

# Hepatitis A Outbreak 2004-2007

## Spatial Analysis & Overview

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# Objectives

- Describe Hepatitis A
- Overview of the MA Statewide and Springfield, MA Hepatitis outbreak
- Spatial Statistics Tools used for the analysis
  - Mean Center, Standard Distance, Spatial Autocorrelation, Cluster Analysis, and Hot Spot Analysis
  - Density
- Community Census variables
- Community Outreach/Prevention
- Considerations for Spatial Analysis

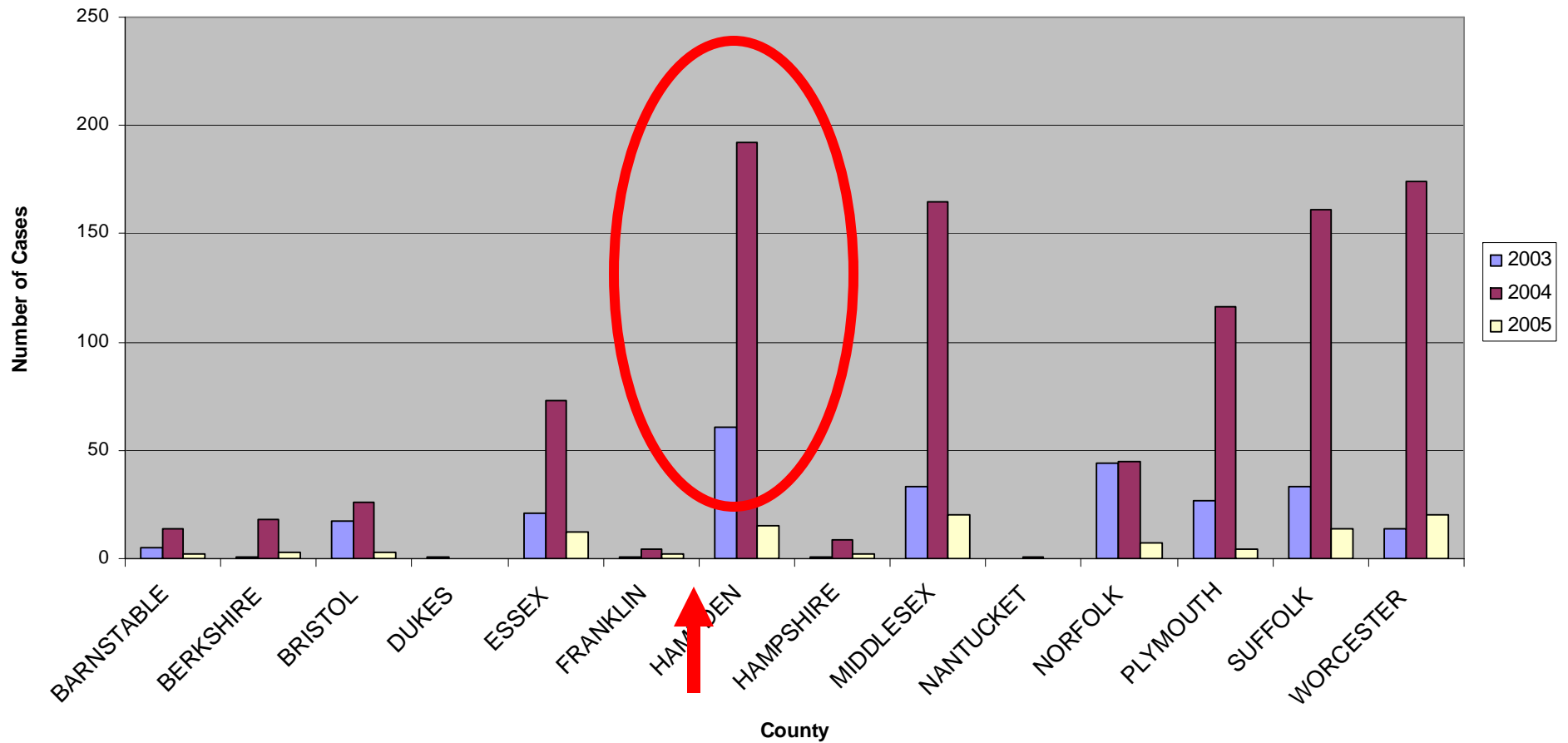
# Hepatitis A virus – what is it?

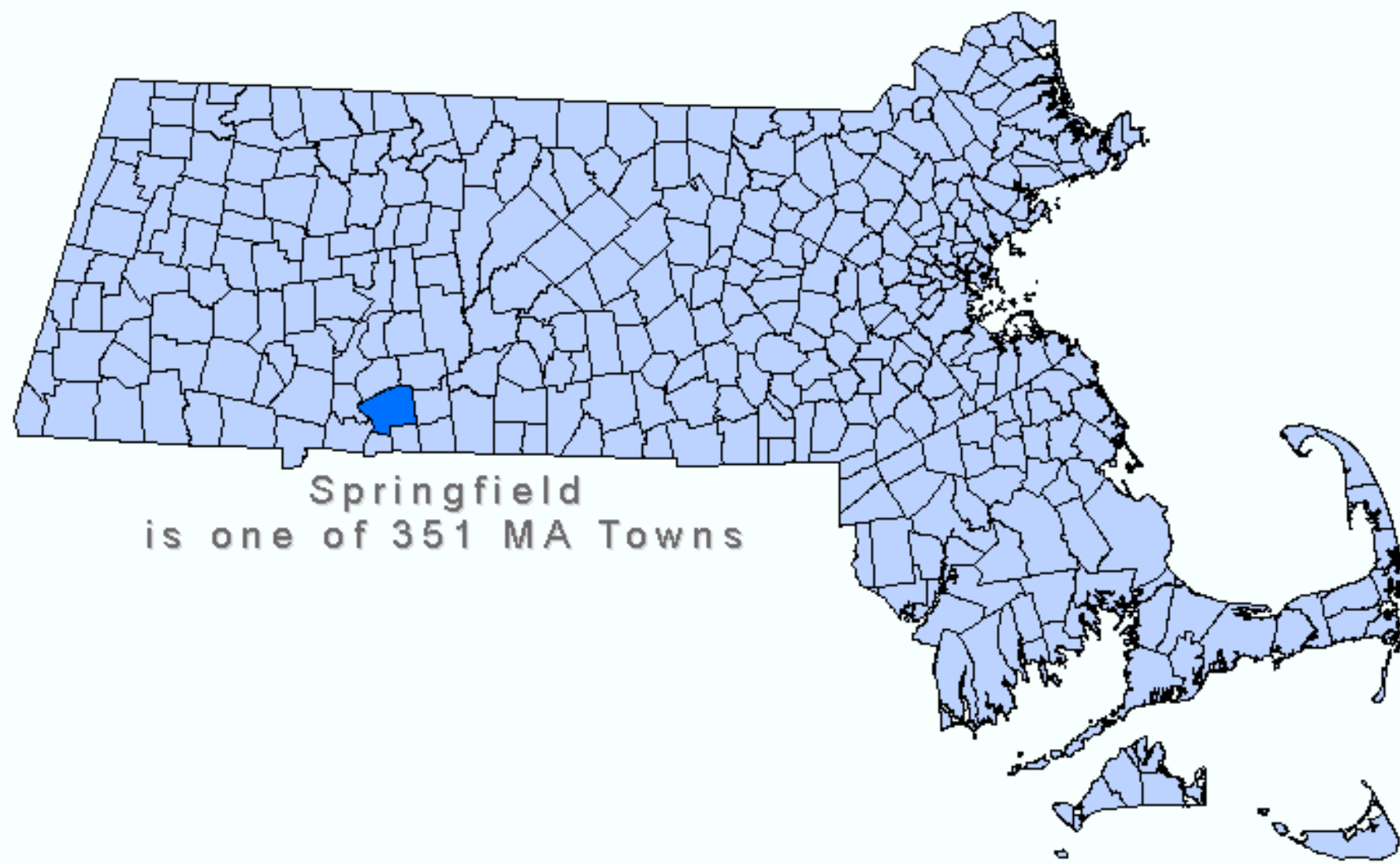
- RNA Picornavirus
- Acute disease or asymptomatic infection
- No chronic infection
- Protective antibodies confer lifelong immunity
- Shed mainly in the feces
- Vaccine preventable
- Average 25 - 30 days (range:15 - 50 days)
- Infectious 14 days before symptoms to 7 days after
- Small amount HAV needed to cause illness

# Massachusetts Outbreak

- Initially, more cases than expected reported in Hampden, Suffolk and Middlesex counties starting in November 2003
- Cases were linked to past or prior incarceration, detox programs, homeless, injection drug use (IDU), unemployed, and co-infection with hepatitis C virus
- Vaccination of the at-risk populations as well as extensive prevention education for these populations and people who work with them
- Several IG Clinics focused at outbreak prevention
- Partnered with community health centers, local boards of health, and communities

