

Lecture 7:

Maps, 2 of 2: Choropleths and Dot Density

March 25, 2019

Overview

Course Administration

Good, Bad and Ugly

Mapping Theory

These Maps in R

Course Administration

1. Sign up for consultations!
2. Good/bad/ugly: we are off one week from what's online
3. Will fix later today
 - sign up for slots April 8, 10 or 11
 - no class meeting April 15
4. In-class workshop April 8: handout online
5. Anything else?

Class 8, April 1: Good Bad and Ugly

Send by 9 am next Monday. Look for a mapping graphic.

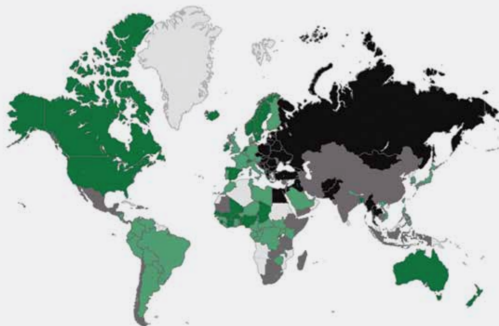
- MD
- GM

This Week's Good Bad and Ugly

- MF
- IT

Musirah's Example

Figure A1: Distribution of Migrant Acceptance Index Scores



Mapping Framework

Today

- Monmonier's important choices for choropleth maps
- Three types of maps
 1. Graduated symbols
 2. Dot density
 3. Choropleth
- Why use each one?
- Size versus intensity
- Best and worst practices
- Color: colorbrewer.org

Monmonier's Five Big Choices

1. “how many categories to use”
2. “how to make these categories reflect significant trends in the data”
3. “how to show progressive increases in intensity with an unambiguous series of graphically stable area symbols”
4. “how to describe the intensity variable clearly and concisely”
5. “how to link the symbols, classification, and intensity measurements with an informative, easily interpreted map key”

A Pathway to Answers

Start with the point

- What question are you trying to answer?
- What point are you trying to make?
- Which parts of the distribution are important?

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And think about the data

- What question can your data answer?
- What level of aggregation is required for your point?

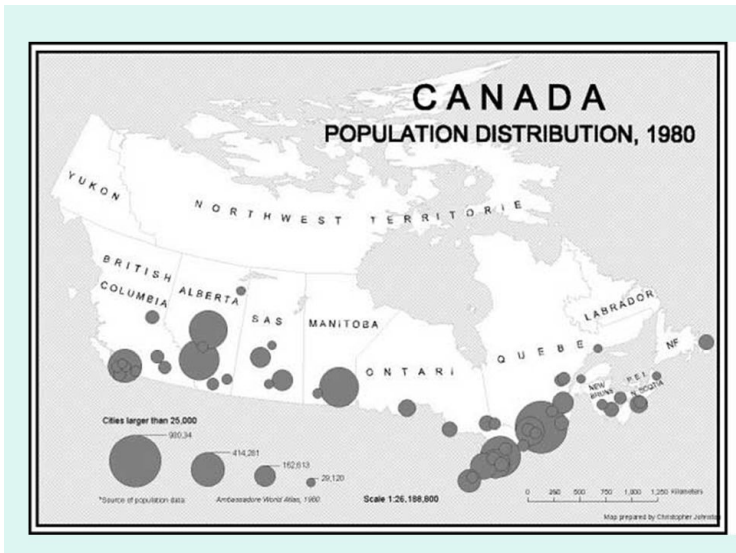
1. Graduated Symbols

- Use symbol of graduated size to convey size or number
- Plot symbol at center of polygon
- Or at point location
- Used to convey absolute magnitudes – examples?

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- Use symbol of graduated size to convey size or number
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- Used to convey absolute magnitudes – examples?
 - area
 - number of people
 - total home value

Graduated Symbol Example



Strengths and Weaknesses of Graduated Symbol Maps

What do you think?

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- Strengths
 - Disassociates area of administrative unit from area conveyed
 - One of few methods for conveying absolute magnitude geographically
- Weaknesses
 - Can be hard to see all areas
 - 2-D size frequently not interpreted quantitatively appropriately

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Best for situations where you want to convey relative, not absolute, magnitude

Best Practices for Graduated Symbol Maps

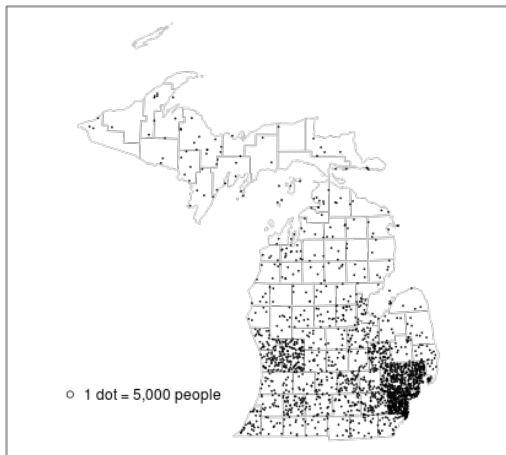
- Use them to convey magnitude
- Make symbols large enough to distinguish
- Be careful of overlap

