# USING MAPS TO SUPPORT TOBACCO EVALUATION:
## An Overview of ArcGIS and Tableau

Lindsay Kephart, MPH

MA Tobacco Cessation and Prevention Program (MTCP)

Massachusetts Department of Public Health

# Overview

GIS to support evaluation efforts

Best uses of *Tableau* software and ArcGIS

Live Tableau Demo

# Evaluation activities

Demonstrating tobacco-related influence in the community

Mapping geographic disparities

Prioritization of program resources

Measuring program impact

Policy tracking & evaluation
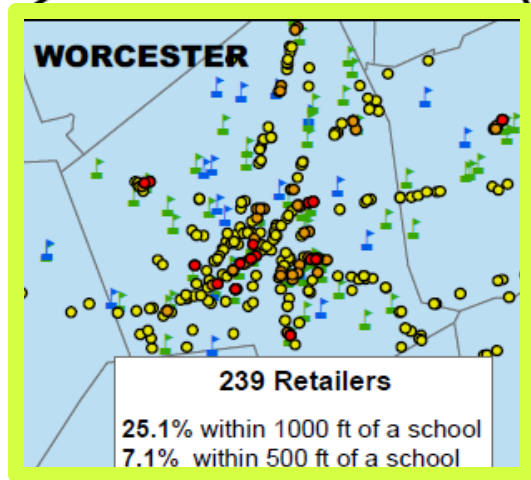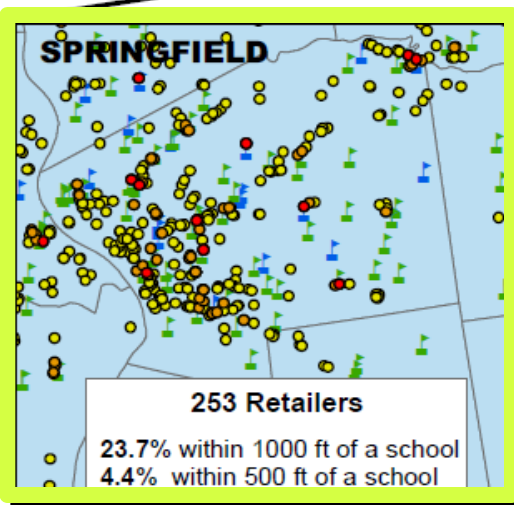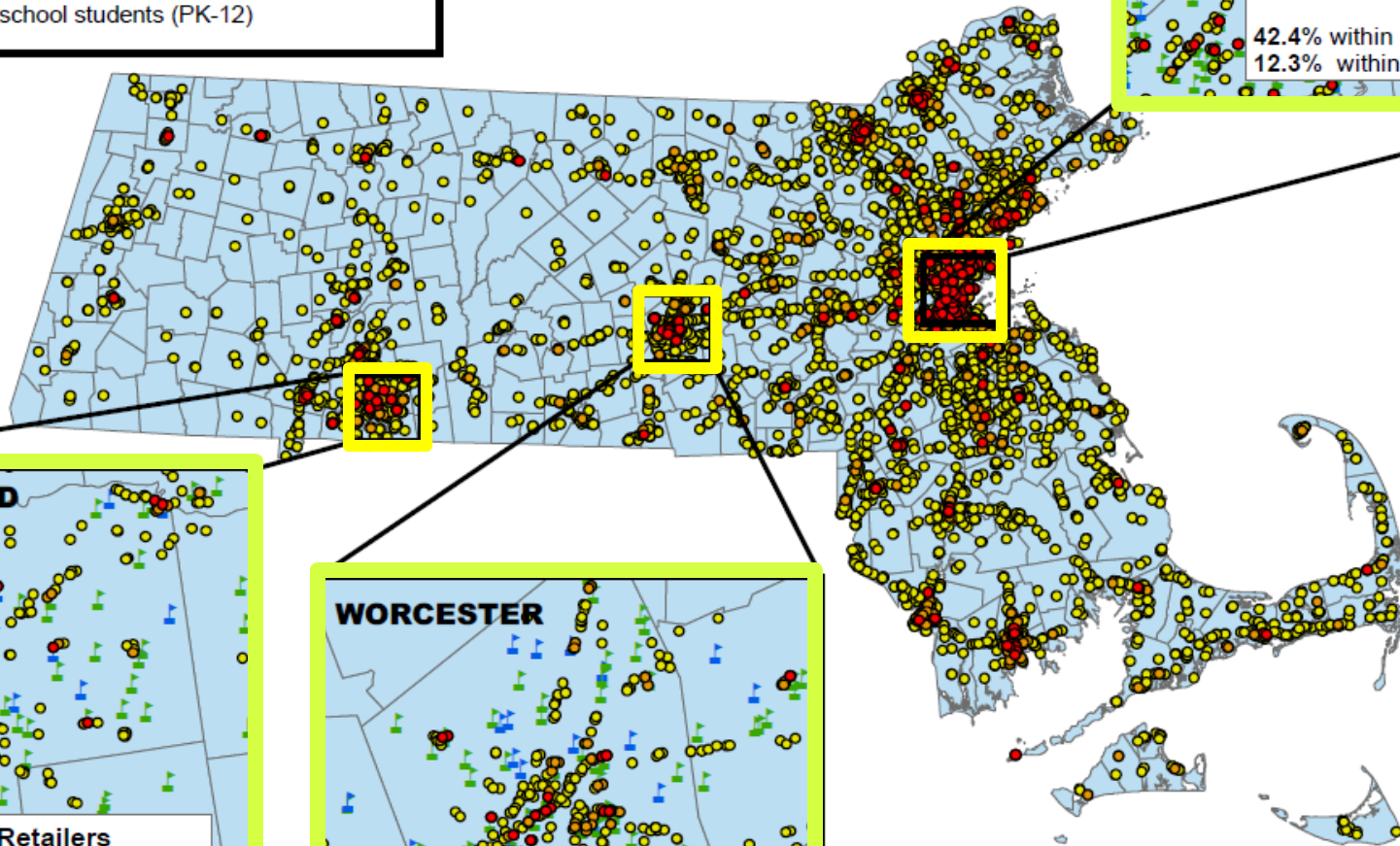
# Demonstrating tobacco-related influence in the community

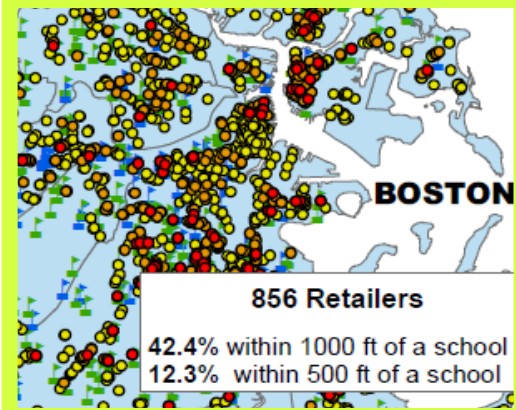# Tobacco Retailers

**Retailers**
- ● Retailers within 500 ft of a school *(315)*
- ● Retailers within 1000 ft of a school *(1,361)*
- ● Retailers more than 1000 ft from a school *(6,083)*

**Schools**
- ⚑ Without high school students (PK-9)
- ⚑ With high school students (PK-12)

## BOSTON

**856 Retailers**

**42.4%** within 1000 ft of a school
**12.3%** within 500 ft of a school

## SPRINGFIELD

**253 Retailers**

**23.7%** within 1000 ft of a school
**4.4%** within 500 ft of a school

## WORCESTER

**239 Retailers**

**25.1%** within 1000 ft of a school
**7.1%** within 500 ft of a school

Make smoking history.

