

Lecture 7:

Maps, 2 of 2: How to Map Data

October 19, 2026

Course Administration

Quizzes

1 Tutorial 6 quiz

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- 2 Return quizzes at end of class
- 3 Can we submit T7 slightly early to vote for UW? Let's Discuss timing.

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Looking forward

- Lecture 8: UW and line charts
- Lecture 9: Scatter plots
- Lecture 10: workshop and guest speaker
 - In-class workshop handout linked under lecture 6
- Lecture 11: 1:1 consultations – sign up linked on Piazza
- Lecture 12: storytelling
- Lectures 13 and 14: presentations

Anything else?

Today's Plan

- ① Good/bad/ugly
- ② Mapping: Choropleths and a bit of color
- ③ R and d3 coding

Next Week's Assignment

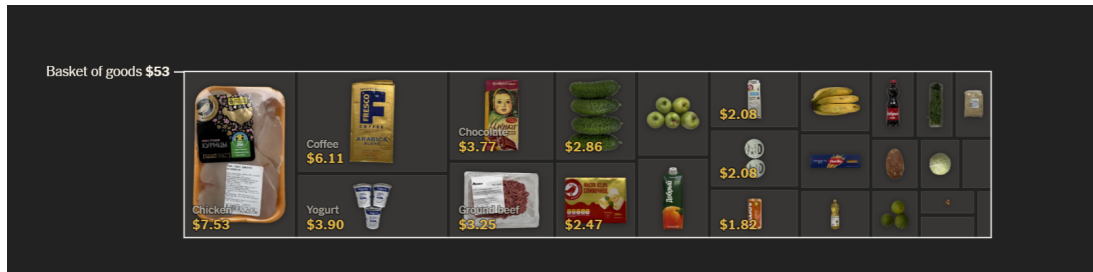
Find a choropleth or dot density or other data map.

Finder	Commenter
Daija	Luke
Avril	Katya

This Week's Good Bad and Ugly

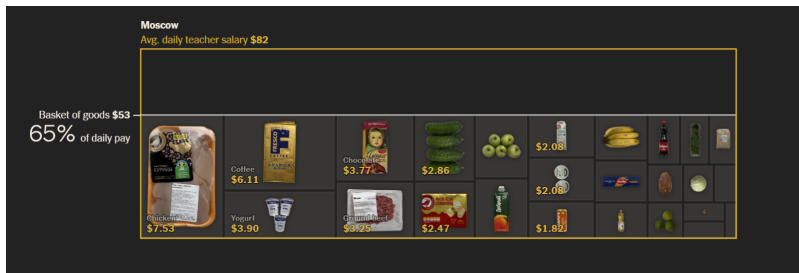
Finder	Commenter
Luke	Miguel
Veronica	Chloe

Miguel on Luke's Example: Shopping



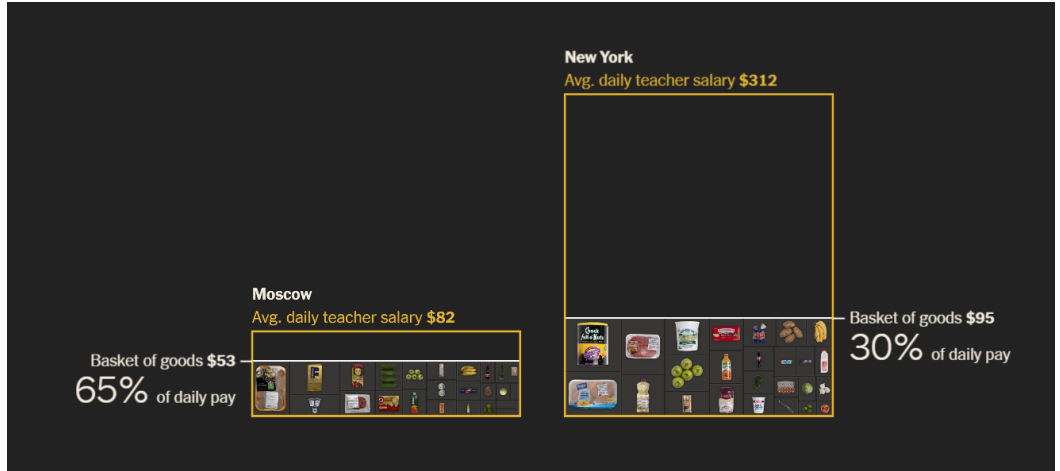
Hopkins, Holder and Robles, "Prices Have Skyrocketed in Russian Supermarkets," *New York Times*, September 23, 2026. [\[link\]](#).

Miguel on Luke's Example: Shopping



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Chloe on Veronica's Example: Spies



“How middle powers are rethinking espionage,” *The Economist*, September 22, 2026.

[\[link\]](#)

Map Half of Lecture

- Ⓐ Important choices for choropleth maps
- Ⓑ Three types of maps
 - ① Graduated symbols
 - ② Dot density
 - ③ Choropleth
 - ④ Combination of count and intensity
- Ⓒ Size versus intensity
- Ⓓ Best practices
- Ⓔ Goats

What You've Already Learned About Maps

- What a map is
 - projection
 - borders
- Use only if you want to convey a geographic relationship
- How to make maps in R: `sf`

What You've Already Learned About Maps

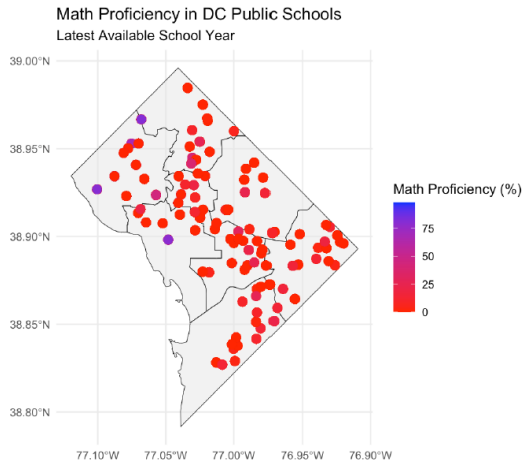
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Today: more on how to show data in maps

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A. Five Big Choices

A. Five Big Choices in Presenting Data

- 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”

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Largely drawn from Mark Monmonier's *Mapping it Out: Expository Cartography for the Social Sciences*

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

And think about the data

- What question can your data answer?
- What level of aggregation does your point require?