2. Dot Density Maps

- Use dots within administrative unit polygons to represent magnitudes
- Similar to graduated symbol map, but can convey magnitude of more than one group
- Each dot can represent one unit, or can represent multiples, such as 10 people

Dot Density Example

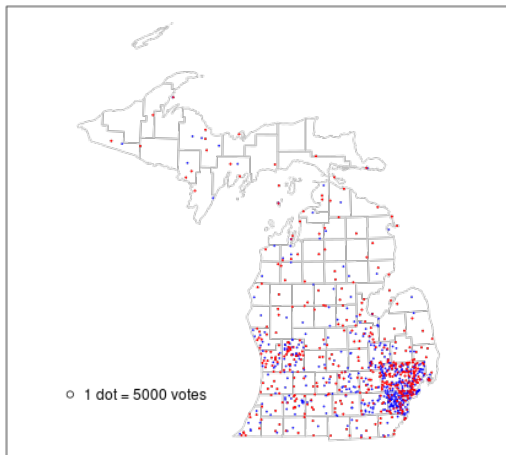
Michigan 2010 Population
Dot Density Map



From https://msu.edu/~ashton/classes/866/notes/lect20/dot_mapping.html

And With Two Variables

Michigan 2016 Election Dot Density Map



From https://msu.edu/~ashton/classes/866/notes/lect20/dot_mapping.html

Strengths and Weaknesses

Strengths and Weaknesses

- Strengths
 - In my opinion, frequently better at conveying magnitude than graduated symbols
- Weaknesses
 - Conveys a granularity to data that do not exist
 - May generate confusion with specific points

Dot Density Best Practices

- Use only when geographical granularity of data approximate granularity of depiction
- Use color as in our upcoming discussion of choropleth maps

3. Choropleth Maps

- Used to show relative rates or intensities across space
- Examples?

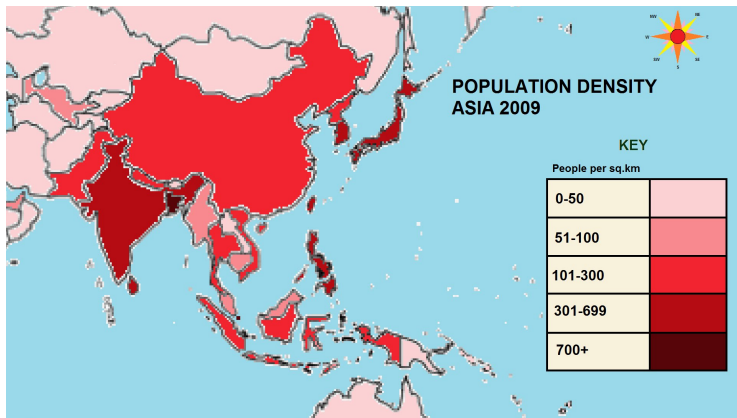
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- Used to show relative rates or intensities across space
- Examples?
 - population density
 - share in poverty
 - share covered by health insurance
- these can be continuous (unclassed) or broken up into categories (classed)
- Also used to show categorical differences across space
- Examples?

3. Choropleth Maps

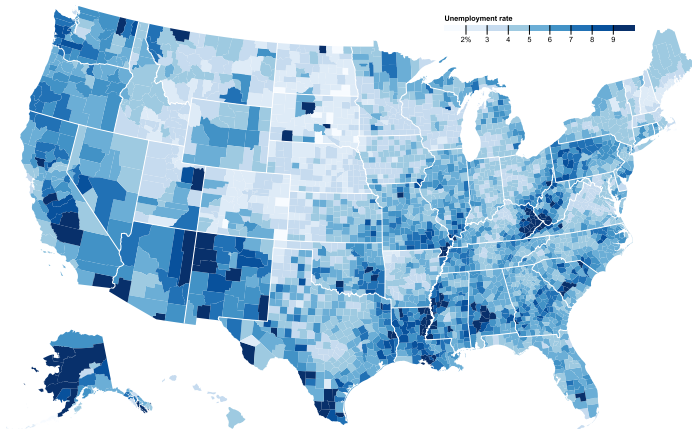
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- Examples?
 - ACA adoption or not
 - type of procurement legislation

