Assessing racial differences in incidence rates of work-related injuries across Public Use Microdata Areas (PUMAs) in Massachusetts, 2008-2011

BACKGROUND

Nonfatal work related injuries and illnesses are all too prevalent across industries in the United States. In 2011, nearly 4 million occupational injuries were reported nationwide. In order to target prevention methods to reduce the burden of occupational health injuries on the nation's civilian labor force, it is critical to understand and identify potential disparities, enabling prevention efforts to focus on pockets where higher rates of injury occur. Although some information about the risk of nonfatal occupational injuries among racial and ethnic groups is available nationally, only recently has data for Massachusetts become available through hospital discharge data. Hospital discharge data allows researchers to use such data to assess disparities among racial and ethnic groups at the state and local level.

In order to generate well-informed decisions on what kinds of public health interventions need to be implemented, it is critical to look at the distribution of injuries in Massachusetts based on location. With a total count of **198,295** occupational injuries statewide from 2008-2011, **t**his analysis presents occupational injury rates stratified by race and analyzed at the Public Use Microdata Area (PUMA) level.

In addition to assessing trends in work-related injuries by racial group, this analysis also explores the relationship between injury rates and demographic features contributing to potential geographic disparities by census block including percent of minority residents, percent of residents foreign born, percent below 65% of the statewide median income, and percent of residents lacking English language proficiency.

METHODOLOGY

NUMERATOR DATA Massachusetts Emergency Department data containing records from 2008-2011 were used to calculate the total count of work-related injuries. After running a preliminary SAS analysis of injury counts, six race categories were created to be further explored including Non-Hispanic White, Non-Hispanic Black, Non-Hispanic Asian, Multiple Races, and Non-Hispanic Alaskan Native/Pacific Islander/Other. Stratifying by race and Hispanic indicator provided the opportunity to assess whether disparities exist in the burden of occupational injuries throughout the state of Massachusetts.

DENOMINATOR DATA In order to calculate rates of injury for each PUMA, the count of injuries was normalized against the five-year average number of full time equivalent workers (FTEs) per area. One FTE is defined by working 40 hours/week, 50 weeks/year. ACS 5-year data was used to calculate the total number of (FTEs) to create the denominator dataset. FTEs were chosen as the denominator dataset in order to base the incidence rate of injury off of the total number of possible workers who potentially could have endured a workplace injury. The data was then normalized by stratified racial group allowing occupational injury rates to be assessed within each racial group calculated per 1,000 workers.

DEMOGRAPHIC ASSESSMENT All data was normalized against the overall injury rate mean (85.1/1000 FTEs) and measured using the same scale to show variability across the maps. Demographic attributes were assessed using spatial joins between environmental justice critical at risk group guidelines indicating that vulnerable areas are categorized by the following:

- Median annual household income is at or below 65% of the statewide median income;
- 25% or more of the residents are a minority;
- 25% or more of the residents are foreign born;
- 25% or more of the residents are lacking English language proficiency.

These populations are known as EJs. This data was compiled, finding the average critical counts met per town and spatially joining to PUMAs.

DEMOGRAPHIC VULNERABILITY

EJ populations are often unable to participate in environmental decision-making processes because they often must work longer hours to compensate for lower hourly wages. This creates an interesting unit of analysis of the correlation demographic characteristics of EJ including whether a minority, what the median household income is, level of English speaking proficiency, and whether or not individuals are foreign born. Figure 8 displays the proportion of these factors added up per town, with larger circles denoting more census blocks fitting the EJ criteria for 1,2,3 or 4 of the above specified EJ criterion.

