# Mapping the Opioid Epidemic: Saving Lives with Naloxone
## Distribution of Naloxone by Tapestry Health in Western Massachusetts, 2008—2016

## The Opioid Epidemic

Deaths from accidental opioid overdoses have increased in the past decade, leading the media and public health professionals alike to declare an "Opioid Epidemic"[1]. The CDC reports that 78 Americans die every day from an opioid overdose [2]. In Massachusetts, an estimated 1,173 people died from opioid related overdose deaths in 2014[4].
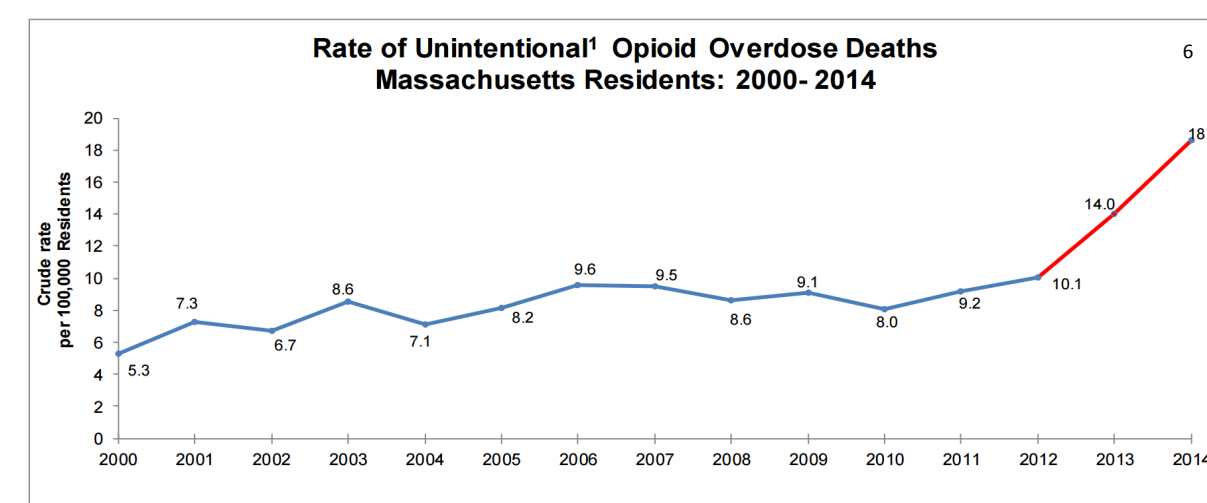
A key strategy proposed by public health advocates is to increase the distribution of naloxone. This lifesaving drug works by blocking opioid receptor sites to stop an overdose[8]. Naloxone can be easily administered, allowing a person witnessing an overdose to effectively intervene.


