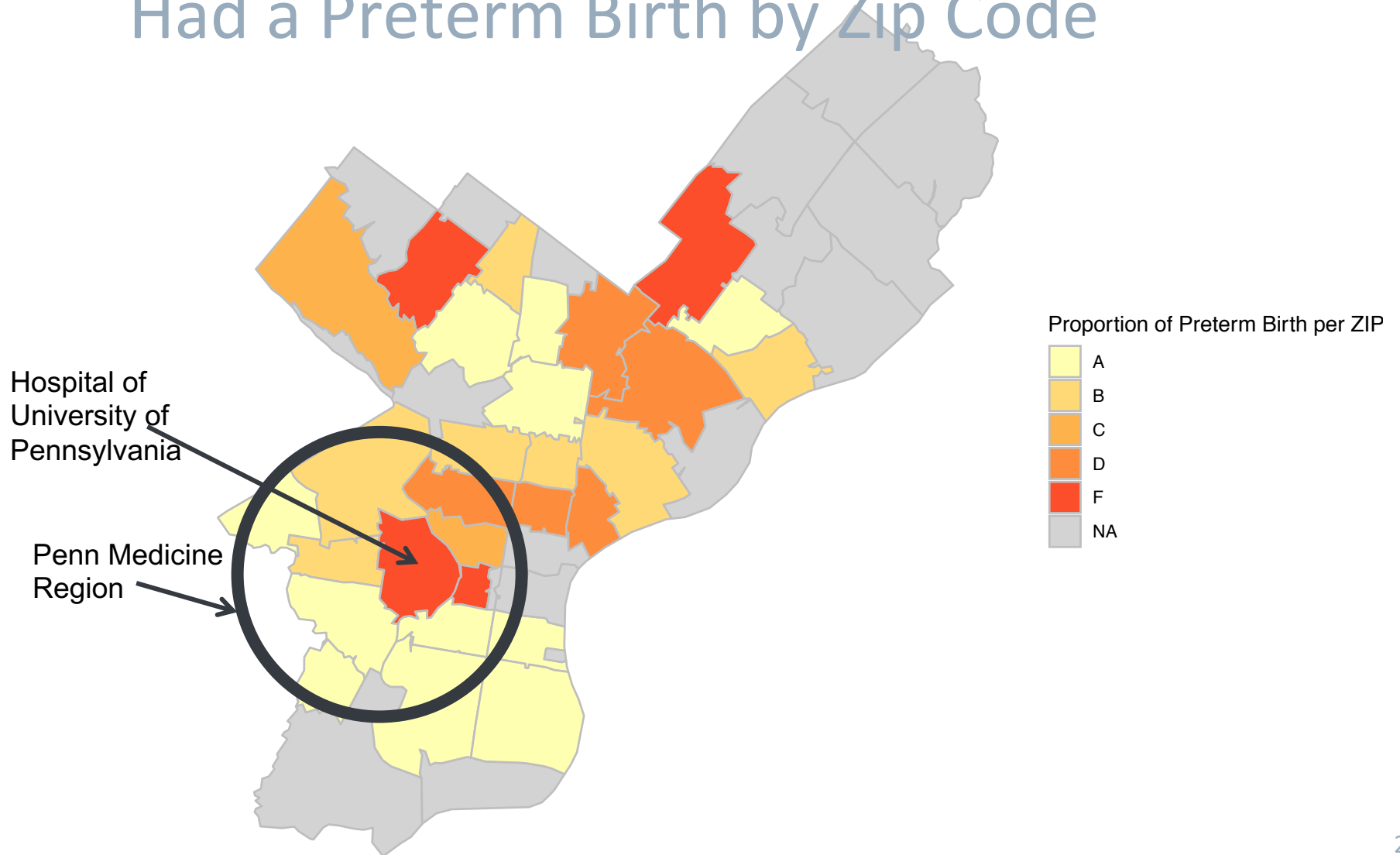
Results – Density of Women Having Had a Preterm Birth by Zip Code