Choropleth with Intensity



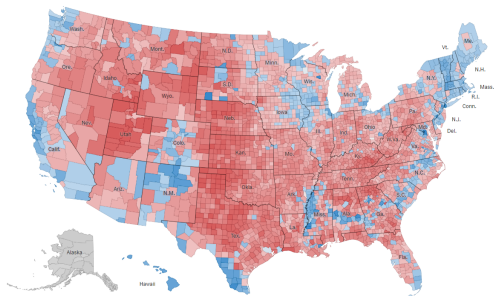
From <https://www.youtube.com/watch?v=PkmAiINPdrI>

Choropleth with Intensity



From <https://bl.ocks.org/mbostock/4060606>

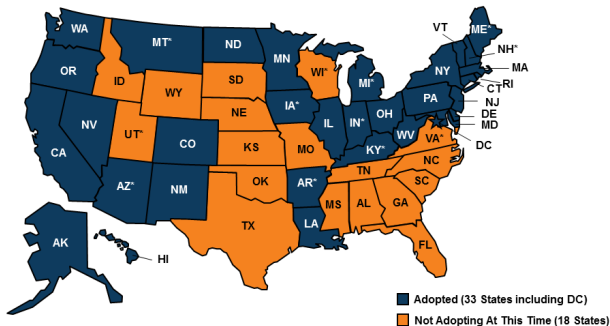
Choropleth with Divergent Scale



From <https://www.nytimes.com/2016/10/19/upshot/what-this-2012-map-can-tell-us-about-the-2016-election.html>

Categorical Map

Current Status of State Medicaid Expansion Decisions



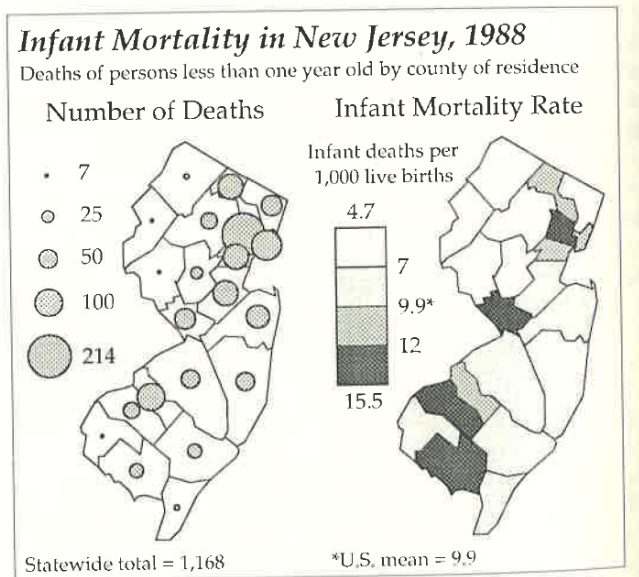
NOTES: Current status for each state is based on KFF tracking and analysis of state activity. *AR, AZ, IA, IN, KY, MI, MT, and NH have approved Section 1115 expansion waivers. VA is considering adopting expansion in their FY 2019 state budget and UT passed a law directing the state to seek CMS approval to partially expand Medicaid to 100% FPL using the ACA enhanced match; see the link below for more detail. CMS approved the Kentucky HEALTH expansion waiver on January 12, 2018, implementation will begin in April 2018. ME adopted the Medicaid expansion through a ballot initiative in November 2017, the ballot measure requires submission of a state plan amendment (SPA) within 90 days and implementation of expansion within 180 days of the measure's effective date; however, the governor failed to meet the SPA submission deadline (April 3). WI covers adults up to 100% FPL in Medicaid, but did not adopt the ACA expansion.

SOURCE: "Status of State Action on the Medicaid Expansion Decision," KFF State Health Facts, updated April 5, 2018.
<https://www.kff.org/health-reform/state-indicator/state-activity-around-expanding-medicaid-under-the-affordable-care-act/>



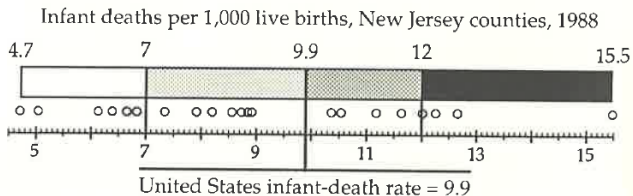
From <https://www.kff.org/health-reform/slide/current-status-of-the-medicaid-expansion-decision/>

4. Combination of Count and Intensity Information



Better Yet, the Histogram Legend

What does this add that the choropleth cannot convey?



Monomnier, Figure 6.10

Monmonier on Count vs. Intensity Data

- Monmonier says never use a [what kind of map] for count data
 - Why?