Figure 8. Total EJ critical criterion count per town

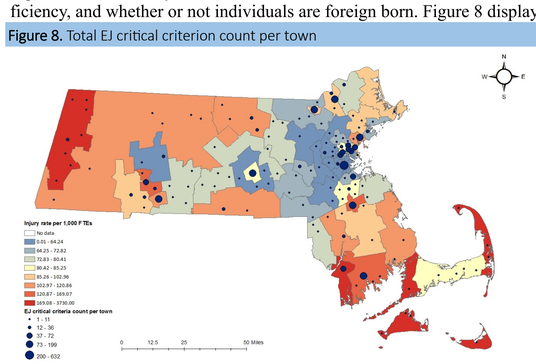


Figure 1. Work-related injury rate per 1,000 FTEs by PUMA, All races

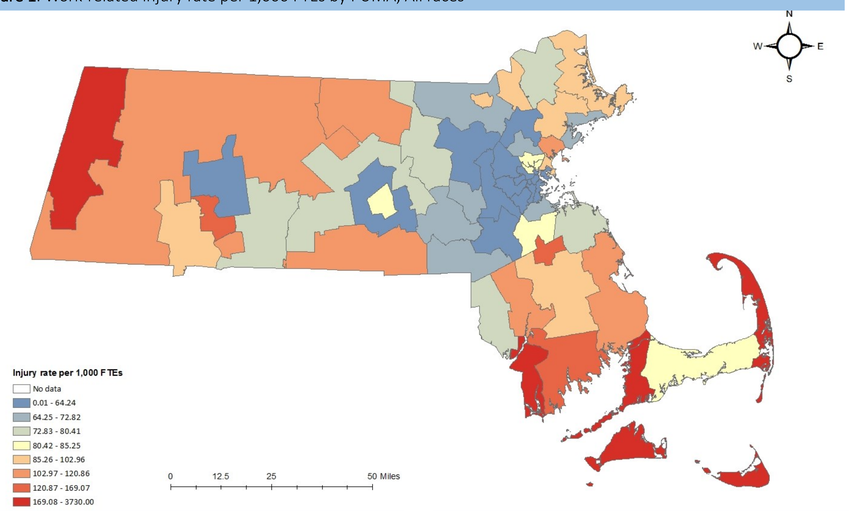


Figure 2. Work-related injury rate per 1,000 FTEs by PUMA, Non-Hispanic Black

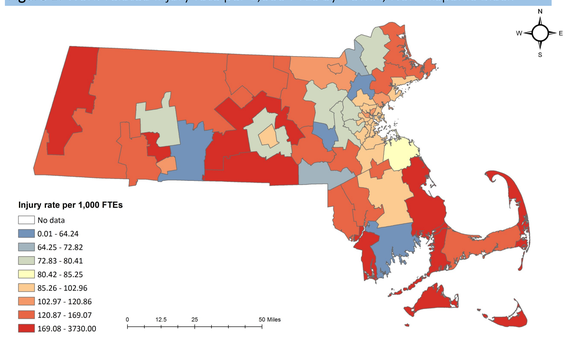


Figure 3. Work-related injury rate per 1,000 FTEs by PUMA, Hispanics

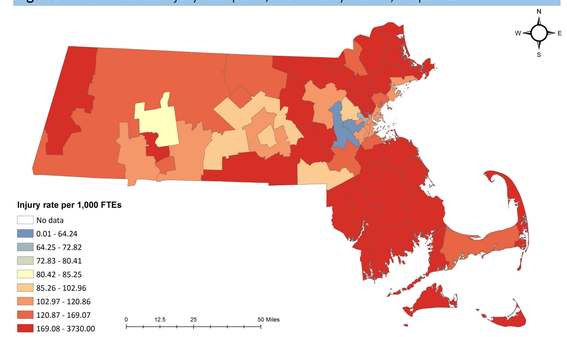


Figure 4. Work-related injury rate per 1,000 FTEs by PUMA, White

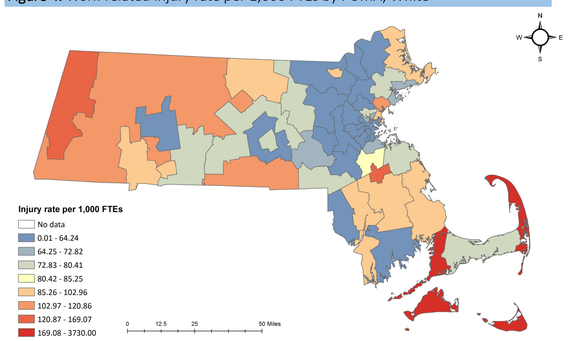


Figure 5. Work-related injury rate per 1,000 FTEs by PUMA, Asian

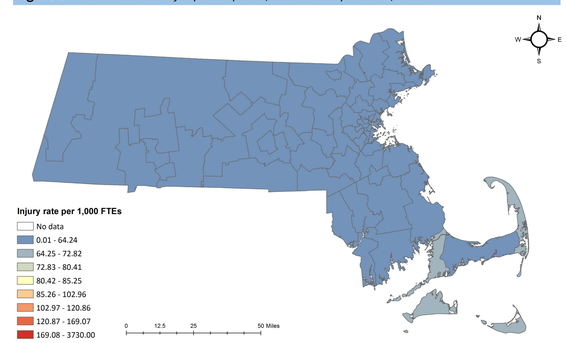


Figure 6. Work-related injury rate per 1,000 FTEs by PUMA, Two races

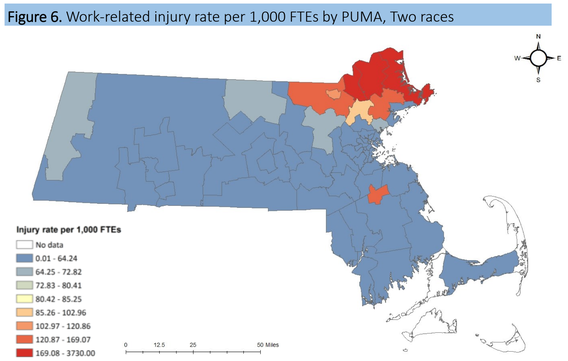
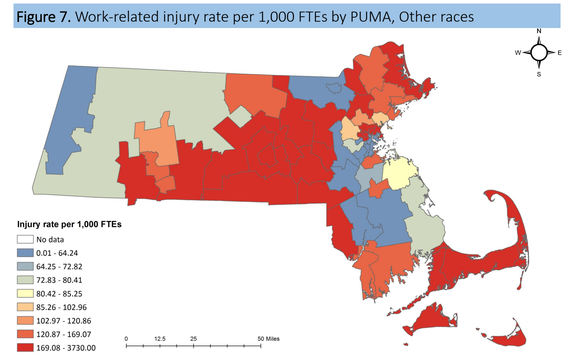


Figure 7. Work-related injury rate per 1,000 FTEs by PUMA, Other races



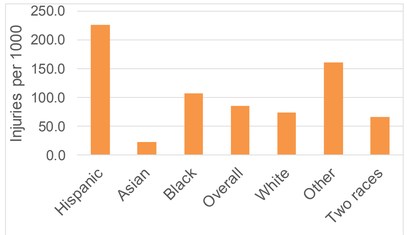
FINDINGS

The overall average injury rate across all racial groups was 85.1 per 1,000 workers. The mean injury rate per racial group is displayed in Figure 9. The highest average injury rate was among Hispanics, followed by the Other race category and Blacks.

Geographically, coastal regions, particularly Cape Cod, had the highest rate of injury across all races. List pockets of high injury rates by racial group. The top five PUMAs with the highest rates per racial group are displayed in Table 1. There was no statistically signifant ovelap across all groups for the five highest rate PUMAs (p>.05). There was some overlap, with PUMA 4700 having the largest amount of overlap across all races.

Among the Hispanic and multiple race groups, there were a number (n=8) of PUMAs where findings showed that the actual count of injuries from 2008-2012 was larger than the number of full-time equivalent workers. This implies that for each full-time equivalent worker, there were multiple injuries sustained during this four-year period.