Rate of Unintentional Opioid Overdose Deaths Massachusetts Residents: 2000- 2014
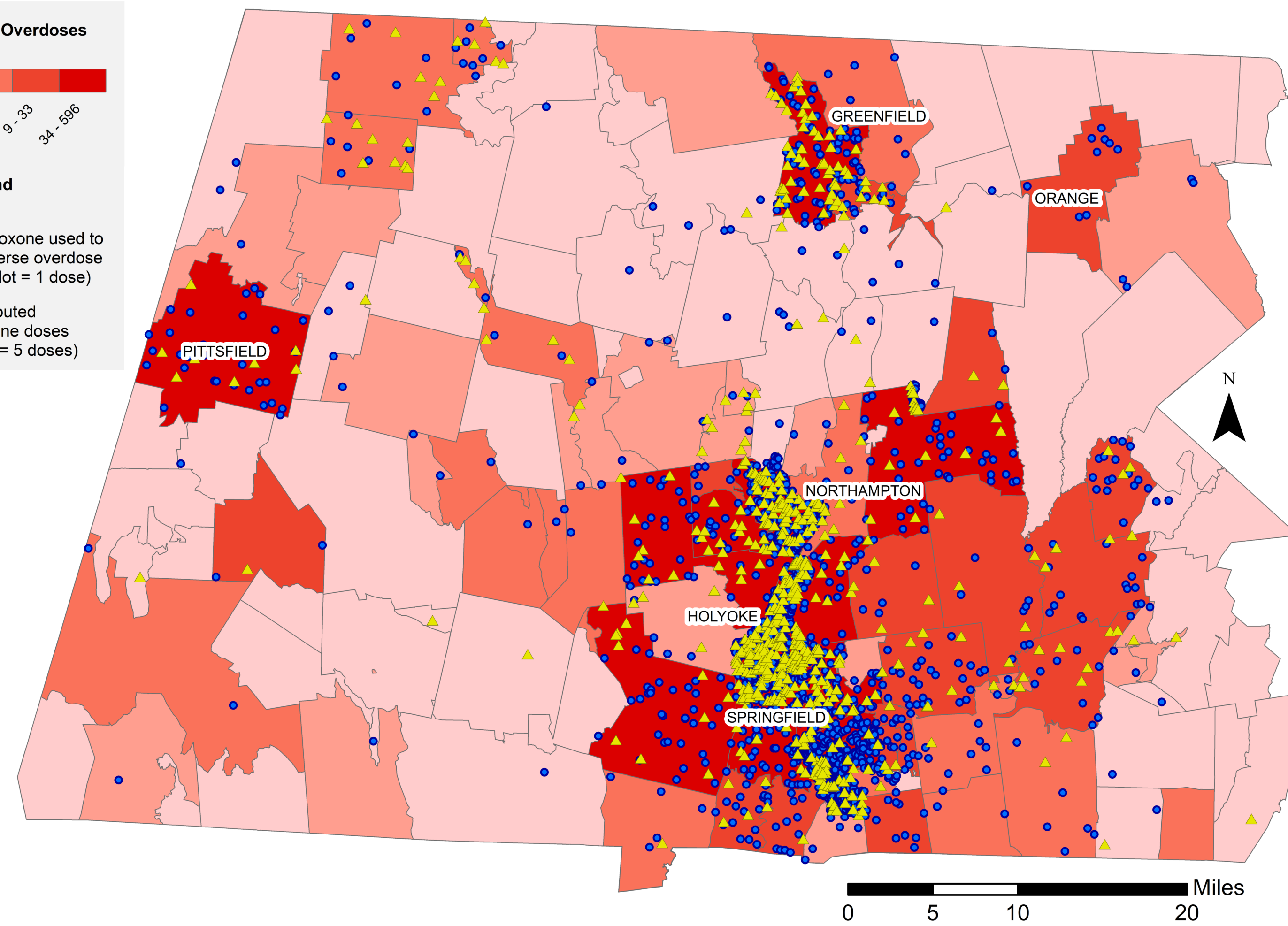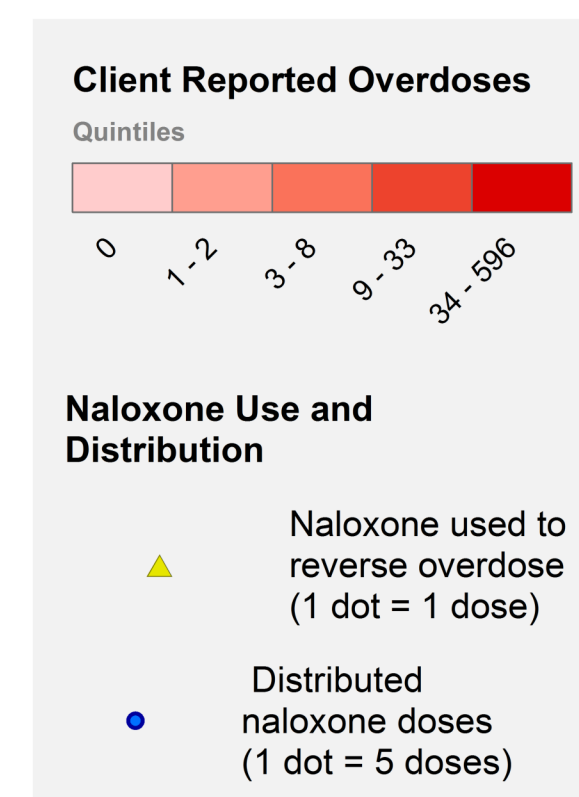
Tapestry Health distributes naloxone in western Massachusetts to drug users, friends, and family, and runs trainings on how to effectively use the medication. Their mission specifically includes providing services to marginalized populations, including, "young people, women living in poverty, recent immigrants, … [and] injection drug users."[9]