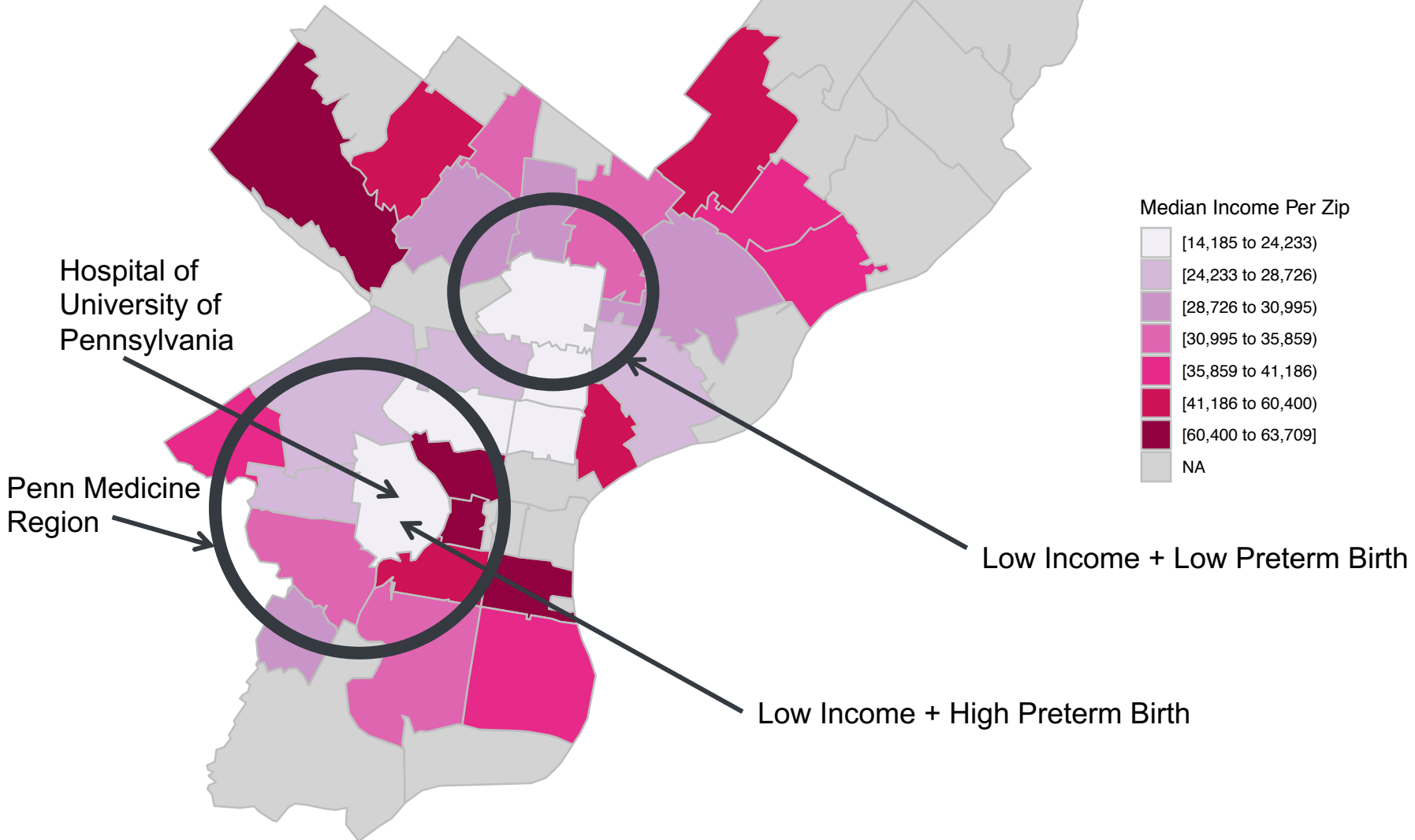
March of Dimes Uses a 5-Grade Scoring System for Preterm Birth