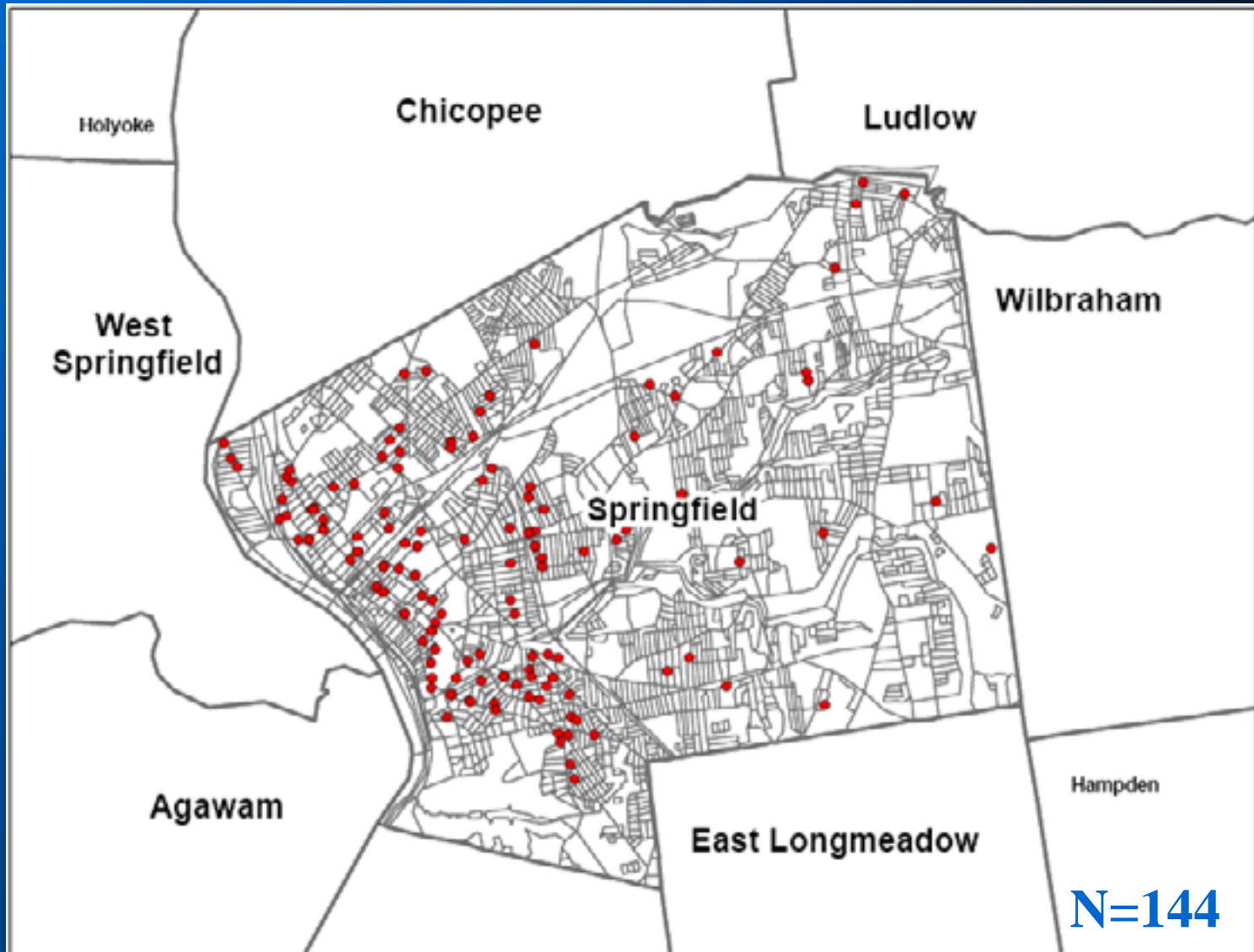
## Number of Cases of Hepatitis A By County: 2003 - March 2005





Springfield  
is one of 351 MA Towns

# Hepatitis A Cases (2004-07)

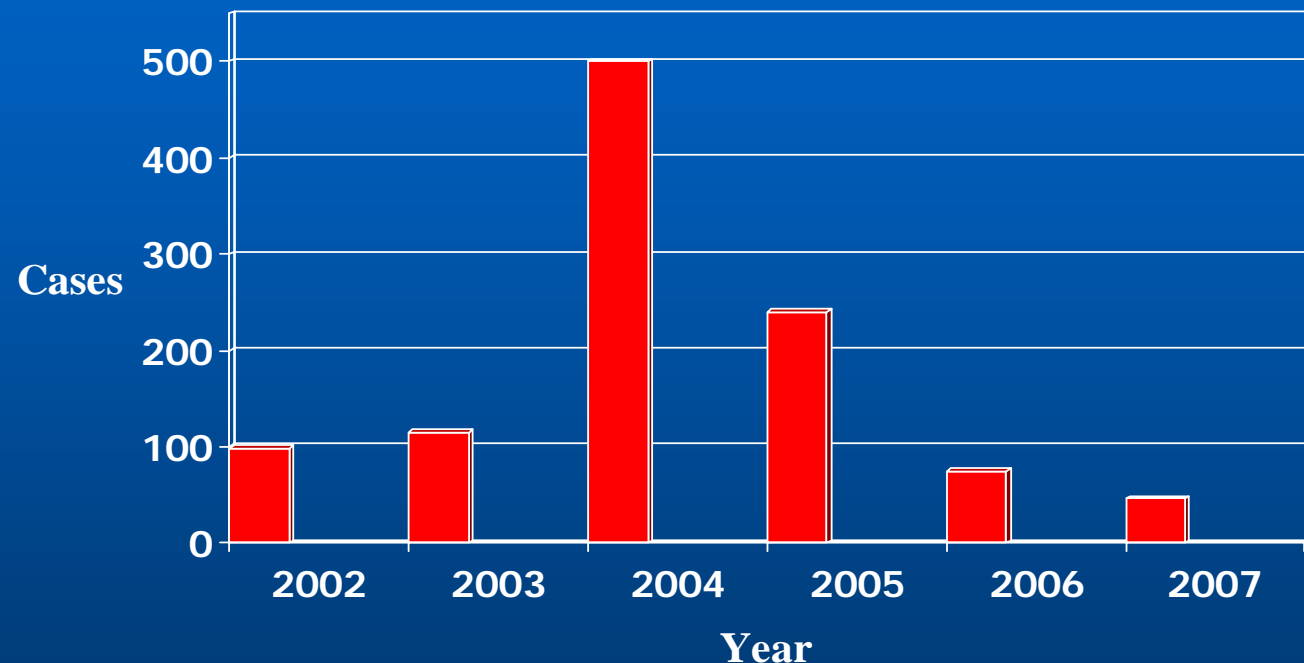


# Outbreak Population Characteristics

- Age: (Mean: 32 yrs, Median: 24 yrs, Range: 1 to 78 yrs)
- Male (56%)
- Race/ethnicity data missing from 13% of reported cases
  - For the 144 cases with race/ethnicity data reported, Hispanic (50%), Caucasian (26%), Black (10%) , Asian (1%), and Other (1%)
- Unemployed (42%)
- IDU/Other drug use (16%)
- Homeless (10%)
- Hepatitis C (8%)
- Previously Incarcerated (7%)
- Hepatitis B (4%)