Tapestry Health is interested in identifying patterns of use of their naloxone services. This project will examine the spatial relationship between key demographic factors and naloxone use. Mapping the response to the opioid epidemic enables organizations such as Tapestry Health to identify gaps in services and disparities in access.


Counties served by Tapestry Health
Cartographer: Anna Kaplan
Date: May 2016
Source: MassGIS
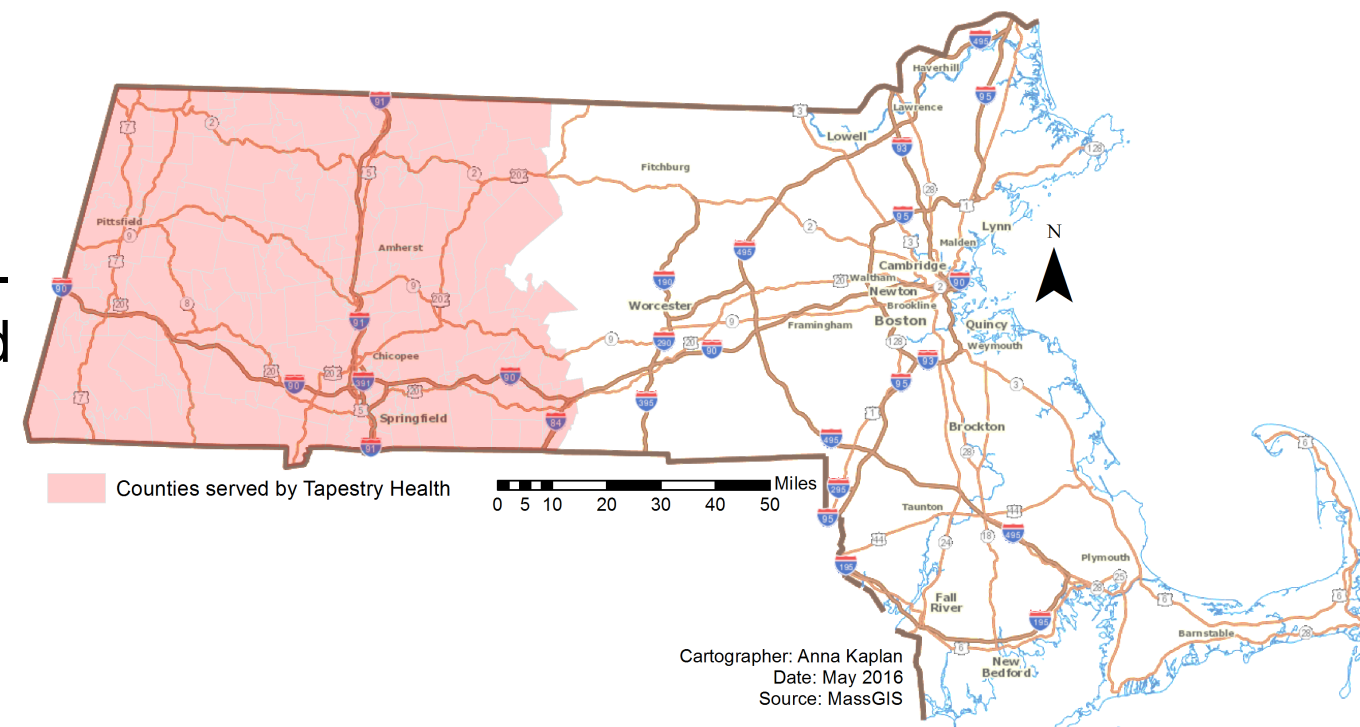
## Client Reported Overdoses and Naloxone Distribution
### Areas of success and gaps in use