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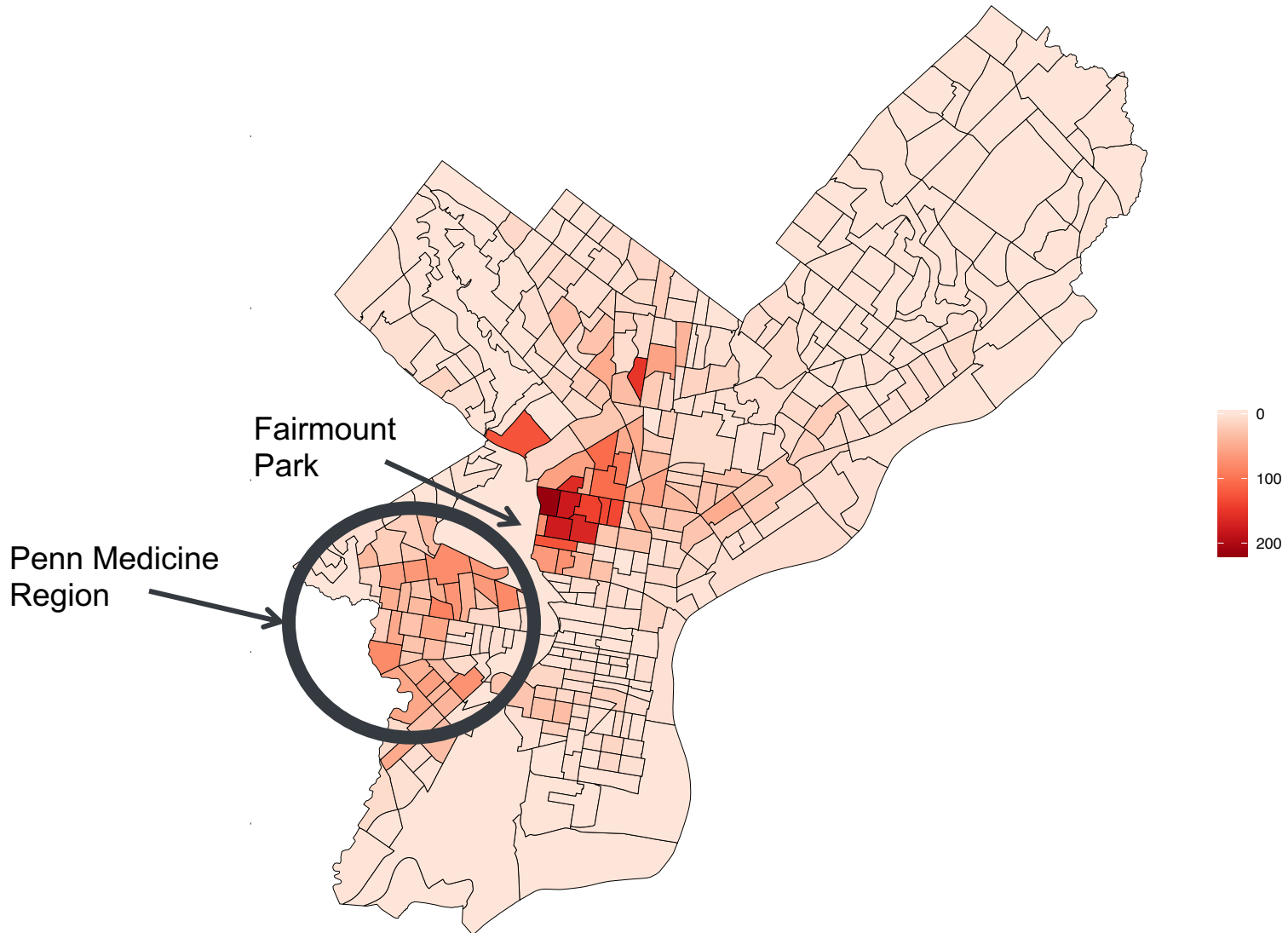
Results – Density of Women Having Had a Preterm Birth by Zip Code