# Hepatitis A Cases in MA

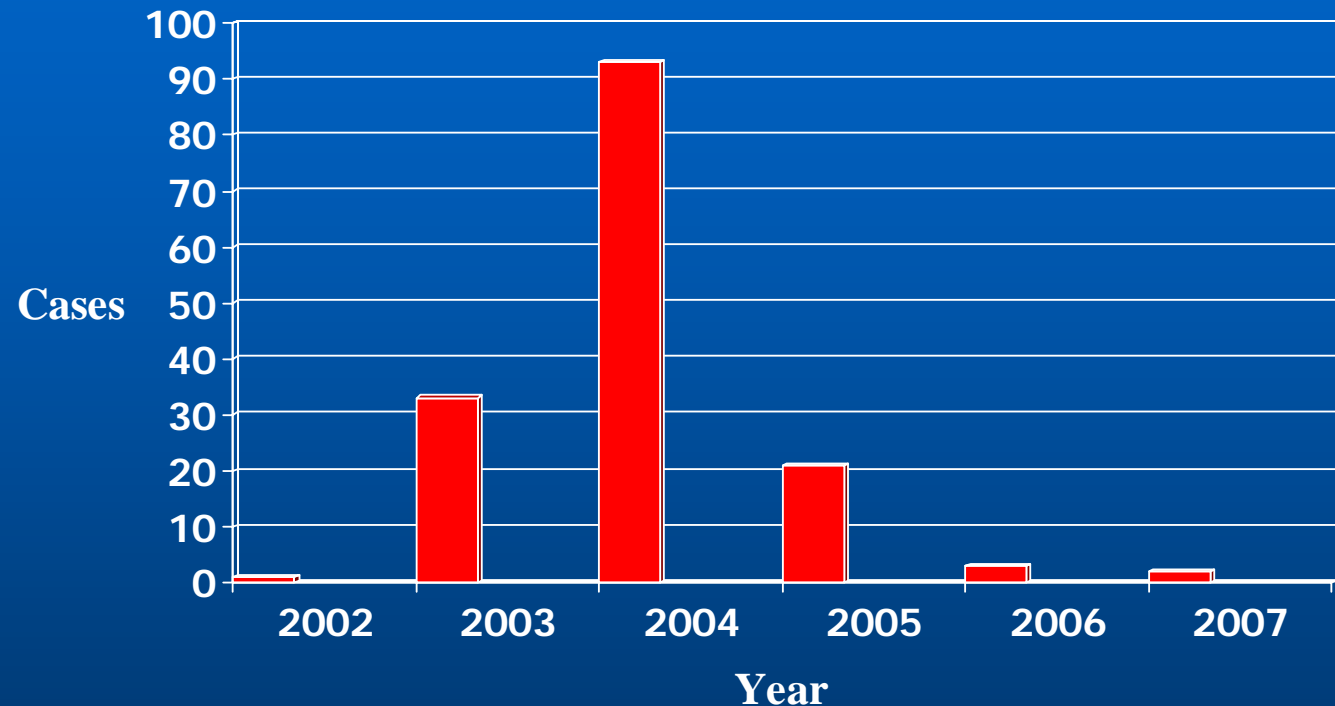


## ● Numbers

- 2007: 46
- 2006: 75
- 2005: 240
- 2004: 500
- 2003: 115
- 2002: 99

\* The data are current as of 10/05/2007 and are subject to change.

# Hepatitis A Cases in Springfield, MA

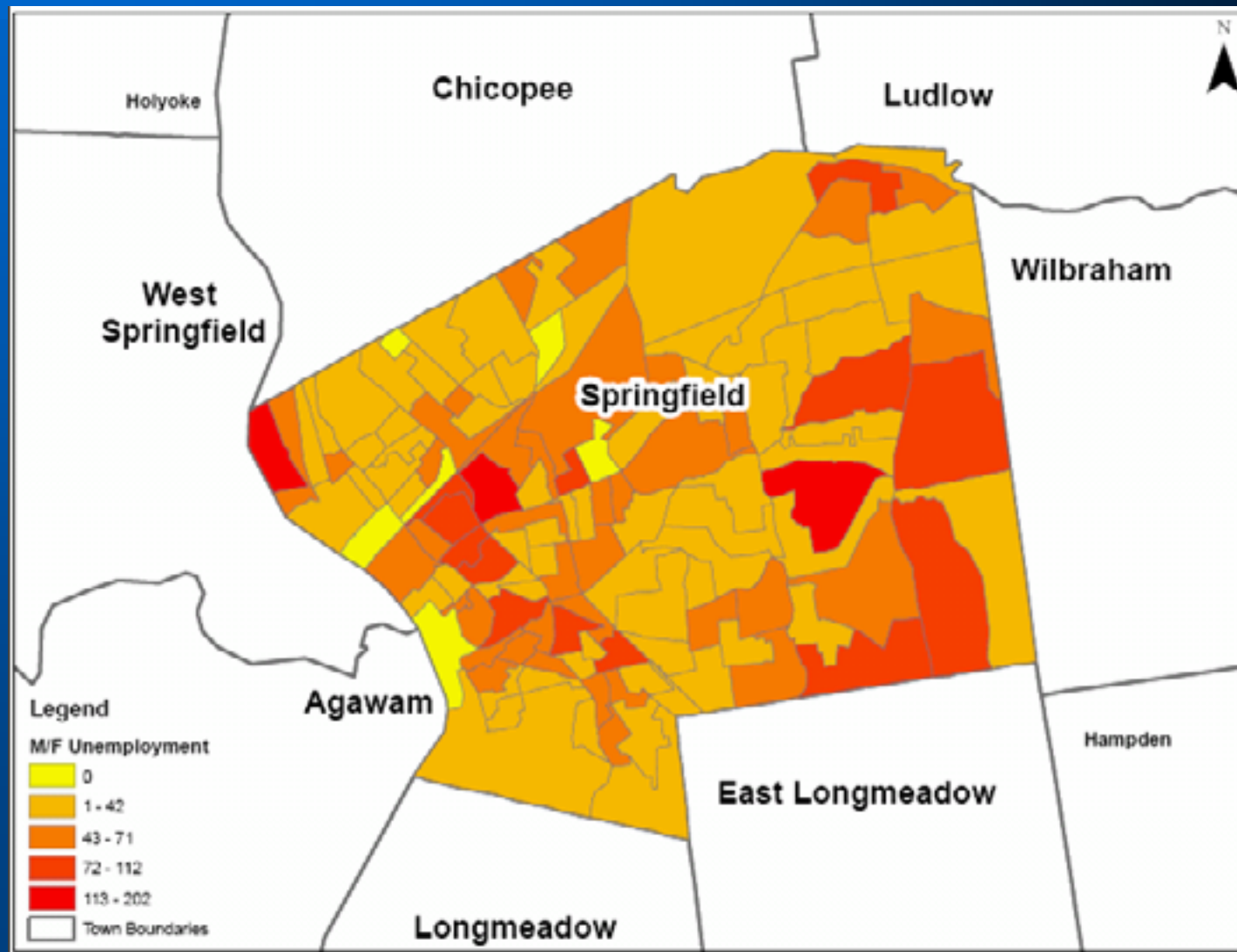


- Numbers

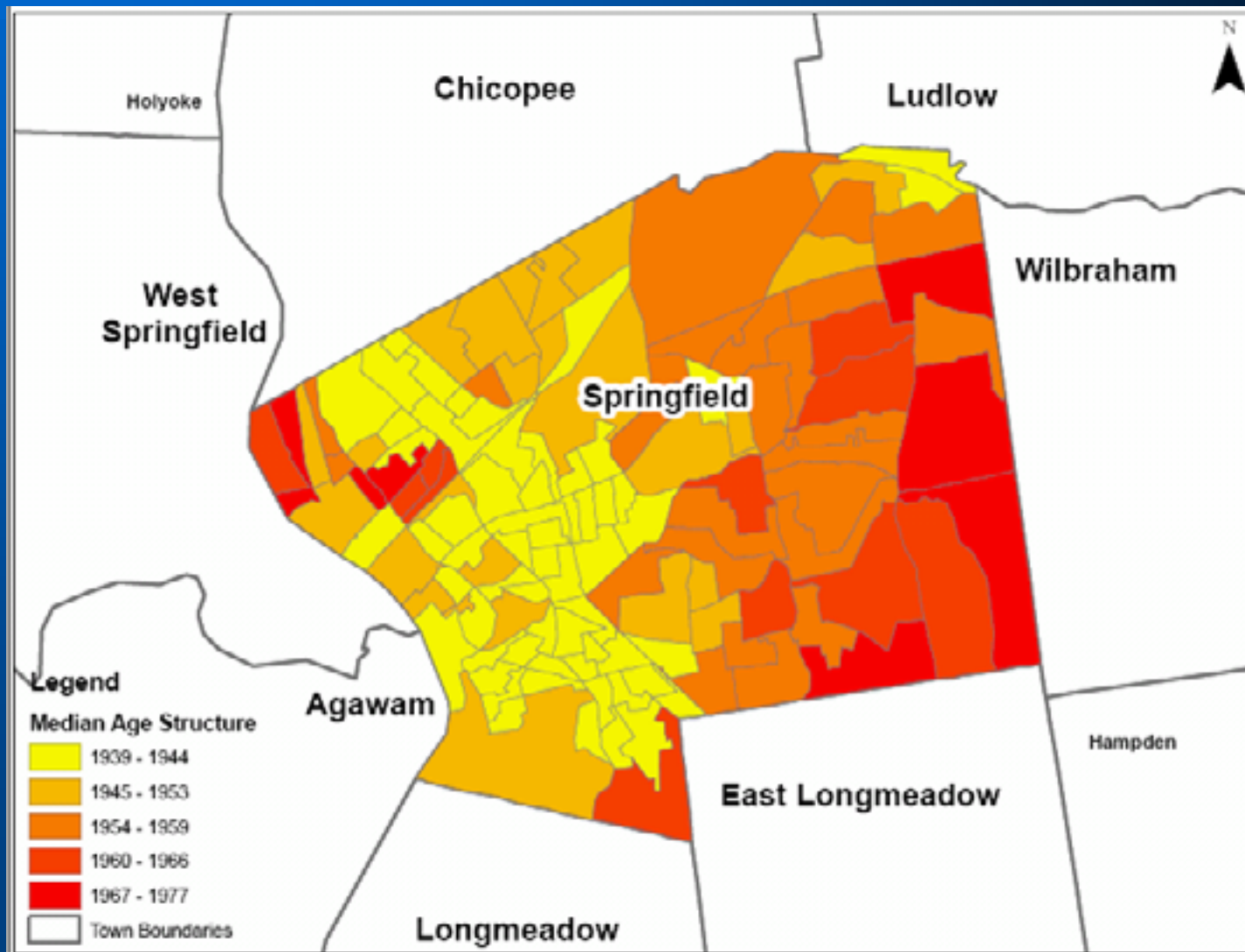
- 2007: 2
- 2006: 3
- 2005: 21
- 2004: 93
- 2003: 33
- 2002: 1

\* The data are current as of 10/05/2007 and are subject to change.