# Demonstrating tobacco-related influence in the community



PITTSFIELD: Tobacco Retailers, 2016
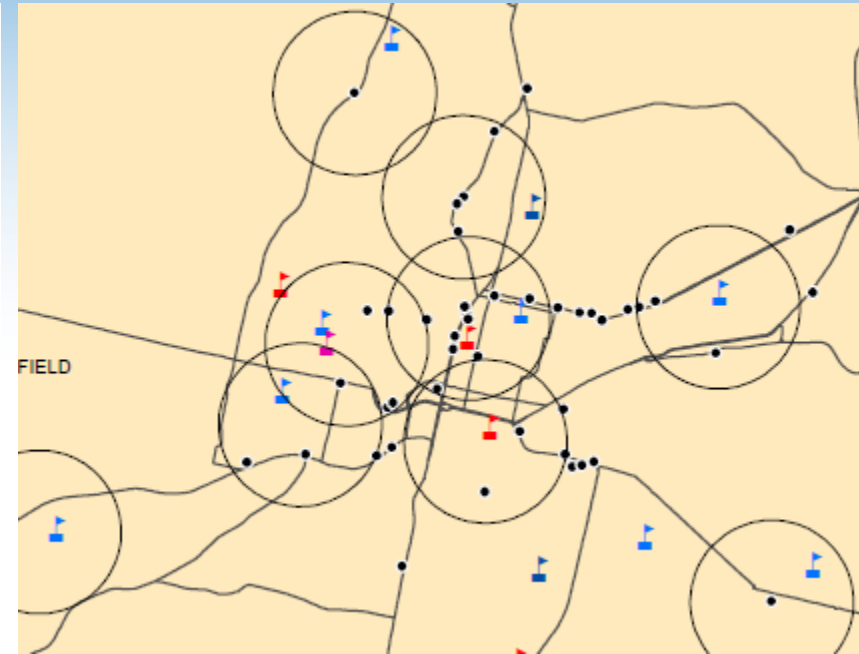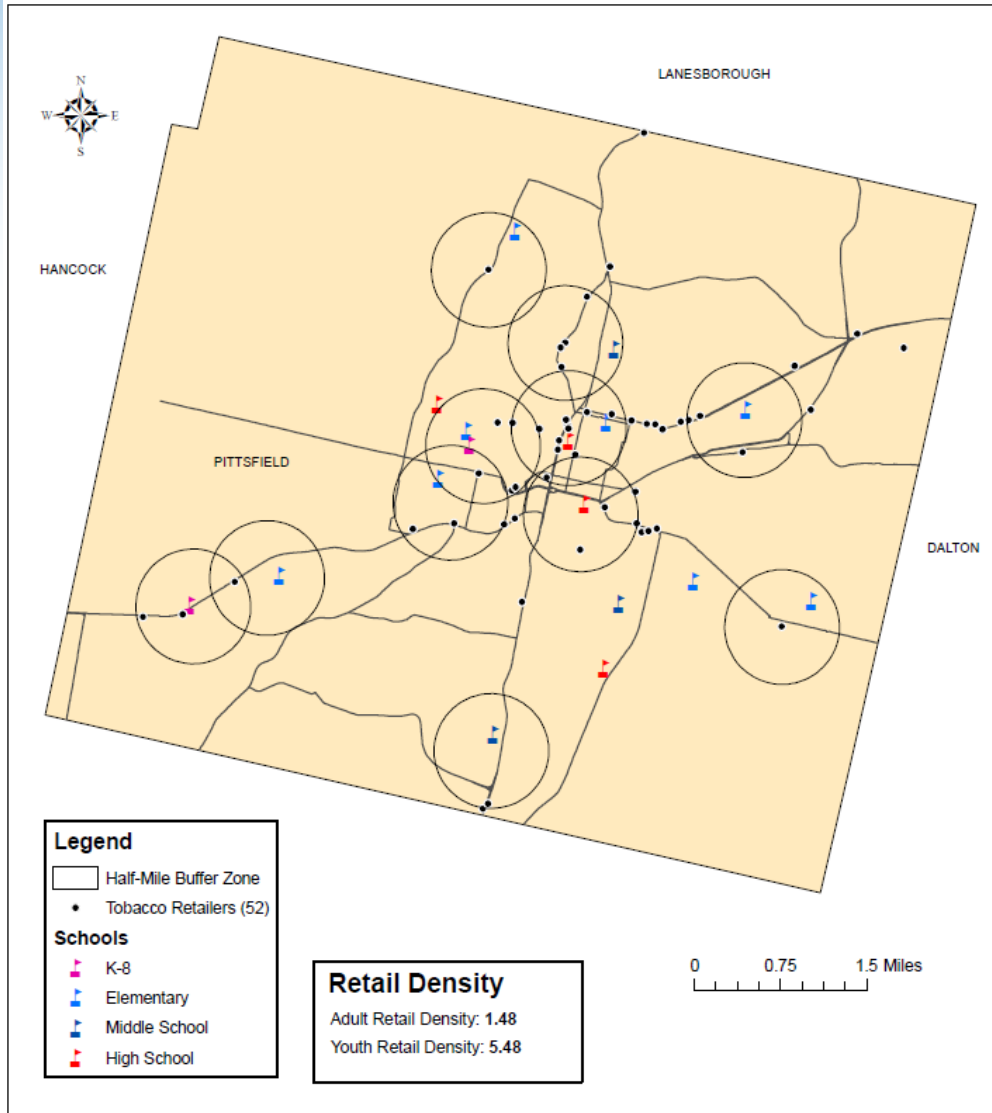
- Retail density near schools
- Comparison to statewide rates

**Can be used to educate local policy makers & stakeholders**

Lynn: Tobacco Retail Density by Zip Code, 2015

# Geographic Disparities



Smoking Rate (2013-2014) in Massachusetts

**Smoking Rate (2013-2014)**

- Less than 11.8%
- 11.8% to < 15.2%
- 15.2% to < 18.4%
- Greater than 18.4%
- Not Avaliable
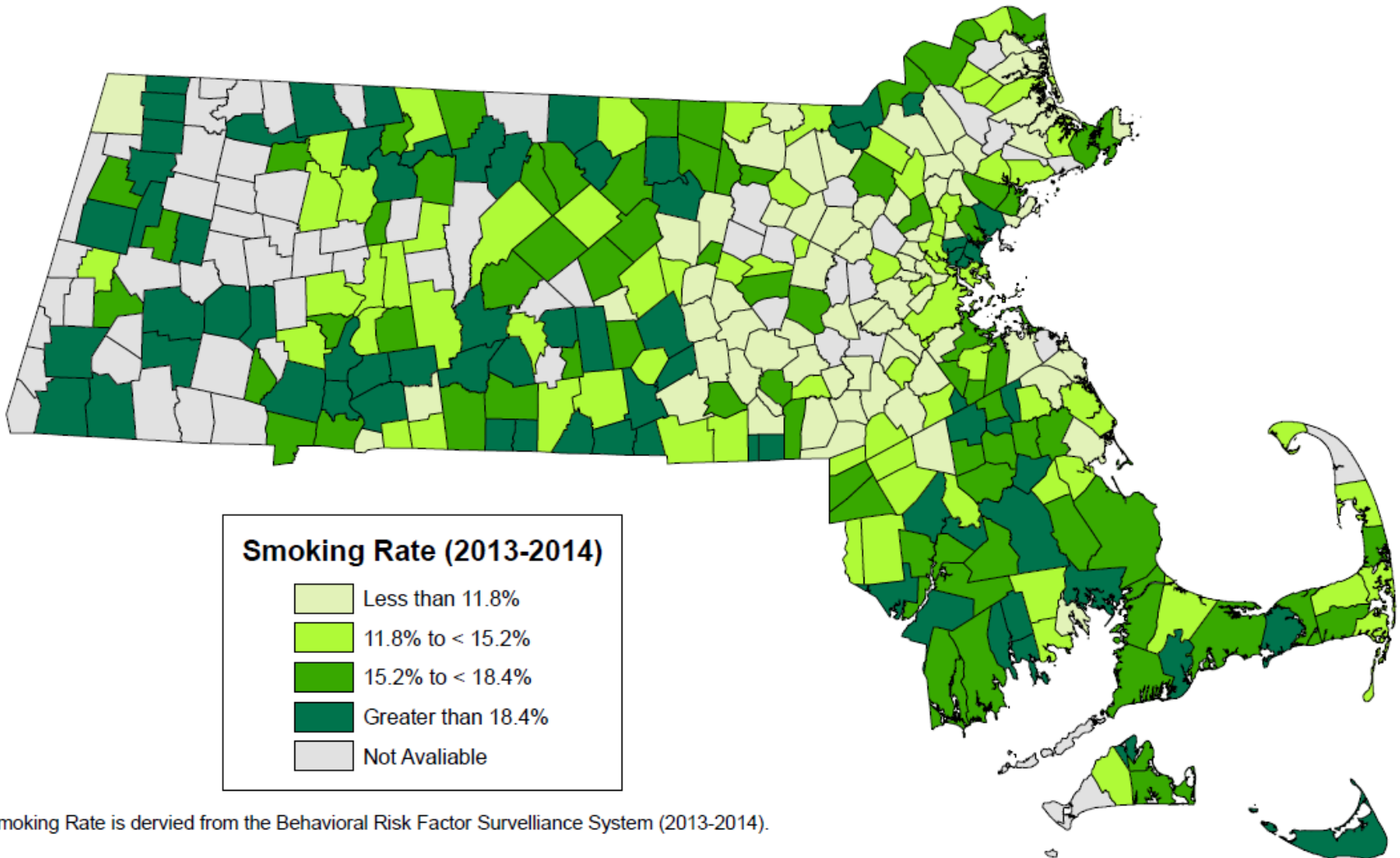
Smoking Rate is dervied from the Behavioral Risk Factor Survelliance System (2013-2014).