Client Reported Overdoses
Quintiles
0 | 1 - 2 | 3 - 8 | 9 - 33 | 34 - 598

Naloxone Use and Distribution
▲ Naloxone used to reverse overdose (1 dot = 1 dose)
● Distributed naloxone doses (1 dot = 5 doses)

GREENFIELD, ORANGE, PITTSFIELD, NORTHAMPTON, HOLYOKE, SPRINGFIELD

Miles
0   5   10   20

## Results

Through combined dot-density and choropleth mapping, we can see the distribution of naloxone kits and overdose reversals compared to regions with high numbers of overdoses. Generally there is high overlap of distribution, reversals, and overdose counts. Several regions stand out on the map:

*Holyoke and Northampton*
These towns bear a major burden of opioid overdoses. This region is younger, more diverse, and has a lower median income than the surrounding towns. High overlap of naloxone distribution and use indicates widespread utilization of Tapestry Health's naloxone services.

*Greenfield*
Greenfield is less densely populated and more homogenous than the southern towns. Residents have a median age in the 2nd quantile and median household incomes in the 1st quantile. There is demonstrated overlap between naloxone distribution and use.

*Pittsfield and Orange*
Naloxone has been widely distributed in these areas, but are lower rates of naloxone use in overdoses compared to the number of doses distributed. They are less densely populated, and have median incomes in the 1st and 2nd quantile.

*Springfield*
Springfield is home to the most diverse, young, and low-income population in western Massachusetts. Tapestry Health has a large presence in the area, and has served 1,227 clients. However, the rate of naloxone use is significantly lower than in the neighboring towns of Holyoke and Massachusetts.

| Town | Overdose reversals per 100 naloxone distributions |
|------|------|
| Pittsfield | 5.06 |
| Greenfield | 12.53 |
| Northampton | 9.85 |
| Holyoke | 13.05 |
| Springfield | 2.53 |
| Orange | 0.00 |

## Methods

**Data sources:**
1) Data was provided by Tapestry Health from their naloxone distribution and report-back programs. They collect opioid use information from individuals they distribute naloxone to, and follow up when the naloxone is used in an overdose.

2) 2010 US Census data and 2014 American Community Survey data was used to create demographic maps of race, income, and age.