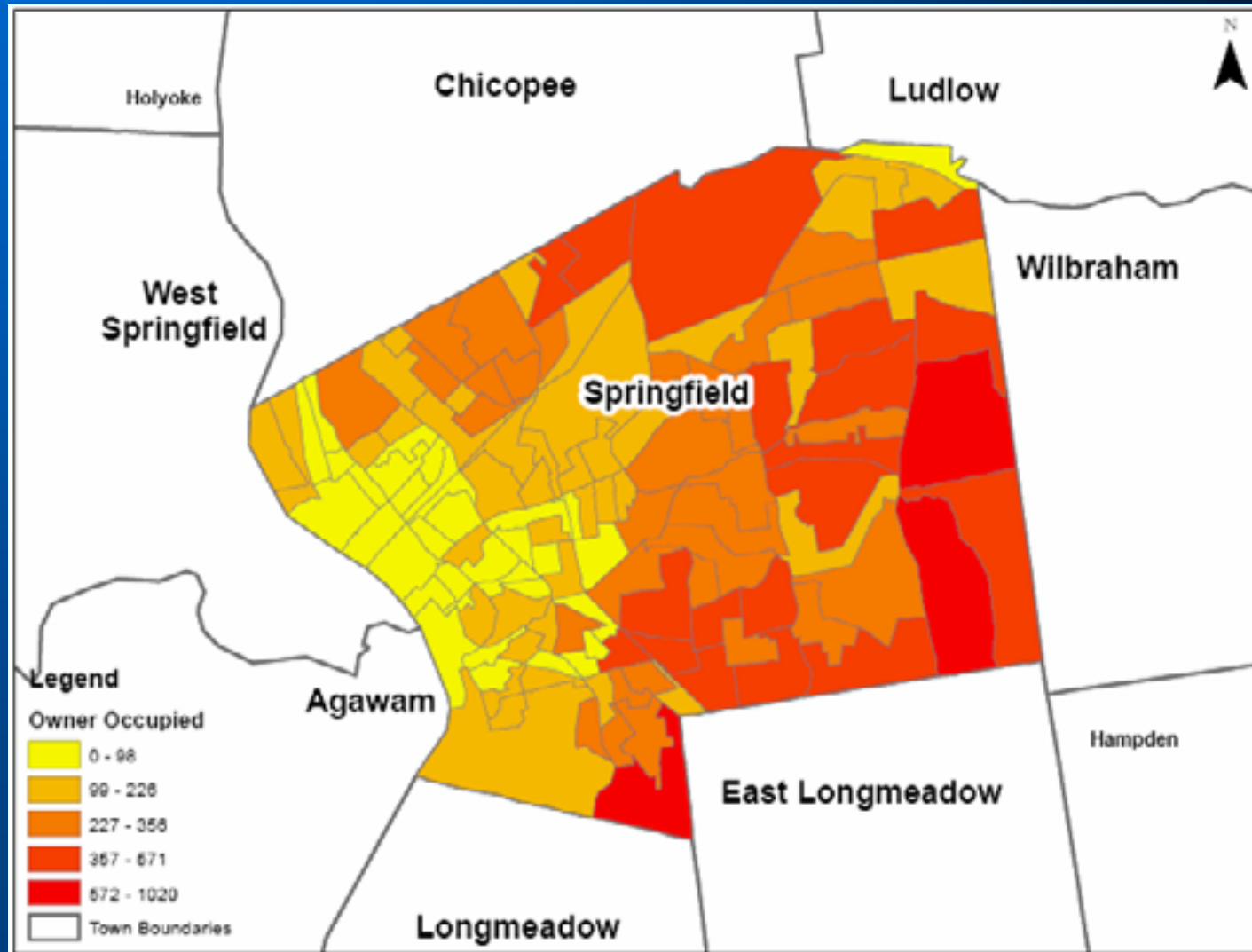
# Male/Female Unemployed



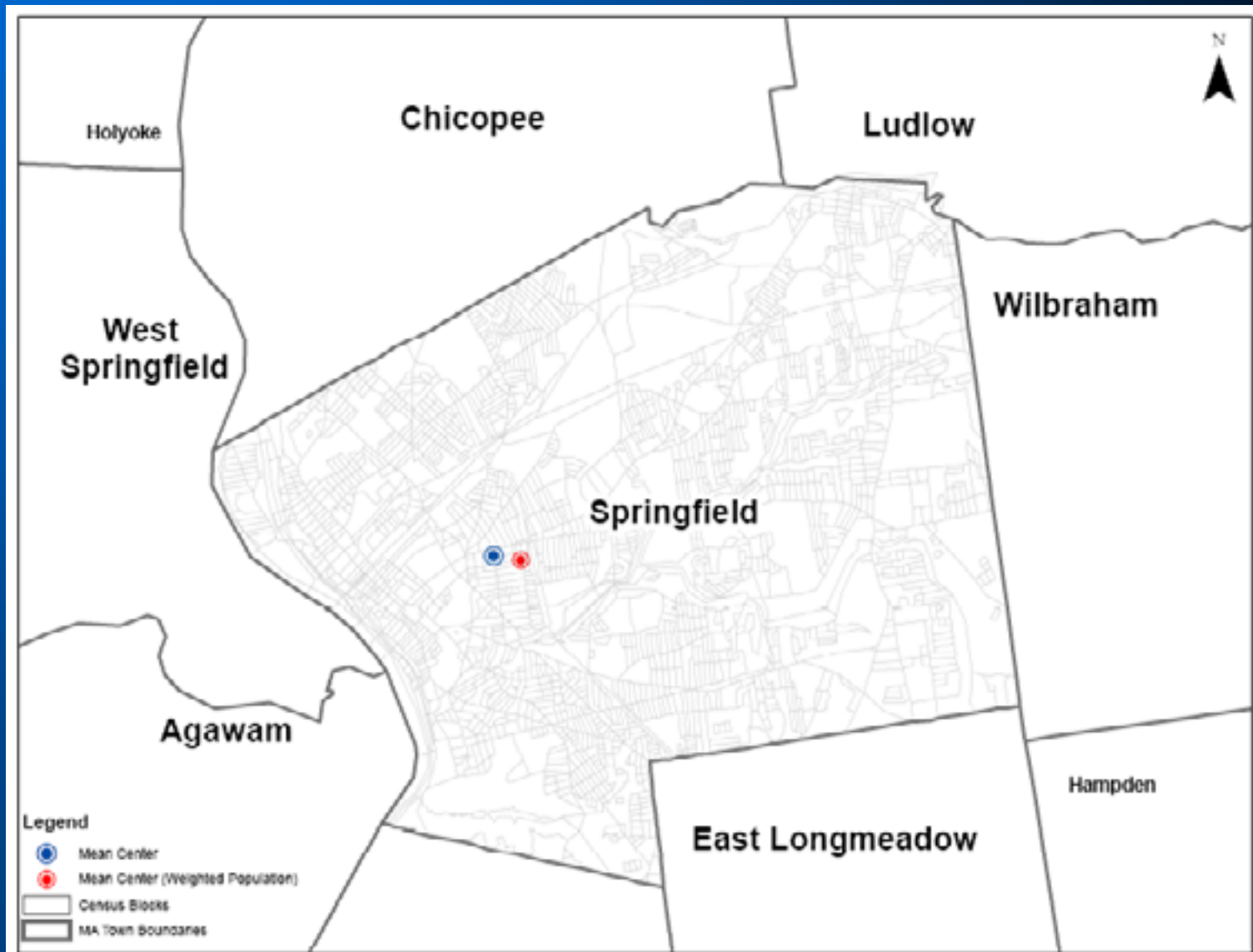
# Median Age of Structure



# Number of Owner Occupied

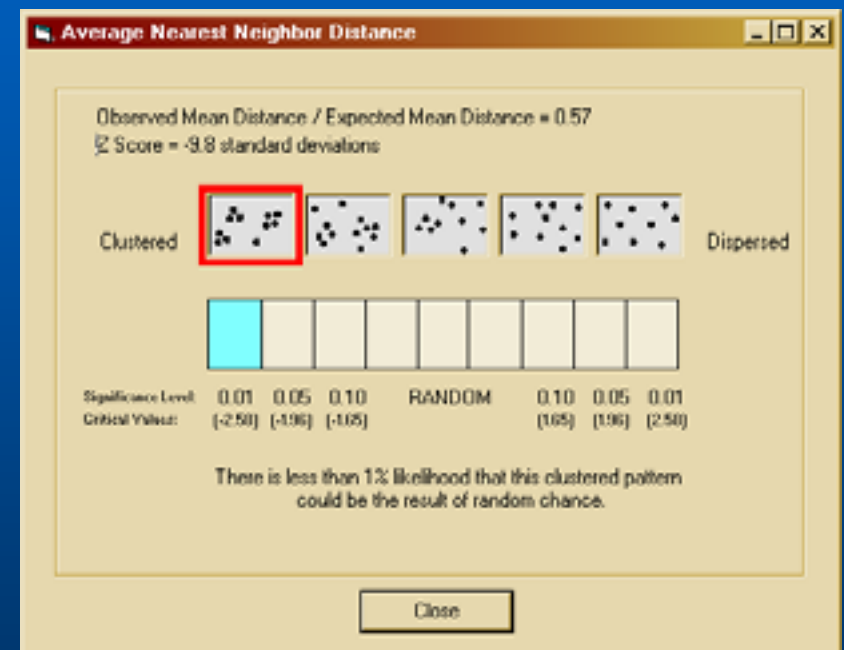


# Mean Center



# Average Nearest Neighbor

- Measures the distance between each feature and its nearest neighbor and then calculates the average.
- $OMD/EMD = 0.57$
- $Z \text{ Score} = -9.8$