Figure 9. Overall average injury rate by race, 2008-2011



Two Races: Part of Barnstable County (PUMA 04700), part of Essex County (PUMA 00700) (PUMA 00800)

Hispanic: Part of Barnstable County (PUMA 04700), two parts of Bristol county (PUMA 0400) and (PUMA 04500), part of Plymouth county (PUMA 04600), part of Middlesex county (PUMA 02800).

Because of the majority of these areas' close proximity to the coast, it can be inferred that seasonal employment is prevalent among these racial groups in these PUMAs, therefore contributing to the lower number of FTEs.

Table 1. PUMAS with highest injury rate, by race 2008-2011

Top 5 highest injury rates among Hispanics, by PUMA

PUMA	Rate/1,000 FTEs	Lower CI	Upper CI
04400	**3,726.6**	2,240.7	5,212.5
04600	**2,387.3**	1,299.1	3,475.5
04500	**1,632.0**	1,342.4	1,921.5
04700	**1,091.4**	440.5	1,742.2
02800	**1,027.4**	671.1	1,383.8

Top 5 highest injury rates among Non-Hispanic Whites, by PUMA

PUMA	Rate/1,000 FTEs	Lower CI	Upper CI
04700	**200.8**	189.6	212.0
00100	**165.0**	156.2	173.8
04000	**128.1**	118.1	138.0
01200	**111.4**	103.5	119.3
00200	**109.2**	104.5	113.9

Top 5 highest injury rates among Non-Hispanic Asians, by PUMA

PUMA	Rate/1,000 FTEs	Lower CI	Upper CI
04700	**71.2**	34.1	108.4
04400	**54.7**	27.8	81.6
04600	**54.4**	17.1	91.8
01100	**50.5**	25.6	75.5
04200	**50.2**	19.0	81.4

Top 5 highest injury rates among Other race, by PUMA

PUMA	Rate/1,000 FTEs	Lower CI	Upper CI
01500	**812.4**	-301.3	1,926.0
04700	**728.7**	281.5	1,175.8
00900	**678.2**	-291.4	1,647.7
02300	**652.7**	287.6	1,017.9
02000	**559.4**	-443.3	1,562.1

Top 5 highest injury rates among Non-Hispanic Blacks, by PUMA

PUMA	Rate/1,000 FTEs	Lower CI	Upper CI
04700	**473.1**	222.8	723.4
00100	**357.9**	221.9	494.0
04600	**309.6**	165.4	453.9
04400	**244.3**	140.6	348.0
01500	**214.8**	46.2	383.3

Top 5 highest injury rates among Multi Race, by PUMA

PUMA	Rate/1,000 FTEs	Lower CI	Upper CI
00700	**3,177.6**	1,261.7	5,093.4
00800	**2,286.8**	597.3	3,976.3
00900	**179.0**	51.3	306.7
00500	**159.2**	74.1	244.4
01000	**149.6**	-29.9	329.1

PUMA contains top 5 rate for 1 race
PUMA contains top 5 rate for 2 races
PUMA contains top 5 rate for 3 races
PUMA contains top 5 rate for 4 races

CONCLUSIONS

Conducting geospatial mapping of work-related injury rates among various races by PUMA allows us to gain information as to whether there are regions of particular concern, both overall as well as among a specific racial group. Identifying which areas appear to have higher concentrations of work-related injury rates will allow intervention methods to meet the needs of the targeted high incidence regions. Racial disparities in work-related injuries are undeniably present throughout the state of Massachusetts, as proven by this analysis. Minority groups are facing a disproportionate number of work-related injuries and further surveillance should be conducted to evaluate additional factors, aside from geographic location, that could be contributing to higher rates among minority populations.

Cartographer: Alejandra Garcia-Pletsch, FA2014 GIS101

Data source: MA Department of Public Health, ACS Community Survey 2008-2012 5 year estimates, TIGER 2008, Mass GIS

Projections:
NAD_1983_CORS96_StatePlane_Massachusetts_Mainland_FIPS_2001