Gunshots & Community Health: Investigating ED visits as a proxy of neighborhood stress

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Presentation Outline

1. Background
2. Project Aims
3. Methods
4. Results
5. Future Analysis
6. Lessons Learned
1. Background
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Your ZIP code may impact your health more than your genetic code
Stress

Behavior

HEALTH

Source: Diez Roux, 2010, AJPH
Physical Neighborhood Environment:
- Housing

Social Neighborhood Environment:
- Safety/Violence

Stress

Behavior

HEALTH

Source: Diez Roux, 2010, AJPH
Residential Segregation

Resource Distribution Inequalities

Physical Neighborhood Environment:
- Housing

Social Neighborhood Environment:
- Safety/Violence

Stress

Behavior

Health

Source: Diez Roux, 2010, AJPH
Philadelphia, 1936: Redlining
Residential Segregation

Resource Distribution Inequalities

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HEALTH

Source: Diez Roux, 2010, AJPH
Causal link between social neighborhood environment, specifically violence → health
Causal link between social neighborhood environment $\rightarrow$ health

- Biological embedding: depression, heart disease, substance abuse all have social determinants in early life (Hertzman 2010)
Causal link between social neighborhood environment → health

● Biological embedding: depression, heart disease, substance abuse all have social determinants in early life (Hertzman 2010)

● Risk for poor self-rated health was 4.6 times greater among subjects who reported ≥5 forms of cumulative exposure to violence (Boynton Jarrett 2008, Pediatrics)
Causal link between social neighborhood environment → health

- Biological embedding: depression, heart disease, substance abuse all have social determinants in early life (Hertzman 2010)

- Risk for poor self-rated health was 4.6 times greater among subjects who reported ≥5 forms of cumulative exposure to violence (Boynton Jarrett 2008, Pediatrics)

- Significant associations between children’s exposure to violence in urban communities, posttraumatic stress, and maladaptive behavior
African American youth from economically-disadvantaged communities experience exposure to community violence at proportionately higher levels than other youth.

In addition to the absence of primary care, non-urgent use of the ER is linked to need factors arising from socioeconomic stress, psychiatric co-morbidities, and a lack of social support (Padgett 1992).

Violence-exposed participants also had 1.71 (95% CI, 1.14-2.56) times more overall ED visits per month and 1.72 (95% CI, 0.95-3.11) times more overall hospitalizations per month from any cause (Apter 2010).

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- In addition to the absence of primary care, non-urgent use of the ED is linked to factors arising from socioeconomic stress, psychiatric co-morbidities, and a lack of social support (Padgett 1992)
  - Low-resource communities use the ED as primary point of access to healthcare
Who visits the ED?

- In addition to the absence of primary care, non-urgent use of the ED is linked to factors arising from socioeconomic stress, psychiatric co-morbidities, and a lack of social support (Padgett 1992)
  - Low-resource communities use the ED as primary point of access to healthcare
- Those exposed to violence may visit the ED more
Exposure to community violence is associated with ED visits

Exposure to community violence is associated w/ ED visits

- Adults with moderate-severe asthma, recruited from clinics serving inner-city neighborhoods, completed questionnaires covering socio-demographics, asthma severity, and ECV and were followed for 26 weeks. Longitudinal models were employed to assess unadjusted and adjusted associations of subsequent asthma outcomes (emergency department (ED) visits, hospitalizations, FEV1, quality of life).

Exposure to community violence is associated with ED visits

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Central Questions

Do neighborhood shootings impact the health of the nearby community?
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Do shootings lead to an increase in ED visits for the people living nearby?
Project Aims

Primary Objective: Determining whether or not there is a relationship between gun violence and ED visits, using EHR data from two University of Pennsylvania Health System hospitals and shooting data from the Philadelphia Police Dept.

Secondary Objective: Understanding the specific symptoms and discharge diagnoses of people who visit the ED after an occurrence of gun violence in their neighborhood in order to assess possible patterns.
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Methods

Geographic and statistical methods can assist in the definition, construction, and selection of neighborhoods

- Obtaining EHR data
- Obtaining PPD data
- Using Excel, ArcGIS for analysis
Table of Contents
(from PennPointPlus server “GinaNikhil” in HUP Emergency Medicine)

1. Electronic Health Record Data Folders:
   a. “Original HUP,PPMC Files”
      i. EMTRAC_HUP_2013 : 39,110 entries
      ii. EMTRAC_HUP_2014 : 38,078
      iii. EMTRAC_PPMC_2013 : 38,081
      iv. EMTRAC_PPMC_2014 : 39,109
   b. “CLEANING”
      v. EMTRAC_HUP_2013_CLEANED : 39,110
      vi. EMTRAC_HUP_2014_CLEANED : 38,078
      vii. EMTRAC_PPMC_2013_CLEANED : 38,081
      viii. EMTRAC_PPMC_2014_CLEANED : 39,109
   c. “HUP+PPMC COMBINED”
      ix. EMTRAC_HUP_PPMC_COMBINED : 154,378
      x. EMTRAC_COMBINED_WESTPHILLY_ONLY : 88,799
      xi. EMTRAC_COMBINED_WESTPHILLY_ONLY_UNMATCHED : 8,116

2. West & Southwest Philadelphia Shooting Data Folders:
   d. “Shooting Data”
      xii. Police_Involved_2013-2014 : 70
      xiii. Shooting data 2013_2014 : 2,175

3. ArcGIS Layered Analysis Folders:
   e. “ArcGIS Analysis Files”
      xiv. Gunshots_ED
      xv. Data.gdb
      xvi. Geocoder
      xvii. Philadelphia Basemap
Data Source

- HUP, Presby
- PPD & phillypolice.com

Files Acquired

- Electronic Health Records, 2013-2014 (CSV)
- Gunshot occurrences, b/w civilians, 2013-2014 (CSV)

Processing Steps

- Combined files in Excel, selected for addresses & zip codes in West and Southwest Philly
- Created a basemap layer in ArcMap, displaying ED patient origin addresses & shooting locations
- Filter ED layer based on date, symptoms presented after a gunshot occurrence
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Future Analysis Directions

- Filtering EHR data by date & time of ED visit, in order to understand the direct pattern between gunshots on a block and the consequent ED visits from that block.
- Understanding limitations: differences between a 'chronic' block (a block that has witnessed gunshots fairly frequently for a long period of time) vs. a 'newer' block.
- Variability: how long does it take for a community to 'react'? Types of shootings? (gang-related, accidents, police-involved, etc)
- Would a block trust the healthcare system in place more or less following an act of violence?
- Beyond: mechanistic, qualitative-based study in the field.
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2. How to use quantitative methods to understand social determinants of health (in this case, violence → neighborhood stress)
3. The daily workings of being a physician-researcher
4. Shadowing Dr. South in the ED
5. Being part of a team and getting to know the research team over at Blockley
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