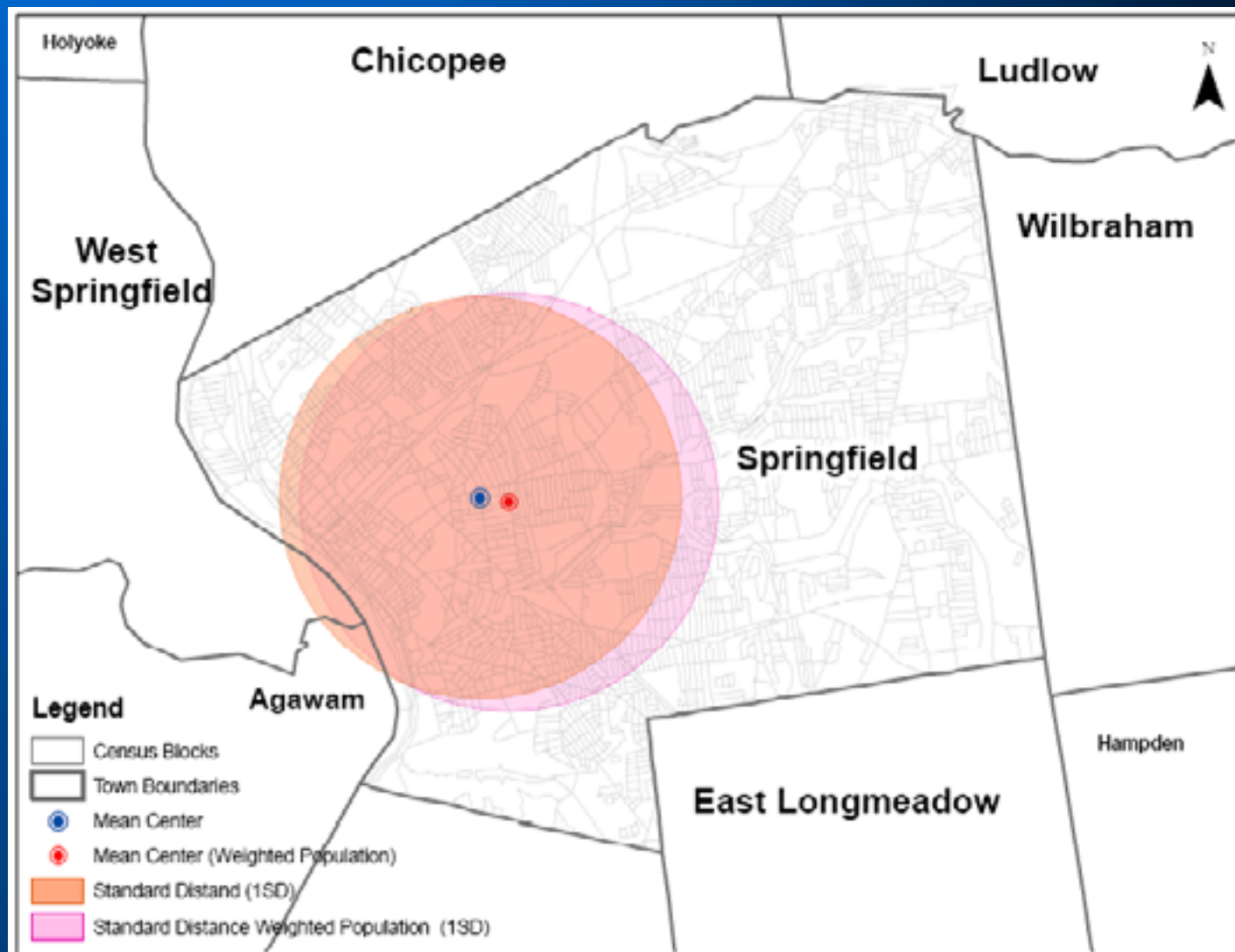


# Census Block Total

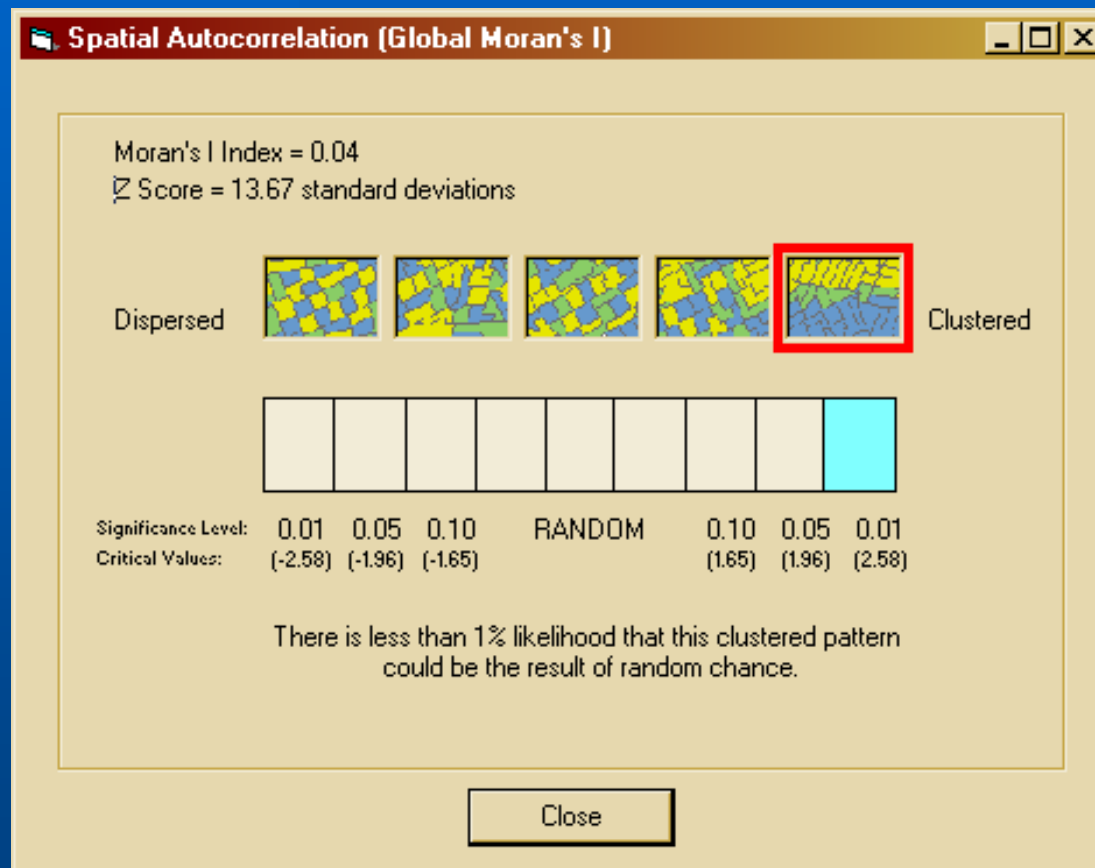




# Standard Distance



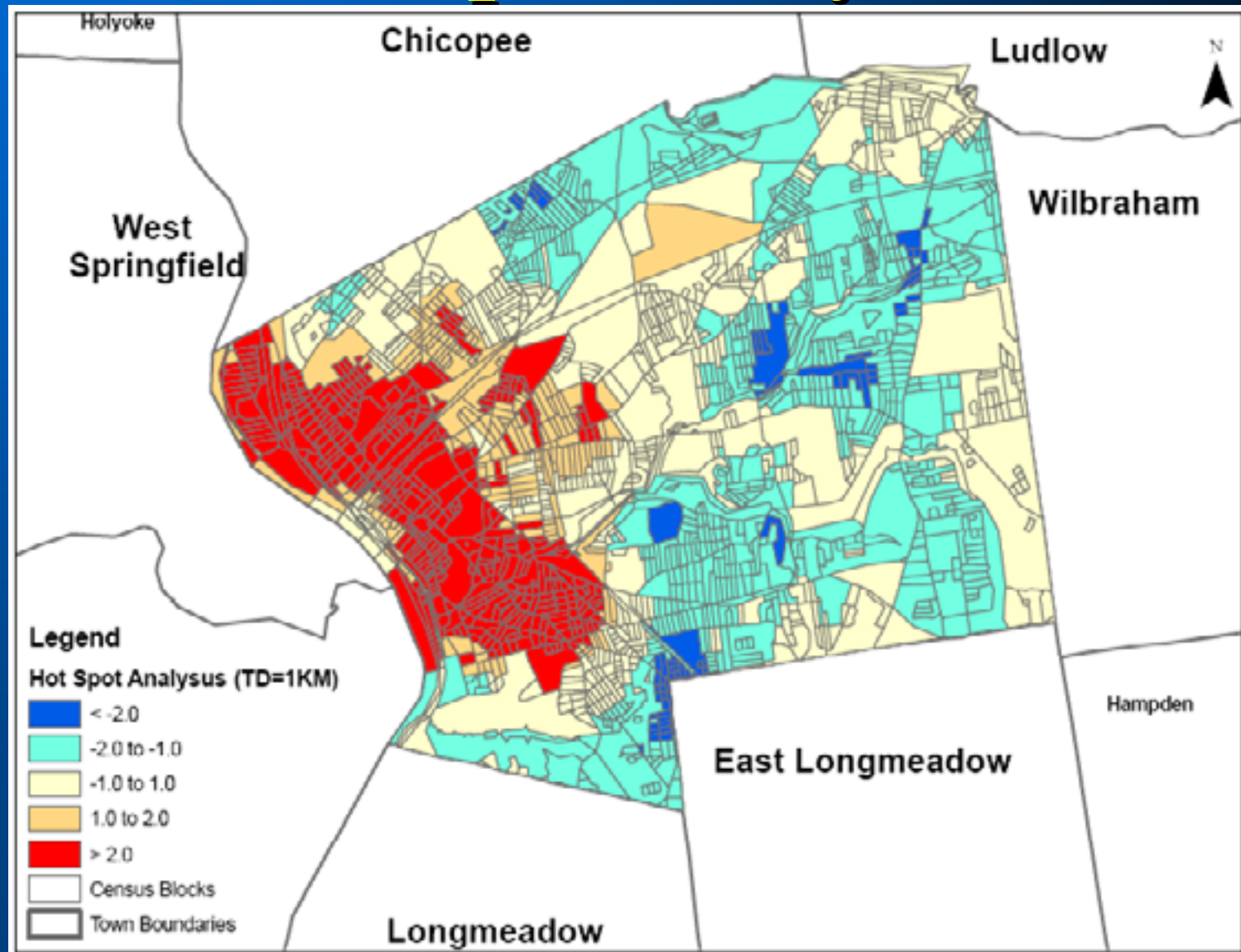