# Geographic Disparities



Density of Tobacco Retailers by Muncipality per 1,000 Residents

**Retailers per 1,000 Residents**

- < 0.8 - Very Low
- 0.8 - < 1.0 - Moderately Low
- 1.0 - < 1.2 - Average
- 1.2 - < 1.5 - Moderately High
- 1.5+ - Very High
- N/A*

Make smoking history.
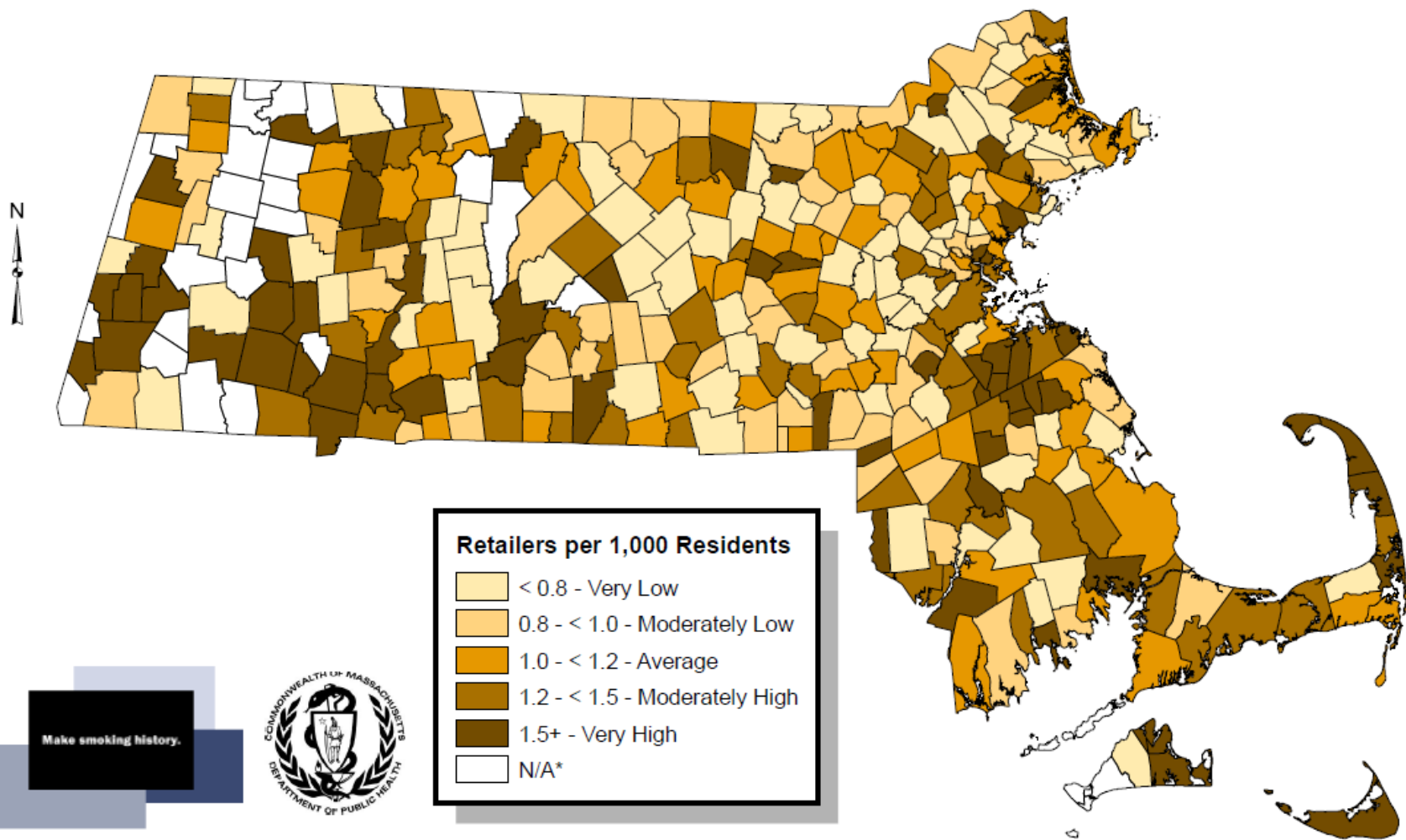
*Retail density is not calculated for towns with a population <1,000 residents.

Population Data from 2010 US Census
Updated 4/12/2016

# Environmental Justice Block Groups and Retail Density



**Exploratory spatial analysis**

- Relationship between retail density, % non-white population and low-income populations

**Retail Density**

243 Tobacco Retailers **(97% of retailers)** are located in EJ block groups.

| EJ Region | % of Retailers | Retail Density |
|-----------|----------------|----------------|
| I | 0 | - |
| M | 21.6% | 1.98 |
| M/I | 59.6% | 2.56 |
| M/I/E | 16.0% | 2.84 |

**EJ Block Groups**

- Income
- Minority or English Isolation
- Minority & Income
- Minority & Income & English Isolation

**Legend**

- Tobacco Retailers (230)
- Springfield Schools (67)

0  0.4  0.8  1.2  1.6  2
Miles
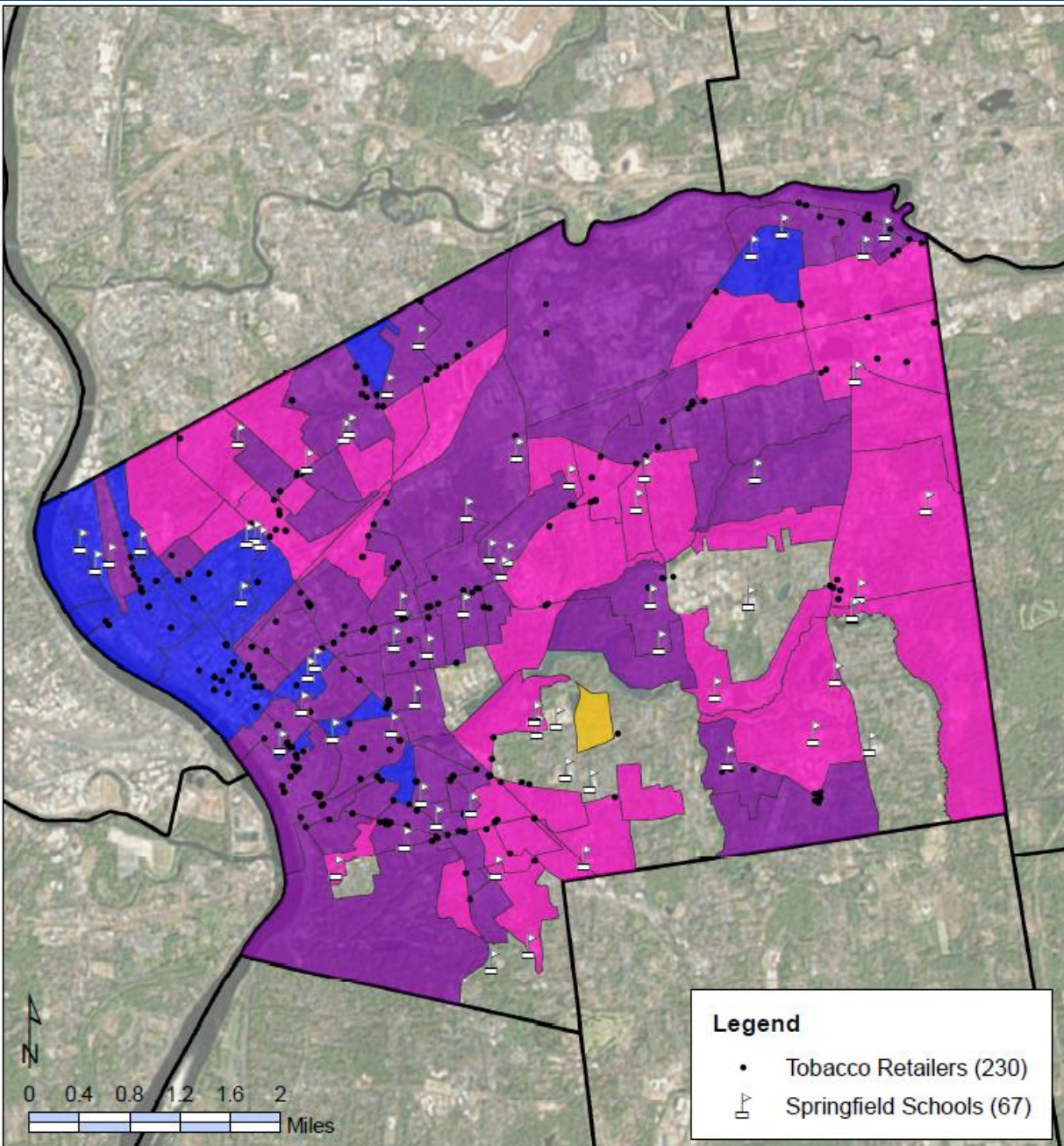
# Prioritization of program resources

MTCP has used community-level tobacco related metrics to inform the prioritization of program resources to high-need communities.