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 - Because size should be the “principle visual variable” for such maps
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Monmonier on Count vs. Intensity Data

- Monmonier says never use a [what kind of map] for count data
 - Why?
 - Because size should be the “principle visual variable” for such maps
- M. says use a choropleth for intensity
- Agree with overall sentiment, but not sure it holds in all cases

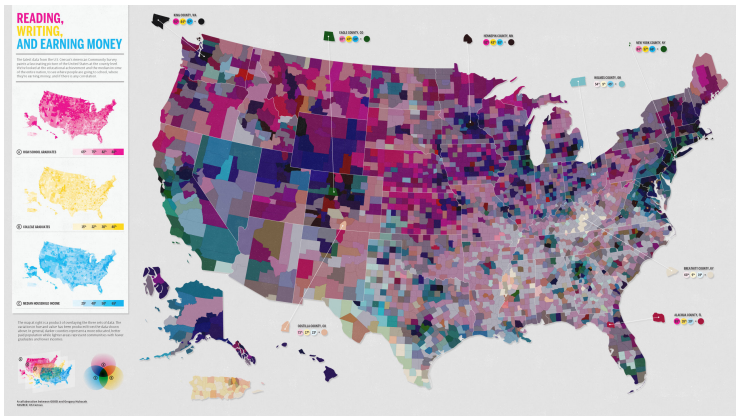
Worst Practices

- Rainbow colors for classification
- Ones that are frequently bad ideas
 - Map total amounts
 - “geographic features that are continuous in nature”

Worst Practices

- Rainbow colors for classification
- Ones that are frequently bad ideas
 - Map total amounts
 - “geographic features that are continuous in nature” “... because their distributions are not controlled by political or administrative subdivisions” (DTB, p. 104)

Beautiful Confusing Map



From <https://gis.stackexchange.com/questions/3087/what-makes-a-map-be-classed-as-badly-designed>

Best Practices

1. Categories
2. Colors
3. Histogram legend

Categories

- 4 is great
- Don't use more than 5 or 6
- Use an intensity ramp only when you care very little about the exact values
- And comparison between values

Colors

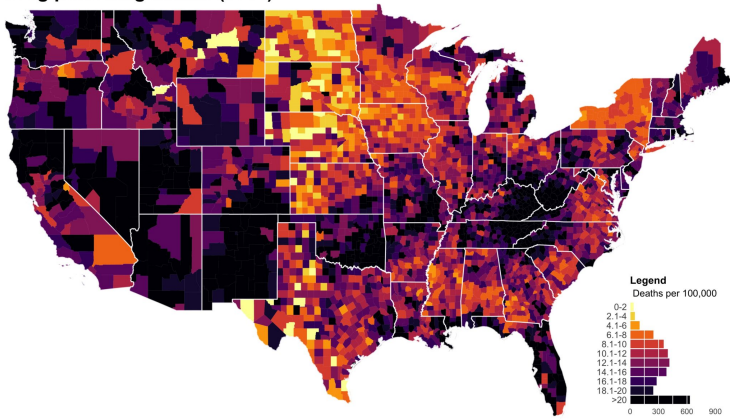
- Make the most intense color the largest value
- Avoid pattern fills if at all possible
- Make your legend a dot plot or histogram with the same colors
- Put anything else on map in a light color

Use ColorBrewer

- Named after Cynthia Brewer
- <http://colorbrewer2.org/#type=sequential&scheme=BuGn&n=3>
- You say
 - number of classes
 - sequential or divergent or qualitative
 - multi-or single hue
 - your preferred color
 - color-blind friendly?
 - screen or printer?
 - and more...
- and it gives you a color scheme!

3. Histogram Legend

Drug poisoning deaths (2014)



Source: <https://blogs.odc.gov/nchs-data-visualization/drug-poisoning-mortality/>

From <https://mathewkiang.com/2017/01/16/using-histogram-legend-choropleths/>

These Maps in R

Types of Maps

- ▶ Apology: Did not figure out how to suppress warnings
- ▶ Choropleths
- ▶ Histogram legends
- ▶ Dot Density

Choropleth Maps

```
p1 <- ggplot() +  
  geom_sf(data = polys, aes(fill = fill.in.variable))
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Assigning colors with a vector

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vectoro <- c("c1", "c2", "c3", "c4")  
scale_fill_manual(values = vectoro)
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Use the same vector for your map and your histogram legend, below.

Histogram Legends

- ▶ Can use a dot plot, as in Monmonier
- ▶ Can use `geom_histogram()`
- ▶ Use the colors to link with the plot (or the whole thing fails)

Dot Density Maps

- ▶ Make a simple feature with points: `st_sample()`
- ▶ Get those points into a matrix: `st_coordinates()`
- ▶ Make the matrix a dataframe: `as.data.frame()`
- ▶ Plot the points
- ▶ Make sure you plot your points on top of a map or they will look funny

Next Lecture

- Next week: Line charts
- Read Few, Chapter 13; Chang, Chapter 4