# Spatial Autocorrelation (Moran's I)



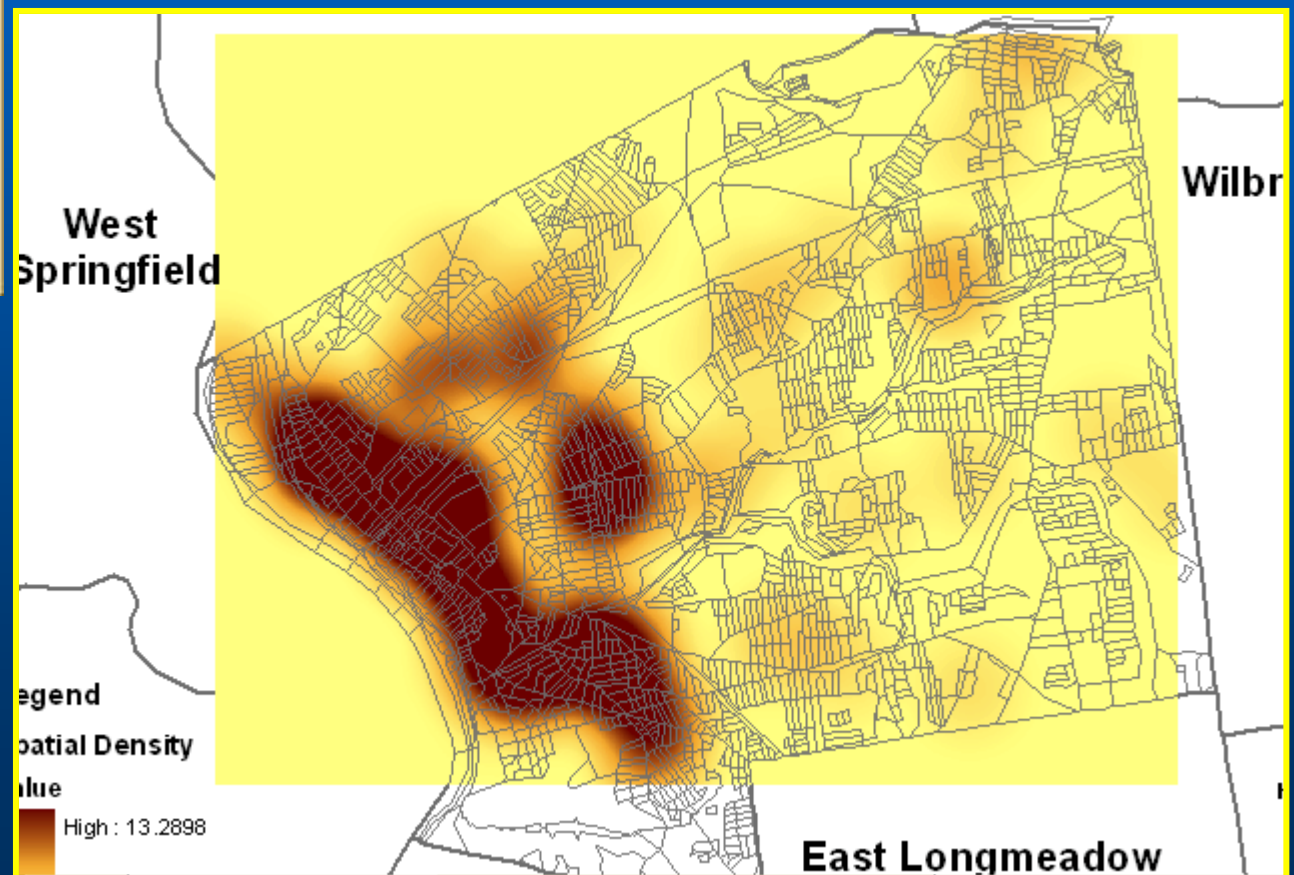
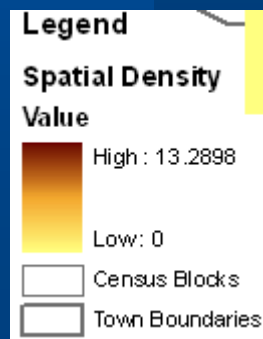
**Moran's I = 0.04**