Median Income in Philadelphia by Zip



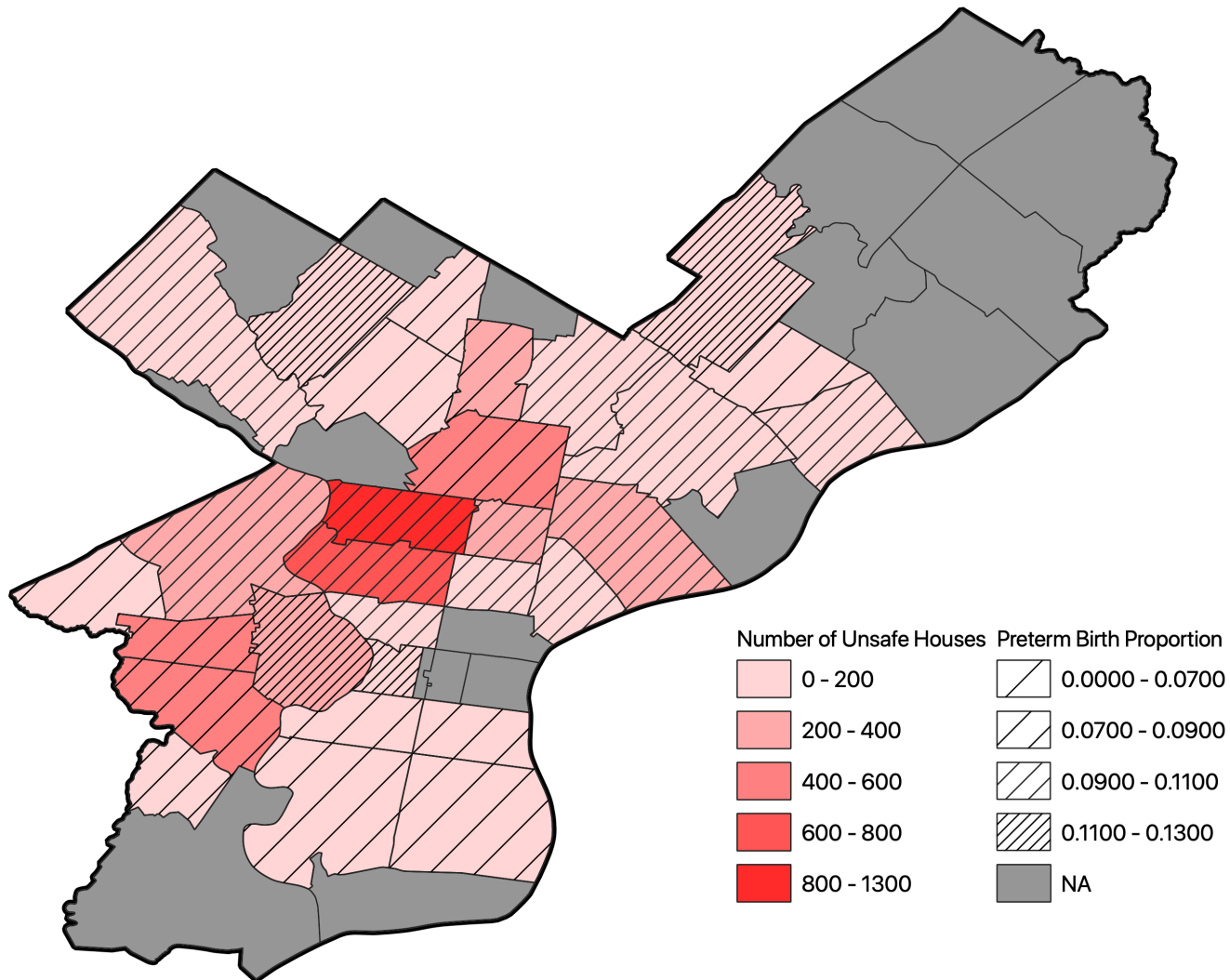
Results: Density of Unsafe Housing in Philadelphia by Census Tracts