*Aggregating by Zip Code:*
Using the Tapestry Health de-identified individual data, the total number of client reported overdoses, naloxone doses distributed, and naloxone doses used were aggregated by zip code in Excel.
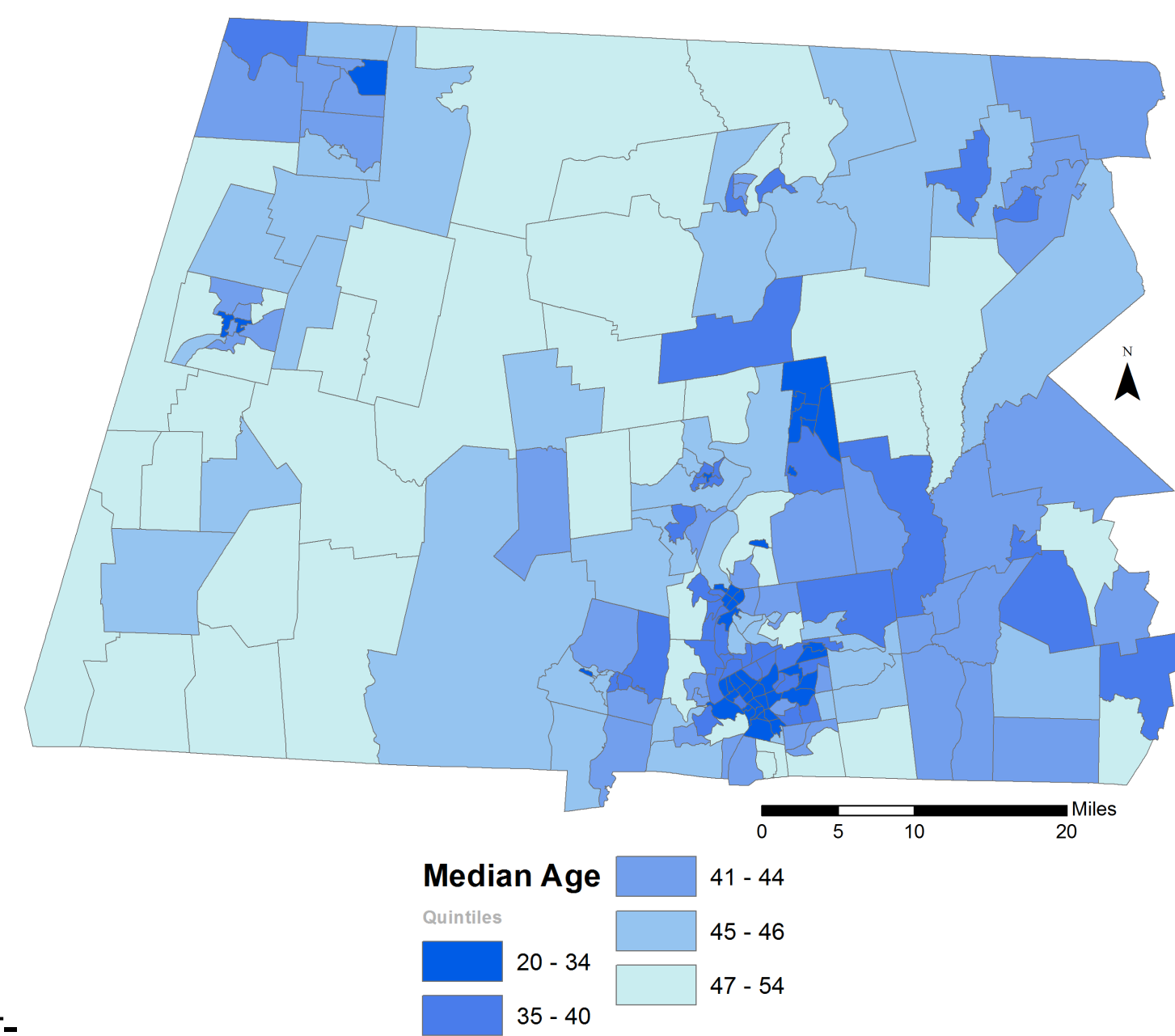
*Demographic Maps:*
2010 US Census data was joined to the MassGIS shapefile of the state. Tapestry Health was interested in the race, age, and income levels of the residents of their target region. Choropleth maps were developed using age and income data to identify areas that are home to a higher proportion of high risk populations for opioid abuse. A dot-density map was used to represent the racial diversity of the region.