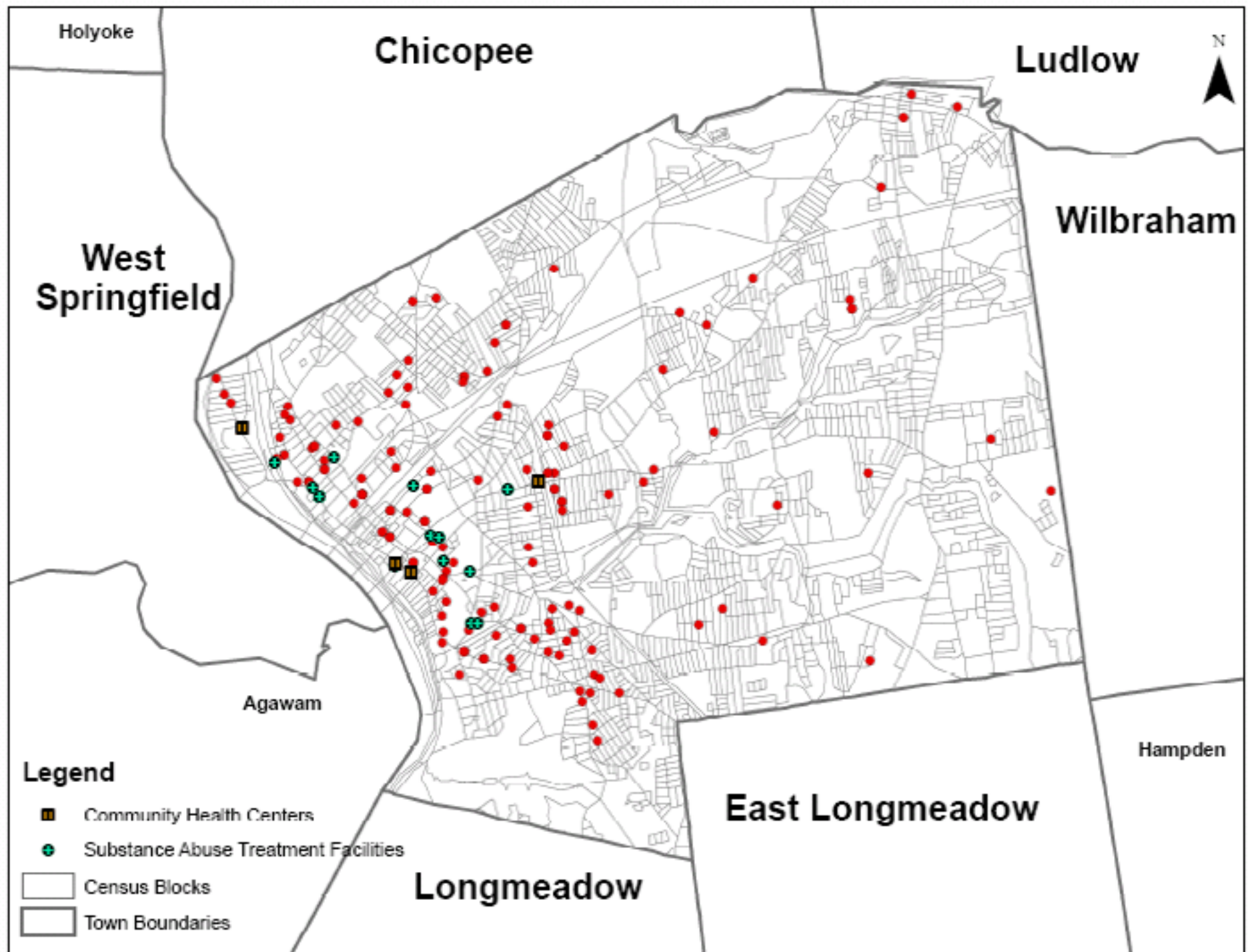
**Z-Score 13.67**

# Hot Spot Analysis

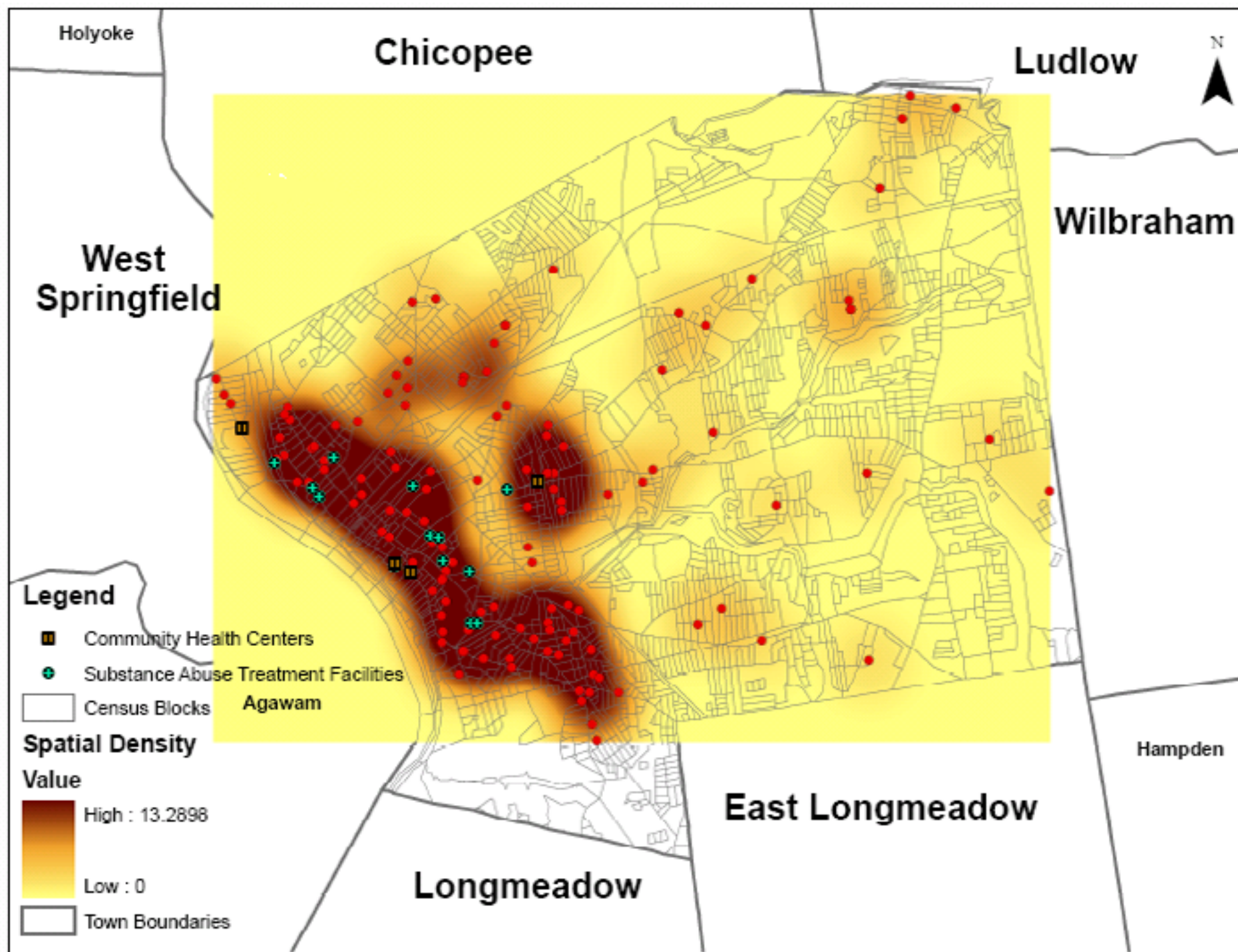


# Spatial Analyst - Density









# Prevention and Control

- All confirmed cases (HAV IgM pos.) investigated
  - Occupation
  - Risk factors
  - Onset date & symptoms
- Close contacts get Immune globulin (IG)  
80-90% effective if given within 2 weeks of exposure
  - Temporary protection (3 months)

# Hepatitis A Immune Globulin (IG)

- Concentrated solution of antibodies prepared from pooled human plasma
- It is not a vaccine
- Provides short-term passive immunity (3-5 months)
- Used for both pre- and post-exposure prophylaxis
  - Needs to be received within 2 weeks of an exposure to be effective as post-exposure prophylaxis



# Community Outreach

- IG Clinics
- Regional Meetings/Outreach
- Posters and Fact Sheets (multiple languages)
- Letters to LBOH and Specialized Populations

**HEPATITIS A IS GOING AROUND...**  
and Vaccination is the Best Protection

The Massachusetts Department of Public Health invites you to attend a regional forum.

At the forum, you will learn:

1. How to protect yourself and others from hepatitis A.
2. How to get vaccinated.
3. How to avoid contact with blood or other body fluids.
4. How to avoid sexual contact with someone who has hepatitis A.

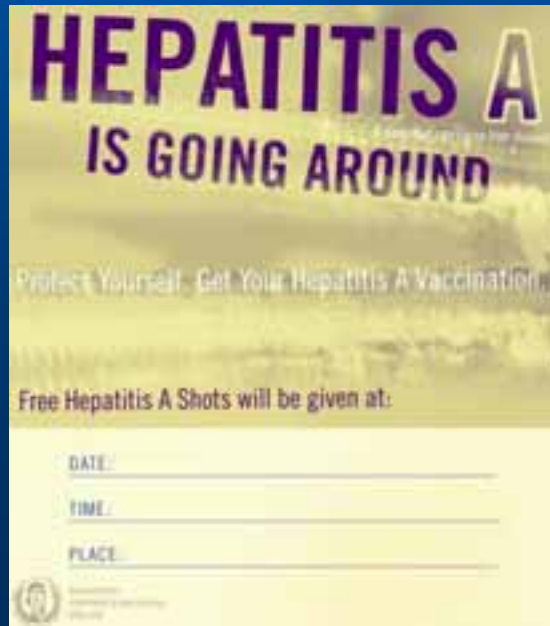
Members of the forum will be given a free hepatitis A vaccine. There will also be a free hepatitis A vaccine clinic.

Site	Address	Phone
Worcester	100 State St., Worcester, MA 01608	508-853-1234
Springfield	100 State St., Springfield, MA 01103	417-739-1234
Lowell	100 State St., Lowell, MA 01854	978-456-1234
Andover	100 State St., Andover, MA 01810	978-682-1234

To register, please fill out the form and return it to the nearest regional forum. Registration is free.