*Data visualization can help visually identify priority areas.*

Turn this ⬇

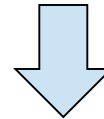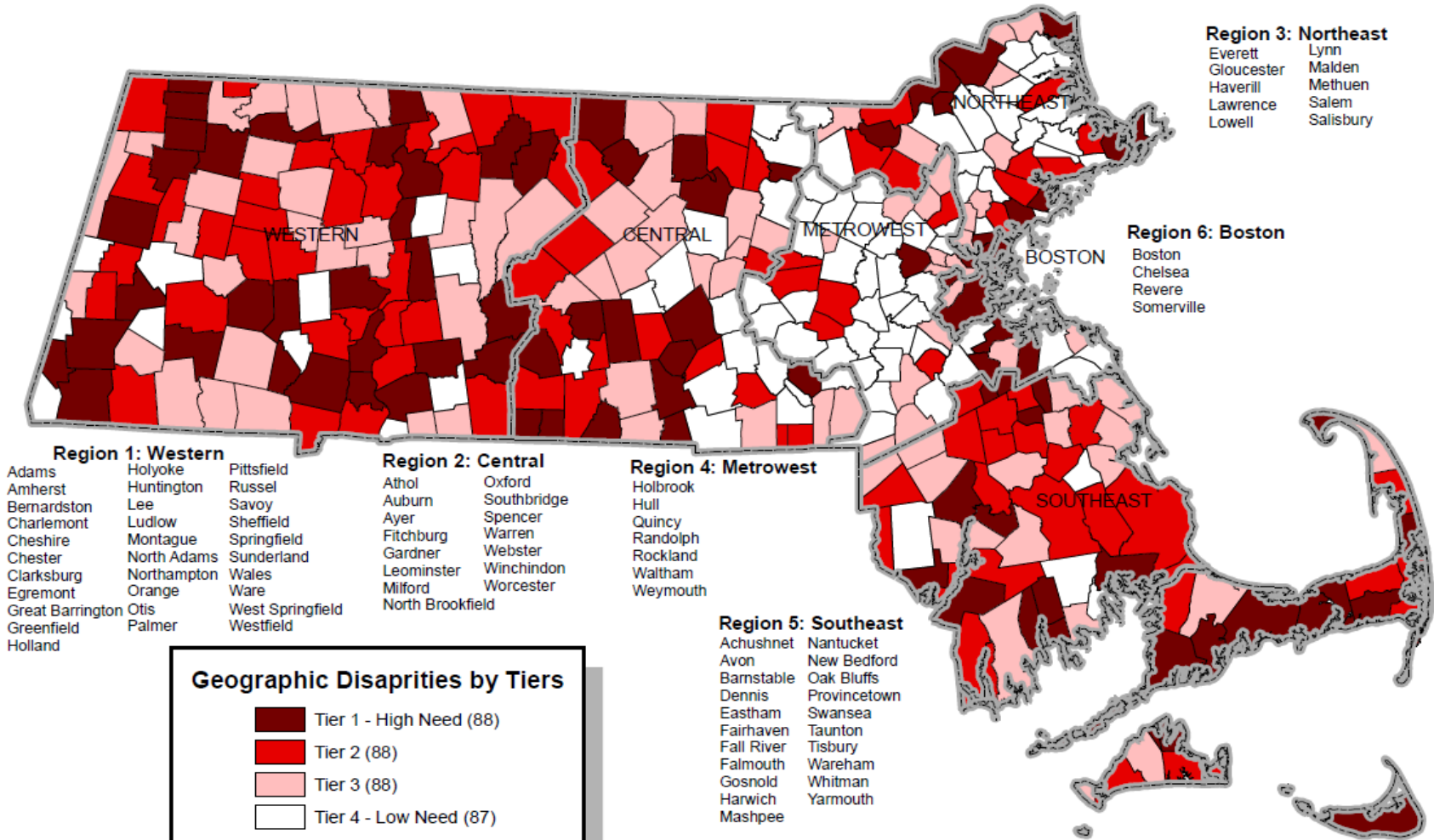| Town_ID | CityTown | County | Tot_Pop | Median_in | pct_below | smoking tier | masshealth tier | mi tier | smoking | Income R | Poverty Ra | YRD Ran | MassHealth | ental Illness | gregate | Final Ra | Tier |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 209 | North Adams | Berkshire | 13708 | 35401 | 16.1 | Tier 1 (18.5 - 32.2) | Tier 1 (13.3–46) | Tier 1 (11.2–23.8) | 262 | 346 | 108 | 216 | 291 | 272 | 1495 | 249 | 1 |
| 201 | New Bedford | Bristol | 95072 | 36172 | 22.7 | Tier 1 (18.5 - 32.2) | Tier 1 (13.3–46) | Tier 1 (11.2–23.8) | 256 | 345 | 120 | 174 | 302 | 281 | 1478 | 246 | 1 |
| 149 | Lawrence | Essex | 76377 | 31631 | 26.5 | Tier 1 (18.5 - 32.2) | Tier 1 (13.3–46) | Tier 1 (11.2–23.8) | 248 | 350 | 122 | 156 | 310 | 284 | 1470 | 245 | 1 |
| 281 | Springfield | Hampden | 153060 | 34628 | 27.6 | Tier 1 (18.5 - 32.2) | Tier 1 (13.3–46) | Tier 1 (11.2–23.8) | 233 | 347 | 123 | 174 | 307 | 280 | 1464 | 244 | 1 |
| 137 | Holyoke | Hampden | 39880 | 31948 | 31.7 | Tier 1 (18.5 - 32.2) | Tier 1 (13.3–46) | Tier 1 (11.2–23.8) | 197 | 349 | 125 | 199 | 308 | 282 | 1460 | 243 | 1 |
| 163 | Lynn | Essex | 90329 | 43200 | 19.3 | Tier 1 (18.5 - 32.2) | Tier 1 (13.3–46) | Tier 1 (11.2–23.8) | 239 | 337 | 116 | 184 | 305 | 277 | 1458 | 243 | 1 |
| 278 | Southbridge | Worcester | 16719 | 47234 | 12.7 | Tier 1 (18.5 - 32.2) | Tier 1 (13.3–46) | Tier 1 (11.2–23.8) | 258 | 327 | 97 | 180 | 303 | 276 | 1441 | 240 | 1 |
| 309 | Ware | Hampshire | 9872 | 51094 | 13.7 | Tier 1 (18.5 - 32.2) | Tier 1 (13.3–46) | Tier 1 (11.2–23.8) | 259 | 313 | 101 | 212 | 284 | 270 | 1439 | 240 | 1 |
| 223 | Orange | Franklin | 7839 | 42809 | 11.8 | Tier 1 (18.5 - 32.2) | Tier 1 (13.3–46) | Tier 1 (11.2–23.8) | 253 | 339 | 93 | 208 | 279 | 259 | 1431 | 239 | 1 |
| 57 | Chelsea | Suffolk | 35177 | 40487 | 24.2 | Tier 1 (18.5 - 32.2) | Tier 1 (13.3–46) | Tier 1 (11.2–23.8) | 250 | 343 | 121 | 179 | 274 | 252 | 1419 | 237 | 1 |
| 192 | Montague | Franklin | 8437 | 42140 | 16.8 | Tier 1 (18.5 - 32.2) | Tier 1 (13.3–46) | Tier 1 (11.2–23.8) | 243 | 340 | 109 | 184 | 278 | 264 | 1418 | 236 | 1 |
| 94 | Fairhaven | Bristol | 15873 | 54144 | 10.2 | Tier 1 (18.5 - 32.2) | Tier 1 (13.3–46) | Tier 1 (11.2–23.8) | 213 | 300 | 84 | 236 | 299 | 278 | 1410 | 235 | 1 |
| 348 | Worcester | Worcester | 181045 | 45036 | 18.3 | Tier 1 (18.5 - 32.2) | Tier 1 (13.3–46) | Tier 1 (11.2–23.8) | 202 | 334 | 114 | 171 | 304 | 269 | 1394 | 232 | 1 |
| 160 | Lowell | Middlesex | 106519 | 50192 | 17.5 | Tier 1 (18.5 - 32.2) | Tier 1 (13.3–46) | Tier 1 (11.2–23.8) | 252 | 318 | 111 | 136 | 300 | 274 | 1391 | 232 | 1 |
| 236 | Pittsfield | Berkshire | 44737 | 43188 | 16 | Tier 1 (18.5 - 32.2) | Tier 1 (13.3–46) | Tier 1 (11.2–23.8) | 247 | 338 | 107 | 150 | 283 | 263 | 1388 | 231 | 1 |
| 248 | Revere | Suffolk | 51755 | 49759 | 14.7 | Tier 1 (18.5 - 32.2) | Tier 1 (13.3–46) | Tier 1 (11.2–23.8) | 224 | 321 | 103 | 161 | 297 | 273 | 1379 | 230 | 1 |
| 316 | Webster | Worcester | 16767 | 48640 | 12.2 | Tier 1 (18.5 - 32.2) | Tier 1 (13.3–46) | Tier 1 (11.2–23.8) | 232 | 325 | 96 | 202 | 264 | 260 | 1379 | 230 | 1 |
| 227 | Palmer | Hampden | 12140 | 50638 | 11.8 | Tier 1 (18.5 - 32.2) | Tier 1 (13.3–46) | Tier 1 (11.2–23.8) | 234 | 316 | 93 | 234 | 241 | 253 | 1371 | 229 | 1 |
| 114 | Greenfield | Franklin | 17456 | 45261 | 14.9 | Tier 1 (18.5 - 32.2) | Tier 1 (13.3–46) | Tier 1 (11.2–23.8) | 223 | 333 | 104 | 209 | 242 | 254 | 1365 | 228 | 1 |
| 93 | Everett | Middlesex | 41667 | 49737 | 11.9 | Tier 1 (18.5 - 32.2) | Tier 2 (10.7 - 13.2) | Tier 1 (11.2–23.8) | 257 | 322 | 94 | 194 | 222 | 266 | 1355 | 226 | 1 |
| 113 | Great Barrington | Berkshire | 7104 | 52843 | 8.5 | Tier 1 (18.5 - 32.2) | Tier 1 (13.3–46) | Tier 1 (11.2–23.8) | 235 | 307 | 72 | 246 | 269 | 226 | 1355 | 226 | 1 |
| 310 | Wareham | Plymouth | 21822 | 54451 | 9 | Tier 1 (18.5 - 32.2) | Tier 1 (13.3–46) | Tier 1 (11.2–23.8) | 246 | 299 | 76 | 233 | 237 | 258 | 1349 | 225 | 1 |
| 325 | West Springfield | Hampden | 28391 | 51358 | 12.2 | Tier 1 (18.5 - 32.2) | Tier 1 (13.3–46) | Tier 1 (11.2–23.8) | 195 | 312 | 96 | 207 | 281 | 256 | 1347 | 225 | 1 |
| 4 | Adams | Berkshire | 8485 | 38340 | 10.3 | Tier 1 (18.5 - 32.2) | Tier 1 (13.3–46) | Tier 1 (11.2–23.8) | 260 | 344 | 85 | 145 | 250 | 262 | 1346 | 224 | 1 |
| 293 | Taunton | Bristol | 55874 | 53600 | 12.1 | Tier 1 (18.5 - 32.2) | Tier 1 (13.3–46) | Tier 1 (11.2–23.8) | 236 | 303 | 95 | 164 | 277 | 265 | 1340 | 223 | 1 |
| 329 | Westfield | Hampden | 41094 | 51620 | 11.8 | Tier 1 (18.5 - 32.2) | Tier 1 (13.3–46) | Tier 1 (11.2–23.8) | 201 | 310 | 93 | 217 | 264 | 250 | 1335 | 223 | 1 |
| 289 | Sunderland | Franklin | 3684 | 53945 | 16.1 | Tier 2 (15.3 - 18.2) | Tier 1 (13.3–46) | Tier 1 (11.2–23.8) | 176 | 301 | 108 | 244 | 265 | 227 | 1321 | 220 | 1 |