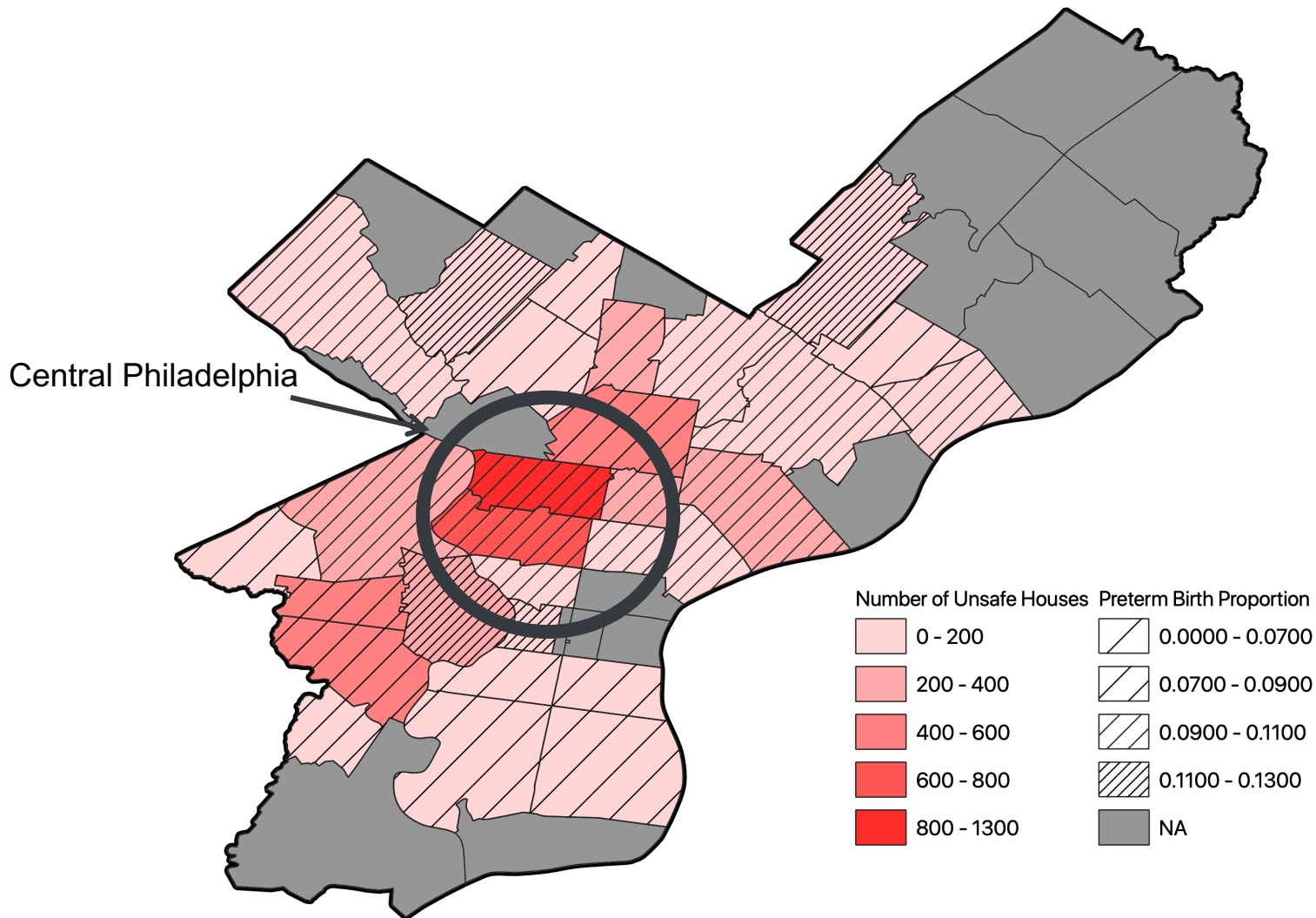
Findings

- ▶ Our results revealed that income was not correlated with preterm birth rate in Philadelphia ($p=0.787$, $r=0.053$)
- ▶ Preterm birth rate was correlated with unsafe housing ($p=0.039$, $r=0.415$) and marginally associated with imminently dangerous housing ($p=0.055$, $r=0.388$)
- ▶ Unsafe housing was most important in preterm birth in our model

Results – Association between Preterm Birth and Unsafe Housing



Results – Association between Preterm Birth and Unsafe Housing



Own Role

- ▷ Learn R Statistical Software
- ▷ Visualize the Philadelphia Communities with Different Housing Conditions
- ▷ Correlate Housing Conditions with Preterm Birth, and also Investigate Income Effects
- ▷ Visualize the Results

Reflections

- ▷ Importance of linking the broad social and economic contexts in future studies of reproductive health outcomes.
- ▷ Collaborative effort
- ▷ Learning experience
- ▷ Hawaii 😊

Acknowledgements

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- ▷ Leonard Davis Institute



Questions?