Registration Form:

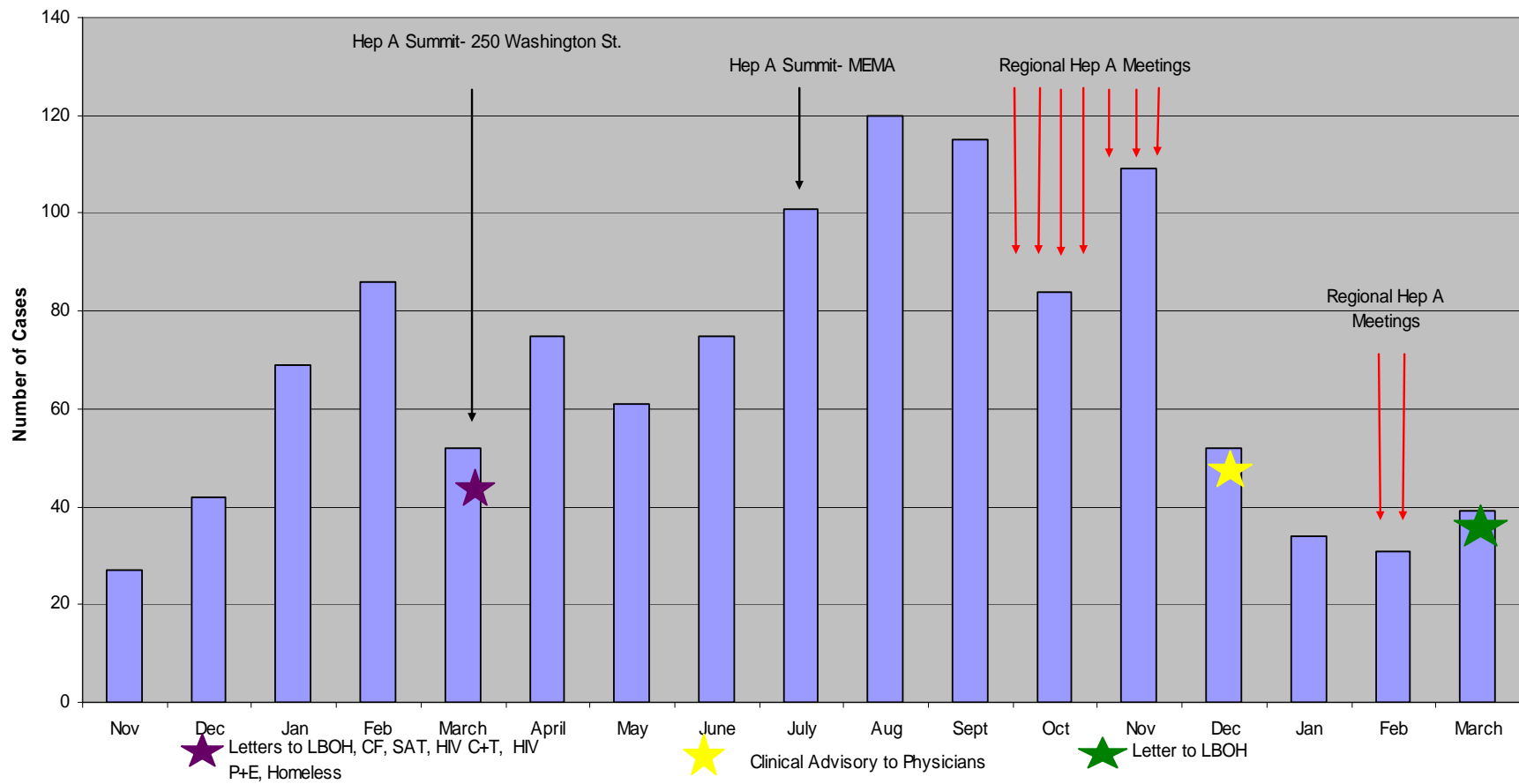
Name: \_\_\_\_\_  
Address: \_\_\_\_\_  
City: \_\_\_\_\_  
State: \_\_\_\_\_  
Zip: \_\_\_\_\_  
Phone: \_\_\_\_\_  
E-mail: \_\_\_\_\_



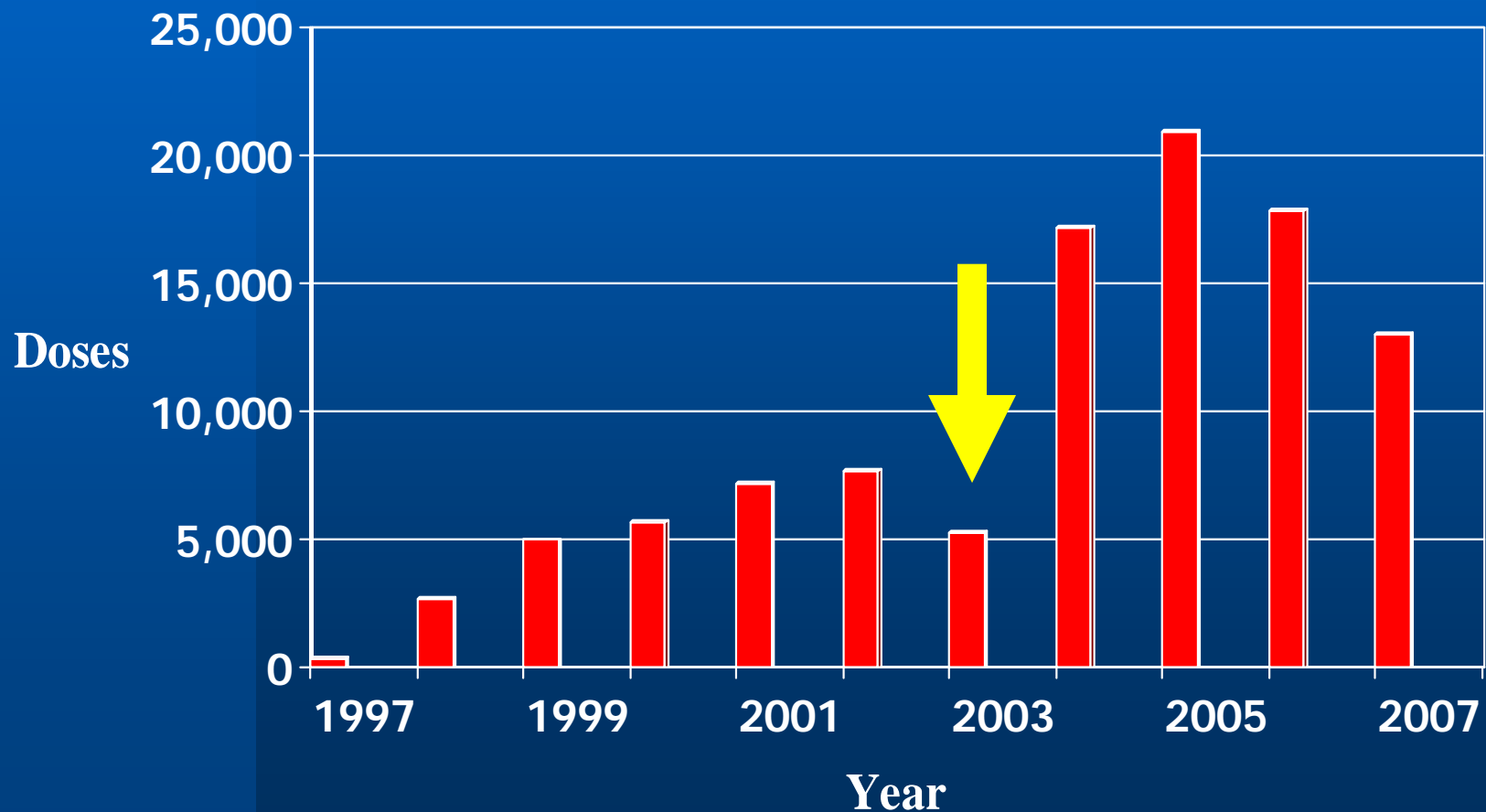
# Prevention

- Hand washing
- All IDU and homeless populations in the targeted areas should receive at least ONE dose of hepatitis A vaccine (if possible they should receive a booster in 6–18 months)
- Close contacts of cases received IG
- Toll-free Hepatitis Hotline was established for public to call: 888-443-HEPA(4372)
- MDPH Hep A web site:  
<http://www.mass.gov/dph/cdc/epii/hepatitis/hepa.htm>

## Hepatitis A Outbreak and Interventions



# Adult Hepatitis A Vaccine Distribution 1997 - 2007



# Hepatitis A Surveillance Data

- Incomplete data/Loss to follow-up
- Topography of exposure is unknown
- Sensitivity regarding disclosure
- Record review of existing database found multiple data entry errors and missing data that was corrected and updated
- Address matching was incomplete for approximately 10 cases due to inadequate address

# Problems with Spatial Clusters

- Not explicit (what is a cluster?)
- Are they statistically significant? (degree of confidence)
- What is the appropriate spatial scale?
- Often arbitrary, too general
- Over and under identification
- In general, the believability problem

# Thanks to...

Michelle Beaudoin, Springfield BOH

Evan Caten, MDPH

Franny Elson, MDPH

Dan Church, MDPH

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**“Anyone who thinks that they are too small to make a difference has never been bit by a mosquito.”**