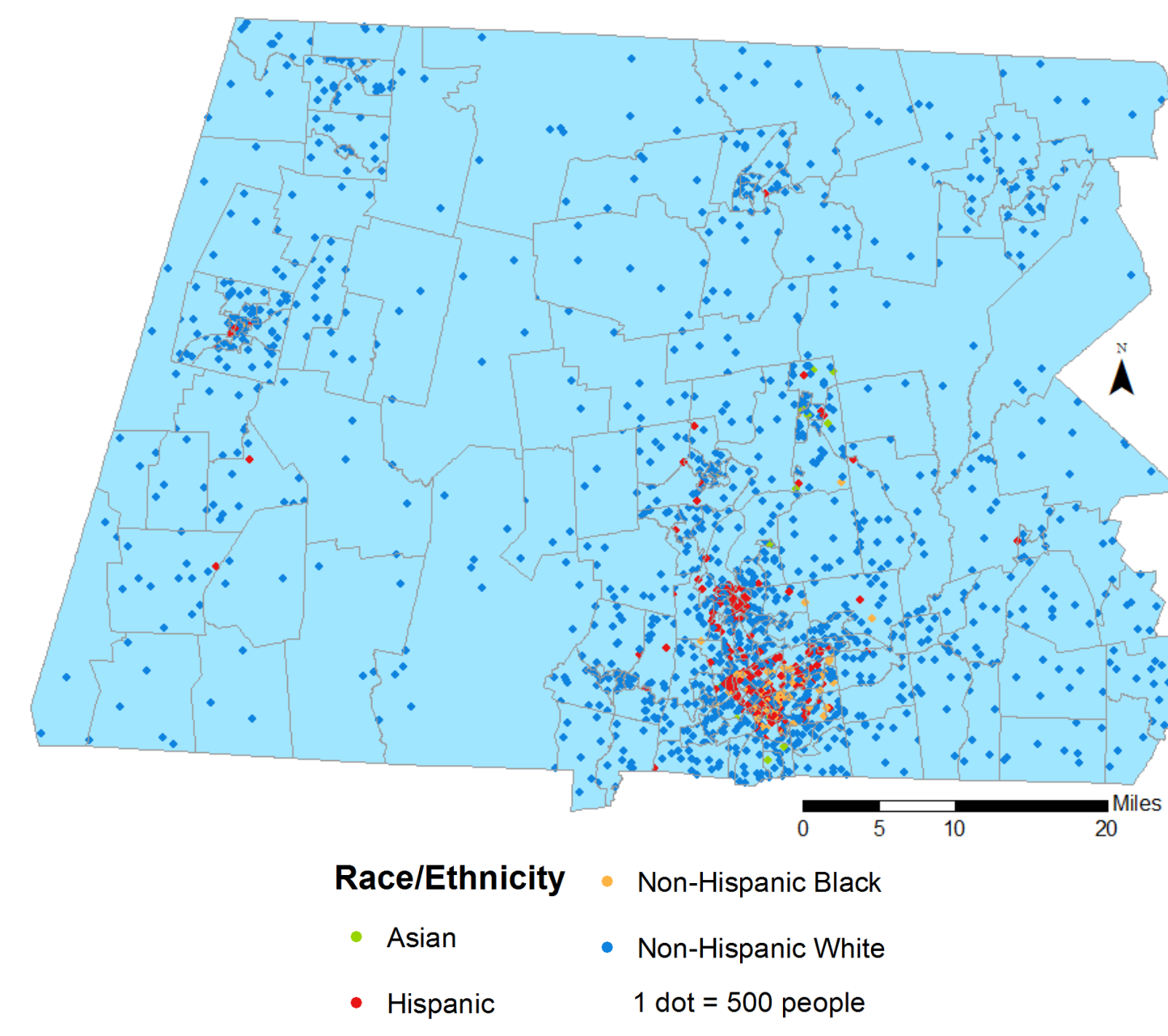*Analysis of Overdoses and Naloxone Distribution:*
Zip code level data was joined to MassGIS shapefiles. A choropleth map of client reported overdoses was overlaid with a dot-density map of the number of naloxone kits distributed and the number of reported overdose reversals.