## Geographic Disparities in Massachusetts, 2016



**Region 3: Northeast**
Everett / Lynn
Gloucester / Malden
Haverill / Methuen
Lawrence / Salem
Lowell / Salisbury

**Region 6: Boston**
Boston
Chelsea
Revere
Somerville

**Region 1: Western**
Adams / Holyoke / Pittsfield
Amherst / Huntington / Russel
Bernardston / Lee / Savoy
Charlemont / Ludlow / Sheffield
Cheshire / Montague / Springfield
Chester / North Adams / Sunderland
Clarksburg / Northampton / Wales
Egremont / Orange / Ware
Great Barrington / Otis / West Springfield
Greenfield / Palmer / Westfield
Holland

**Region 2: Central**
Athol / Oxford
Auburn / Southbridge
Ayer / Spencer
Fitchburg / Warren
Gardner / Webster
Leominster / Winchindon
Milford / Worcester
North Brookfield

**Region 4: Metrowest**
Holbrook
Hull
Quincy
Randolph
Rockland
Waltham
Weymouth

**Region 5: Southeast**
Achushnet / Nantucket
Avon / New Bedford
Barnstable / Oak Bluffs
Dennis / Provincetown
Eastham / Swansea
Fairhaven / Taunton
Fall River / Tisbury
Falmouth / Wareham
Gosnold / Whitman
Harwich / Yarmouth
Mashpee

### Geographic Disparities by Tiers

- Tier 1 - High Need (88)
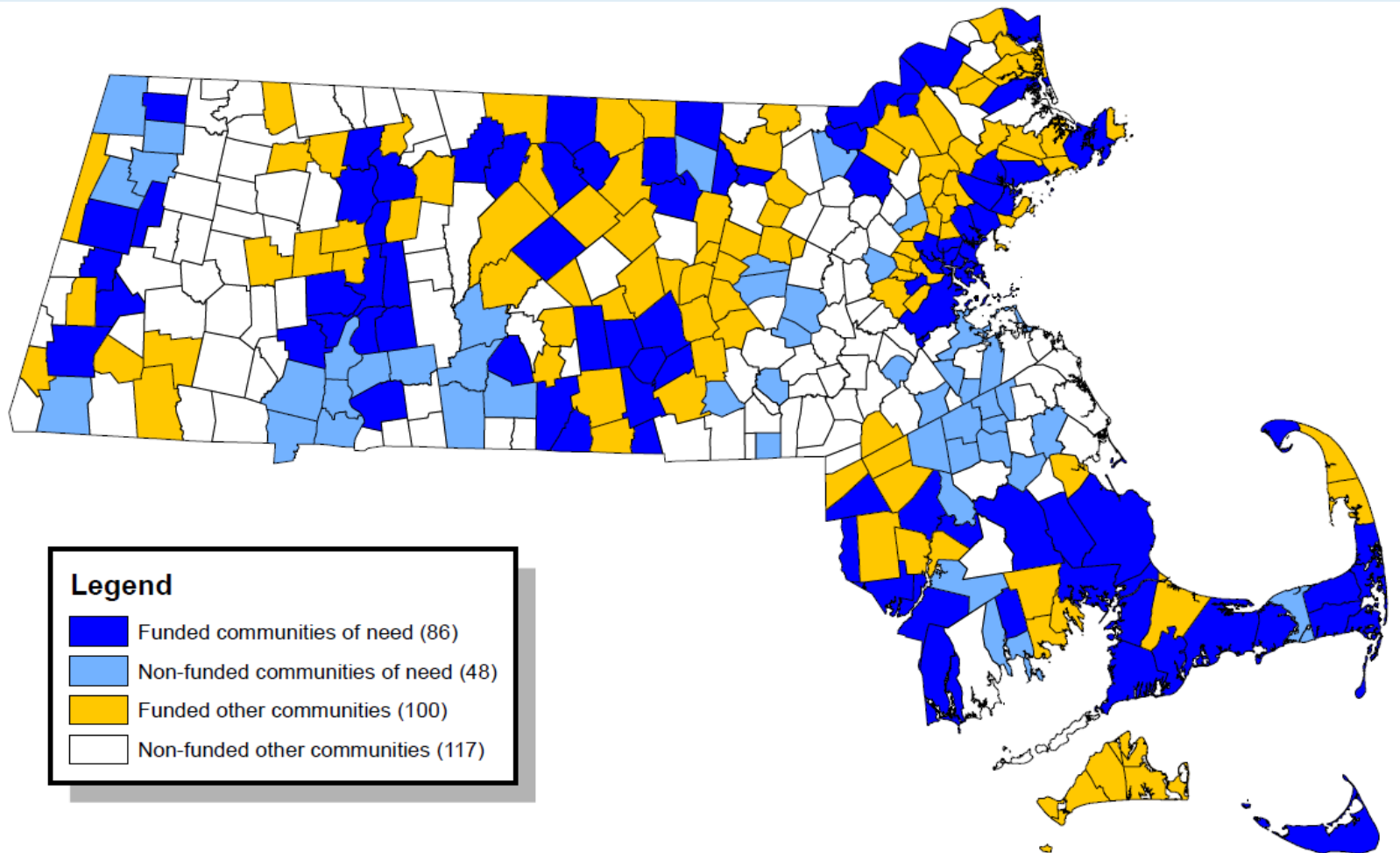- Tier 2 (88)
- Tier 3 (88)
- Tier 4 - Low Need (87)

