Ethnic Differences of Lead Poisoning Rates in Chicago: A Community Comparison

Dimka Aleksandrova
Geography Department, Binghamton University

BINGHAMTON UNIVERSITY
STATE UNIVERSITY OF NEW YORK

Introduction

Lead Toxicity

- A preventable health hazard caused by exposure to environmental lead from outside and inside sources
- Increased blood lead levels are 10 µg/dL and above
- Implications include impaired growth, lower IQ, nervous system and kidney damage, decrease muscle and bone growth

Purposes

- Examine the health effects of lead poisoning in children and the legal implications aspects of lead poisoning legislation
- Review the evolution of Chicago communities in terms of urbanization, industrialization, and related environmental and socio – demographic health risks
- Examine the pediatric health geographies of four community areas in Chicago:
  - two at high risk of lead poisoning
  - two at low risk of lead poisoning
- Evaluate the geographic access to health care facilities that meet the needs of the at risk children residing in these communities

Literature Review

Anderson et. al, 1996

- Lead has the ability to replace some of the important metals the human body needs -Calcium, Iron, Zinc

Margai, 2009

- The lead poisoning acceptable levels also decreased throughout the years from 60 µg/dL in 1960's, 40 µg/dL in 1971, 30 µg/dL in 1978, 25 µg/dL in 1985, to 10 µg/dL in 1991

Margai & Henry, 2003

- Children between infancy to the age of 6 have a higher chance of health damage

Hypotheses

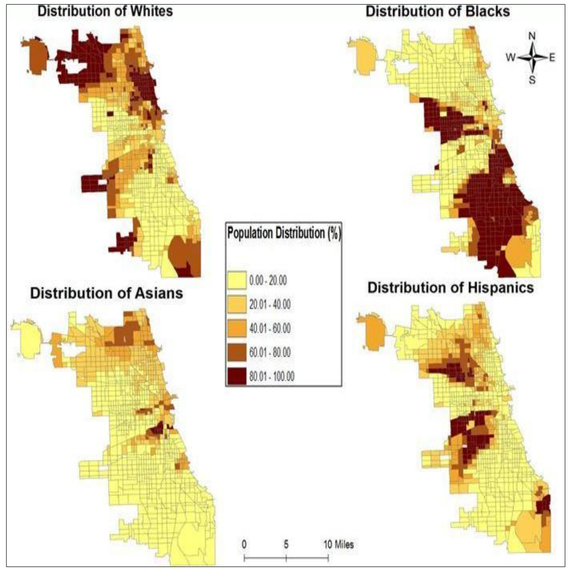
Ho_1: The lead poisoning rates for Chicago are not significantly higher than the national rates.*

Ho_2: The lead levels observed of 0.5 miles near the medical facilities are consistent with the rest of the city. *

Ho_3: The lead levels observed of 0.5 miles near the industrial areas are consistent with the rest of the city. *

*The alternative hypothesis for each null hypothesis will include that there is a difference.

Study Area – Chicago

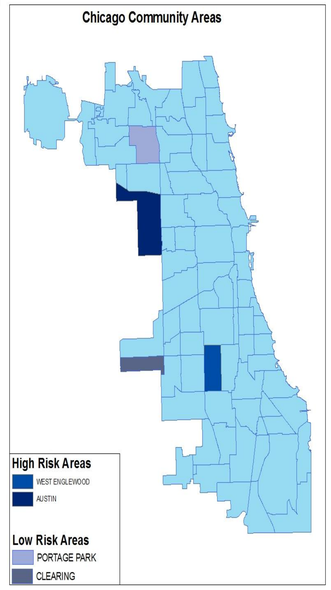


Population Distribution, Chicago 2005 - 2009

Total population of 2 896 016

-White 38.2 percent
- Black 35.6 percent
- Hispanic 26 percent

* *The city is considered to be the second largest in African American population and third in Hispanic*



Data

Demographic/Socioeconomic for Chicago

- American Community Survey 2005-2009, 5 year estimate
- Chicago Metropolitan Agency

Median Household Income and House Value

- Chicago Housing Community and Development

Lead Poisoning Distribution and Shapefiles

- Department of Public Health of City of Chicago

*All variables observed were examined based on census tracts.

Methods

GIS/Statistics

- Choropleth and gradual symbol mapping
- Buffer of 0.5 miles
- Geocoding
- One sample T-test

Field Work

- Trip to Chicago to examine the neighborhoods and housing conditions of four community areas
  - West Englewood
  - Austin
  - Portage Park
  - Clearing

Results

Variable	Number (N) Total tested	Percentage (%) Total Tested	Percent of Elevated Blood Lead Levels of 10 µg/dL or Greater (%)
Total Number of blood Lead tests	105382		2.5
Age (years)			
Younger ≤ 1	36 763	35	0.75
2	17 087	16	0.56
3	17 059	16	0.46
4	17 229	16	0.37
5	12 334	12	0.22
6	4 910	5	0.07
Blood Specimen Type			
Capillary	23 194	22	1.17
Venous	82 188	78	2.64
Venous Blood Lead Levels in Micrograms per Deciliter (µg)			
<10	80 461		
10 - 20	1 380		
21 - 30	216		
31 - 40	75		
40+	56		

Lead Poisoning Rate of Chicago, 2007

HYPOTHESIS 1: Comparison of Lead Poisoning Levels

One-Sample Statistics

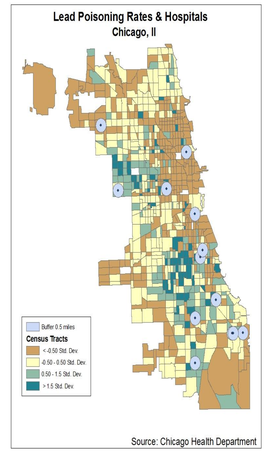
	N	Mean	Std. Deviation	Std. Error Mean
Elevated Blood Lead Levels	863	2.4565	3.85258	.13114

One-Sample Test

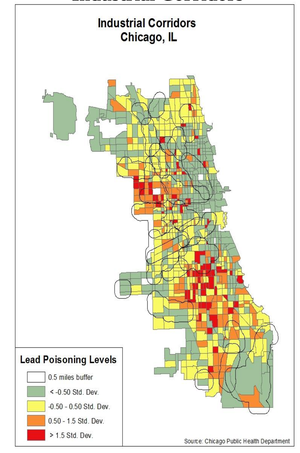
	Test Value = 1.2					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference Lower	Upper
Elevated Blood Lead Levels	9.581	862	.000	1.25655	.9991	1.5139

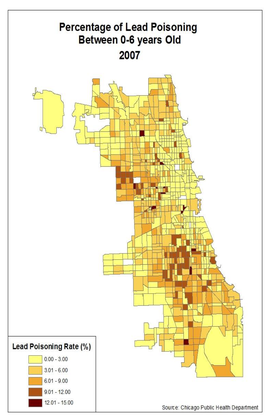
Results - con't

HYPOTHESIS 2: Distribution of Medical Centers



HYPOTHESIS 3: Industrial Corridors





West Englewood

Austin

Portage Park

Conclusions

Data rejected the hypotheses

- Hypothesis 1: Lead poisoning levels in Chicago are significantly higher than the national levels.
- Hypothesis 2: Based on GIS techniques applied, lead levels observed of 0.5 miles near the medical facilities are not consistent with the rest of the city.
- Hypothesis 3: Based on GIS techniques applied, lead levels observed of 0.5 miles near the industrial areas are not consistent with the rest of the city.

References

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