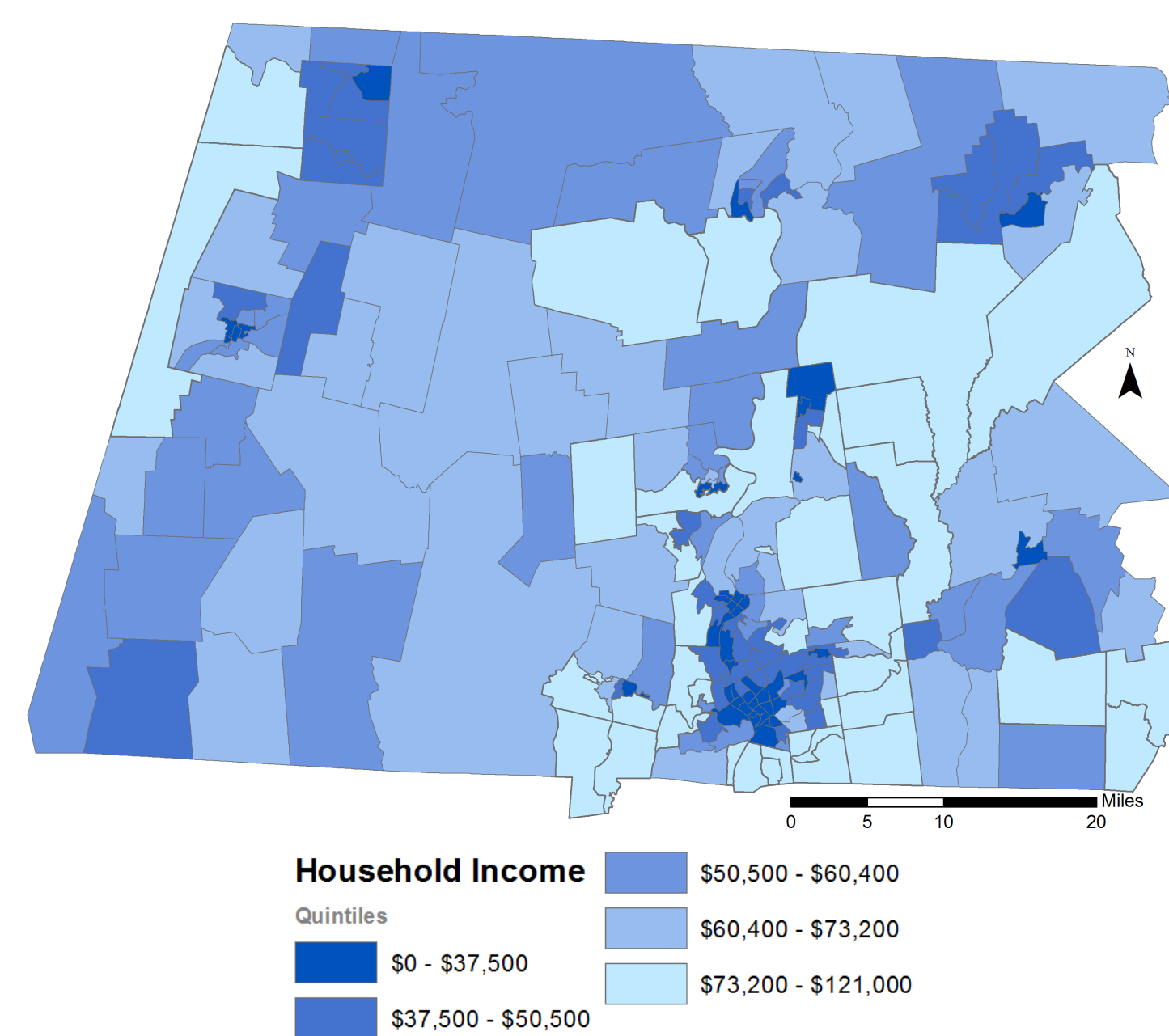## Demographics of Western Massachusetts

### Median Age

Median Age
Quintiles
20 - 34 | 35 - 40 | 41 - 44 | 45 - 46 | 47 - 54

### Race and Ethnicity

Race/Ethnicity
● Asian
● Non-Hispanic White
● Hispanic
● Non-Hispanic Black
1 dot = 500 people

### Yearly Household Income

Household Income
Quintiles
$0 - $37,500 | $37,500 - $50,500 | $50,500 - $60,400 | $60,400 - $73,200 | $73,200 - $121,000

## Discussion

Through mapping Tapestry Health's naloxone distribution network, it is clear that they have successfully reached high risk populations. The high overlap of distributed naloxone and opioid reversals indicates effective training of opioid users to respond during emergencies. In particular, Holyoke, Northampton, and Greenfield have high rates of opioid reversals.

Pittsfield, Springfield, and Orange had significantly lower rates of naloxone usage. However, this data was limited by its reliance on client reporting. Loss to follow-up and recall bias may have resulted in missing or inaccurate data. It is also possible that clients receive naloxone in one location, but report overdoses in another.

Despite these limitations, further efforts should focus on increasing naloxone usage. Tapestry Health has successfully distributed naloxone to these towns, so additional training or follow up may improve outcomes [7].

In the future, attempts to address the opioid epidemic should consider the spatial distribution of their services to identify areas of greatest need. Further study including mortality data from the state Health Department could improve identification of these regions.

## References and Acknowledgements

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