*Tier 1 communities, or the highest need communities, are listed by region

The criteria to determine if a town is a priority community includes: median income, percent below federal poverty level, smoking rate, youth retail density, percent of residents with Medicaid and percent of residents with mental illness.

Median income and percent below federal poverty level is obtained from the 2010 U.S. Census
Smoking rate and percent of residents with Medicaid or mental illness were calculated using small area estimates based on 2013-2014 BRFSS

# Prioritization of program resources

Identify current funding and make adjustments to better address tobacco inequities.



Legend
- Funded communities of need (86)
- Non-funded communities of need (48)
- Funded other communities (100)
- Non-funded other communities (117)

# Measuring program impact

## Using maps & census data to illustrate program *reach*



**Population Reached by Healthy Eating and Physical Activity Sites**

- ● Farmers Markets in Maintenance
- ● Markets in Maintenance
- ◐ Markets in Conversion
- ◐ Farmers Markets in Conversion
- ▨ Environmental Justice Block Groups

**Worcester**
Mass in Motion

### Population Reached by Healthy Eating Sites

| | |
|---|---|
| % of total community population reached by sites in maintenance | 16% |
| % of "High Need" population reached by sites in maintenance | 23% |
| % of additional population reached by sites in conversion | 27% |

Sites in "conversion" are in one of several phases of assessment and planning prior to making a healthy change in operations or being implemented for physical activity. Sites "in maintenance" or "implementation" have changed operations or have implemented a project plan.

Buffers around Mass in Motion sites vary from ¼ mile to 1 mile depending on the type of site. Population reach is calculated by estimating the population that lives in block groups reached by the buffers. Block groups shaded in purple represent areas of high need based on household income, minority population, or linguistic isolation.
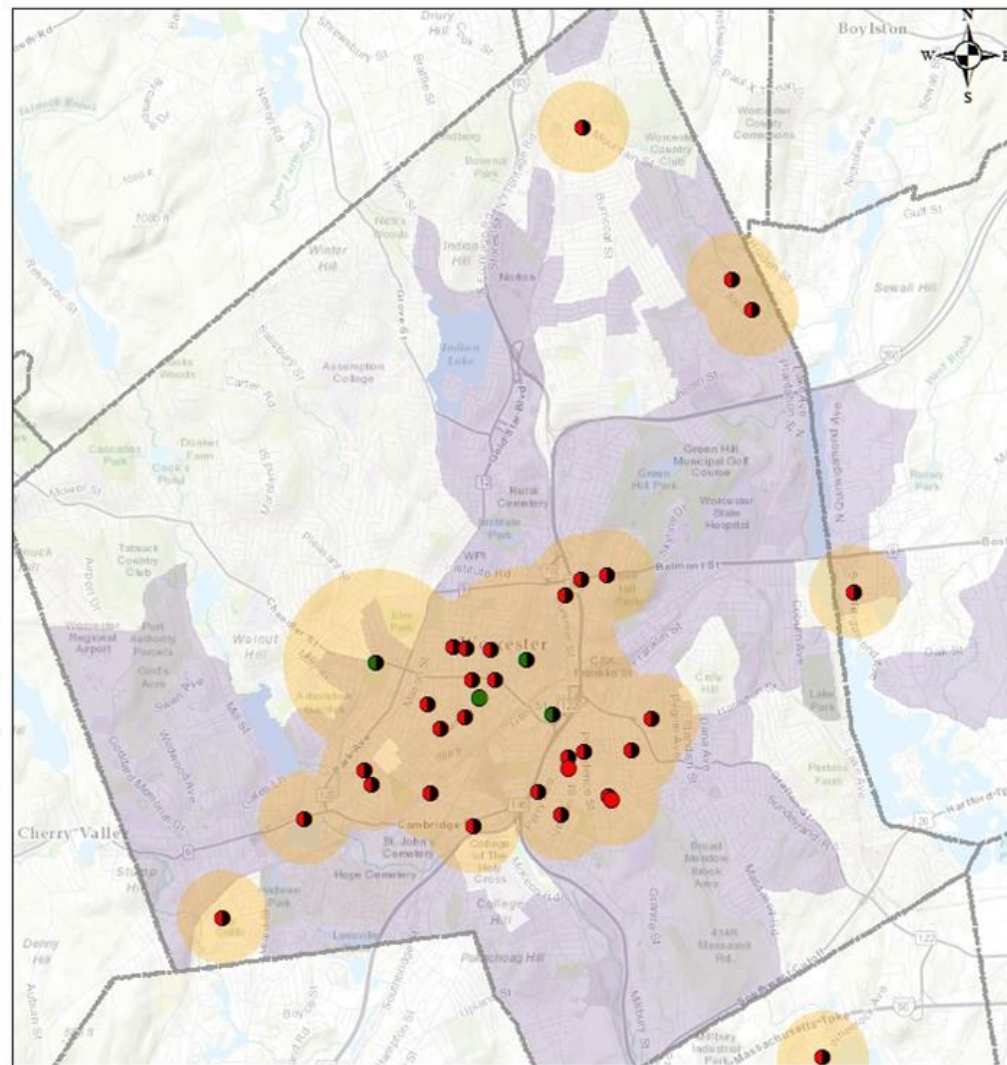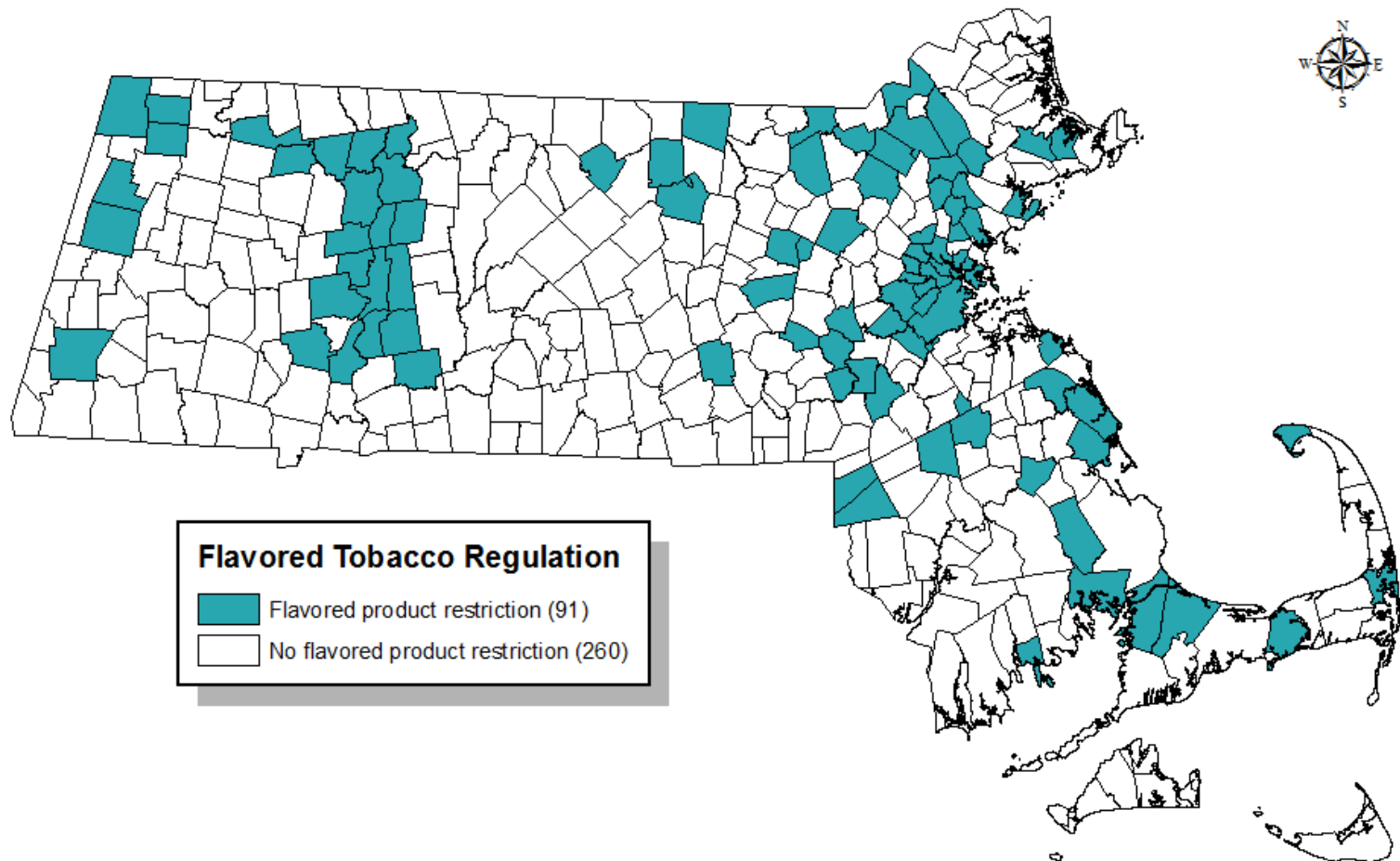
Updated as of June 2016

# Policy tracking & evaluation

Display which municipalities have certain priority policies



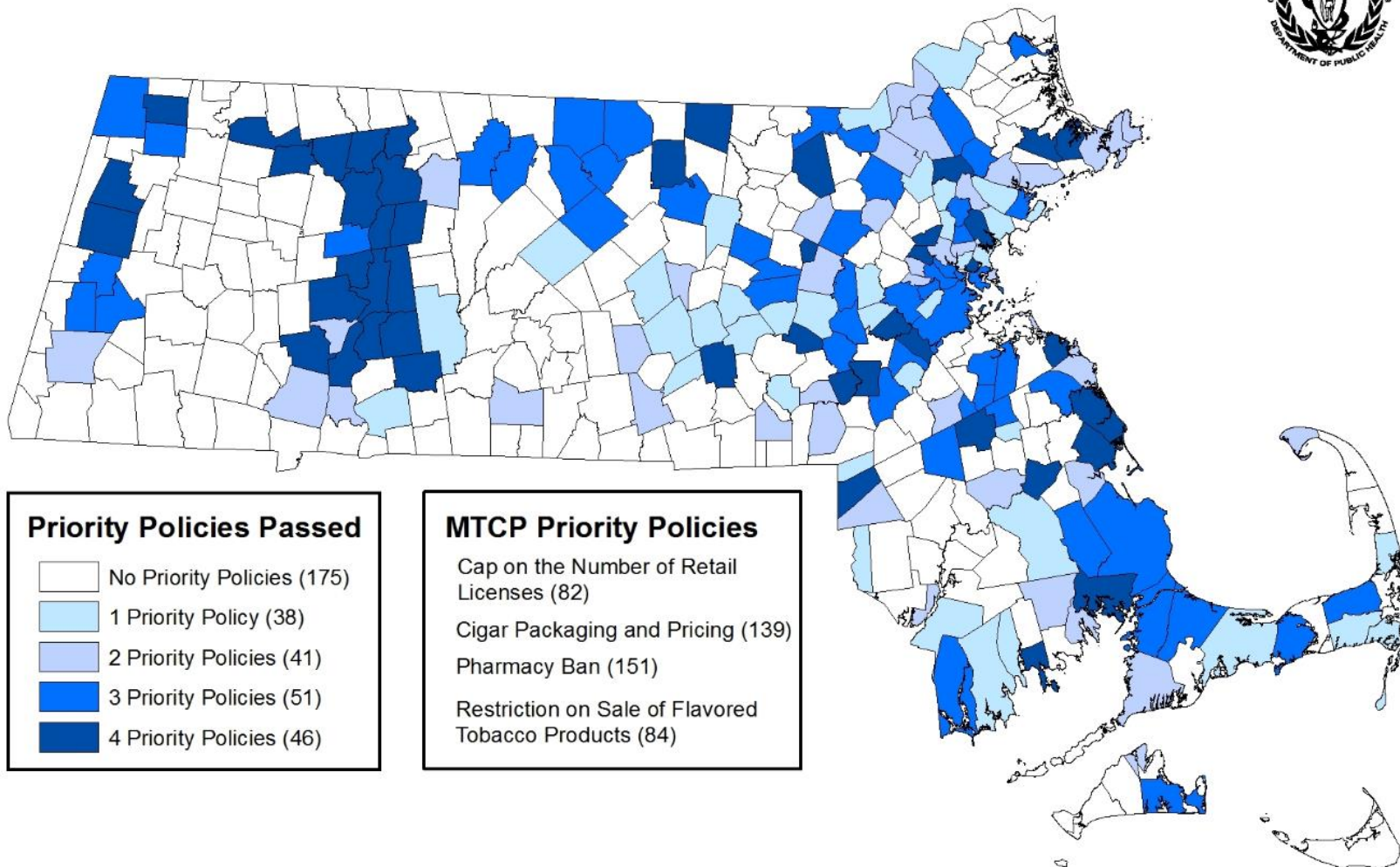**Municipalities with Regulations Restricting the Sale of Flavored Tobacco Products**

**Flavored Tobacco Regulation**

- Flavored product restriction (91)
- No flavored product restriction (260)

# Policy tracking & evaluation

## Visually show policy progress to date



Priority Policies Passed in Massachusetts Communities, 2017

**Priority Policies Passed**
- No Priority Policies (175)
- 1 Priority Policy (38)
- 2 Priority Policies (41)
- 3 Priority Policies (51)
- 4 Priority Policies (46)

**MTCP Priority Policies**
- Cap on the Number of Retail Licenses (82)
- Cigar Packaging and Pricing (139)
- Pharmacy Ban (151)
- Restriction on Sale of Flavored Tobacco Products (84)

Mapping in Tableau

# Tobacco Regulations in Massachusetts

| Ban of Tobacco Sale in Pharmacies | Cap on # of Retail Licenses | Minimum Legal Sale Age of 21 | Restriction on Packaging of Cheap Cigars | Restriction on Sale of Flavored Products | No Retail Tobacco Policies |
|---|---|---|---|---|---|
| 151 | 82 | 138 | 139 | 84 | 156 |



Number of Retail Tobacco Policies
- 0
- 1
- 2
- 3
- 4
- 5

© OpenStreetMap contributors
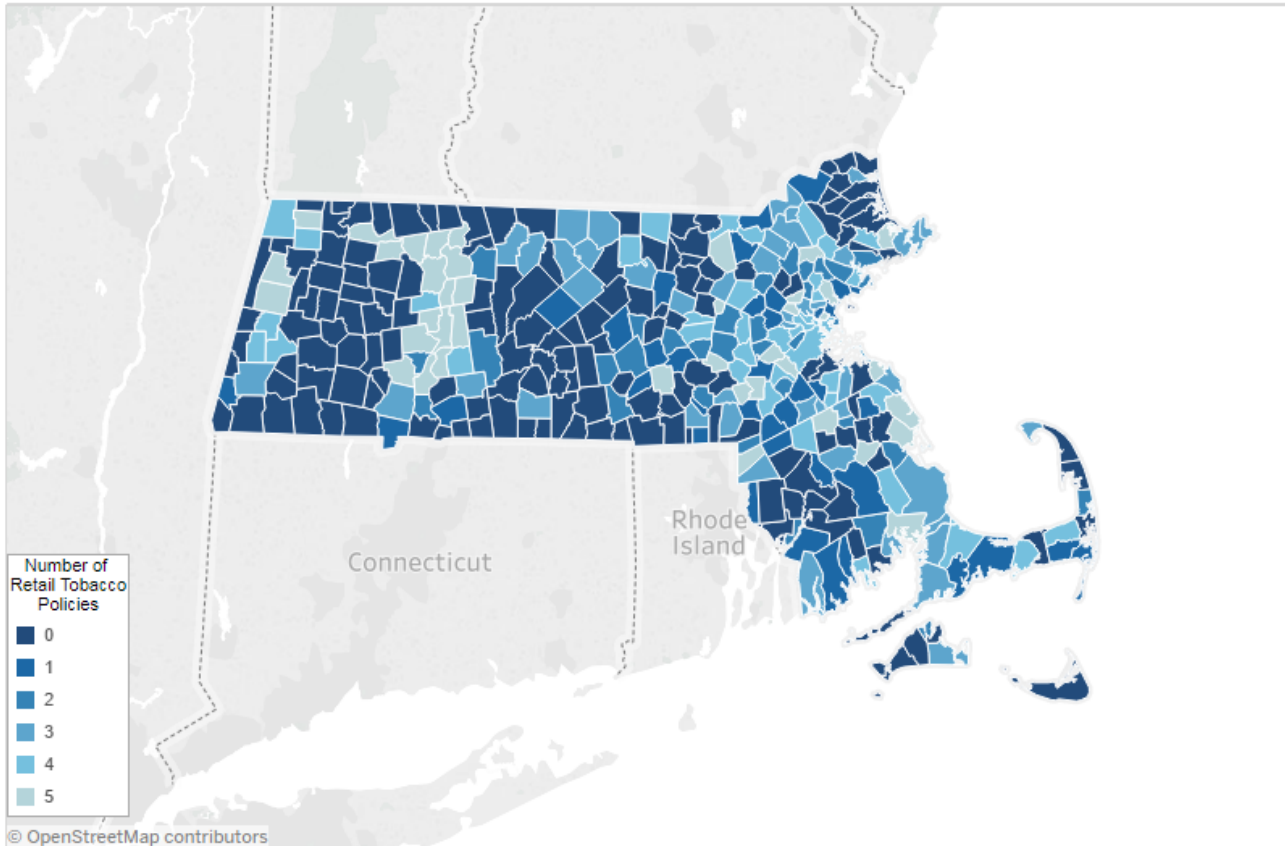
**Policies by City or County:**

**City/Town**
(All) ▼

**County**
(All) ▼

**Policy Filters**

**Retail Tobacco Policy**
- ● (All)
- ○ Ban of Tobacco Sale in Pharmacies
- ○ Cap on # of Retail Licenses
- ○ Minimum Legal Sale Age of 21
- ○ Restriction on Packaging of Cheap Cigars
- ○ Restriction on Sale of Flavored Products
- ○ No Retail Tobacco Policies

**Number of Policies**
- ☑ (All)
- ☑ No Tobacco Policy: 0 Policies
- ☑ 1-2 Policies
- ☑ 3 Policies
- ☑ Strong/Comprehensive: 4-5 Policies

| City/Town | Total Number of Retail Tobacco Policies | Ban of Tobacco Sale in Pharmacies | Cap on # of Retail Licenses | Minimum Legal Sale Age of 21 | Restriction on Packaging of Cheap Cigars | Restriction on Sale of Flavored Products | No Retail Tobacco Policies |
|---|---|---|---|---|---|---|---|
| Abington | 3 | ✕ | ✕ | | ✕ | | |
| Acton | 3 | ✕ | | ✕ | ✕ | | |
| Acushnet | 0 | | | | | | ✕ |
| Adams | 4 | ✕ | | ✕ | ✕ | ✕ | |
| Agawam | 0 | | | | | | ✕ |

Make smoking history.

Updated 2/28/17

⇦ Undo  →  Redo  ⇤ Reset

⚬⚬ Share   Download   Full Screen

+ableau
3,852 views

# Tableau Overview

Tableau is an interactive visualization software for internal or external use

- *Desktop, Server, Online, Public*

Can use for interactive mapping with the ability to display more information than a GIS map

- *Can also make charts, tables, graphs*

Users can hover and filter to change the visualization

Can display multiple metrics at one time

- *Easier comparison between metrics*
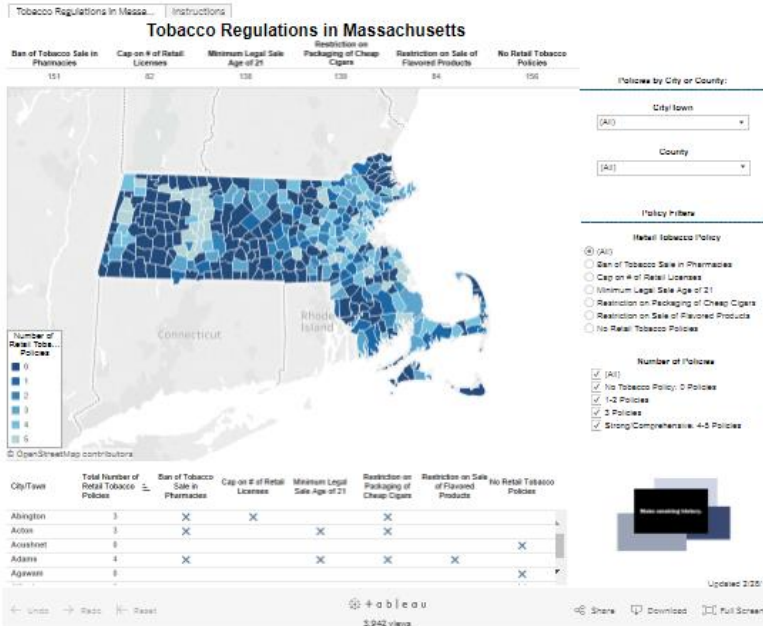
Easily updated

# Live Tableau Demo

## http://mahb.org/tobaccomaps/
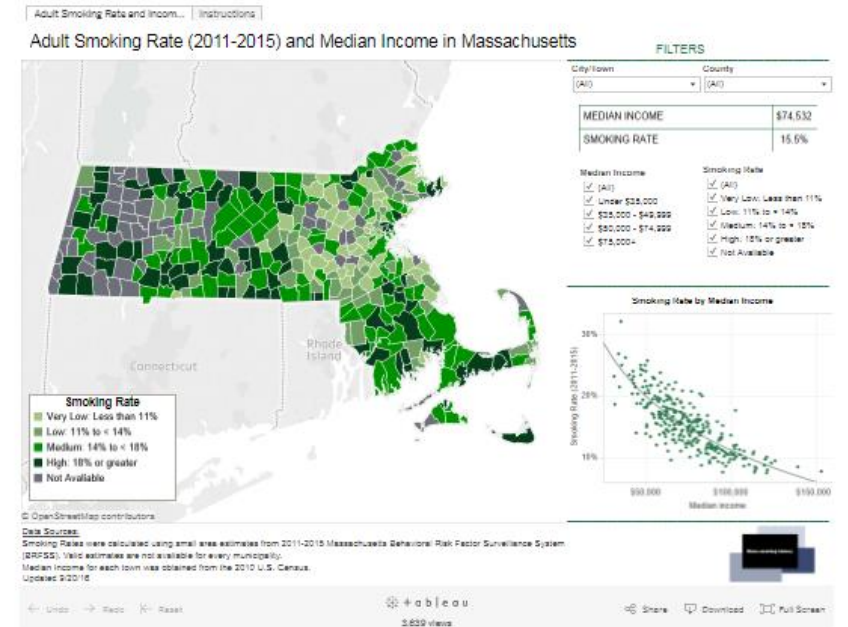
# ArcGIS and Tableau

| | ArcGIS | Tableau |
|---|---|---|
| Purpose | Desktop mapping of data; Used to create static maps | Desktop & Online visualization of data; can create interactive maps |
| Ease of Use | Clean data beforehand; Requires some technical skills | Can manipulate data in program; Interface is mostly drag and drop |
| Analysis | Can perform a variety of spatial analyses | More emphasis on visualization; less analysis |
| Display | Good for focusing on a particular topic; harder to display multiple relationships at one time | Easier to display multiple relationships at one time |
| Updating | May have to re-upload data & create new exports | Make edits to source data and refresh in Tableau |

# ArcGIS and Tableau

## MTCP primarily uses:

**ArcGIS for:**

- Displaying static maps with one primary focus
  - # of municipalities with a particular policy
  - Retail density and zipcode
  - Retail density near schools
- Easily exported/printed & shared with staff

**Tableau for:**

- Interacting with maps to show multiple relationships at once
  - Towns with both cigar or flavor policies
  - Compare smoking rates across a county
- Easily shared & viewed online for public and field staff; harder to print

# Summary

**Mapping** is an important tool used in MTCP evaluation efforts for visualizing tobacco-related metrics in Massachusetts communities

- Retail Density & Retailers near schools
- Geographic disparities (e.g. smoking rates)
- Prioritizing resources & measuring program impact
- Policy progress

Data visualization softwares such as *ArcGIS* and *Tableau* can help inform evaluators, program staff, field staff & the general public about local tobacco data

# THANK YOU

Questions?

*E-mail*: Lindsay.Kephart@state.ma.us