B. Three Types of Maps

Three Types of Maps

- ① Graduated symbols
- ② Dot density
- ③ Choropleth

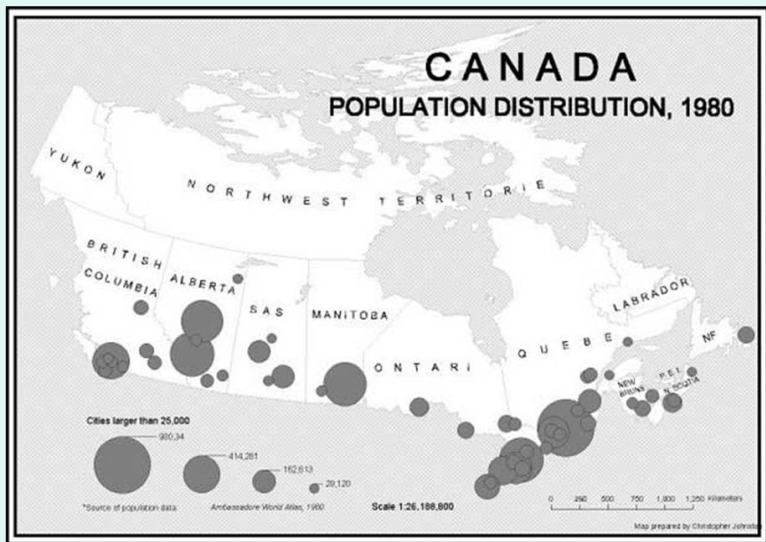
B.1. Graduated Symbols

- 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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- Plot symbol at center of polygon
- Or at point location
- 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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What do you think?

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 - Disassociates area of administrative unit from magnitude 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 absolute, not relative, magnitude

Best Practices for Graduated Symbol Maps

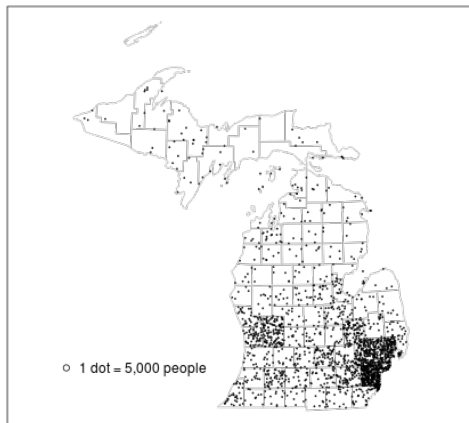
- Use them to convey magnitude
- Make symbols large enough to distinguish
- Be careful of overlap

B.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

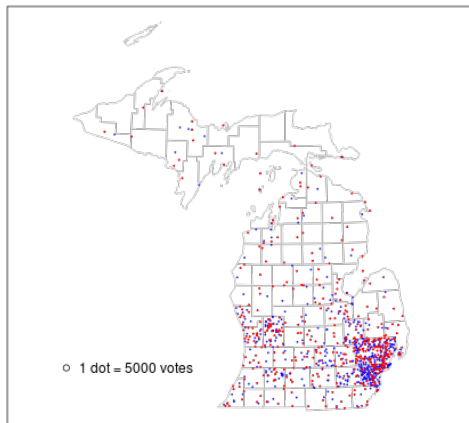
Michigan 2010 Population
Dot Density Map



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
 - Can describe magnitude of more than one type
- Weaknesses
 - Conveys a geographic specificity 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

B.3. Choropleth Maps

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

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 - share in poverty
 - share covered by health insurance

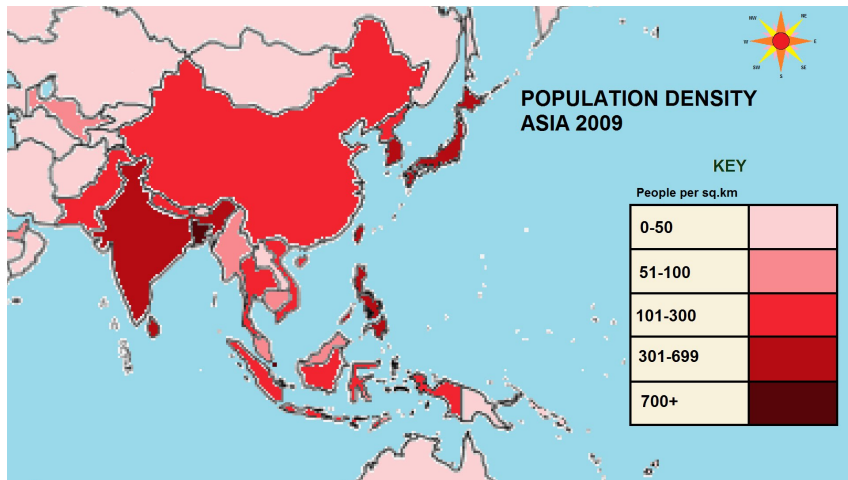
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- or broken up into categories: classed
- Also used to show categorical differences across space
- Examples?

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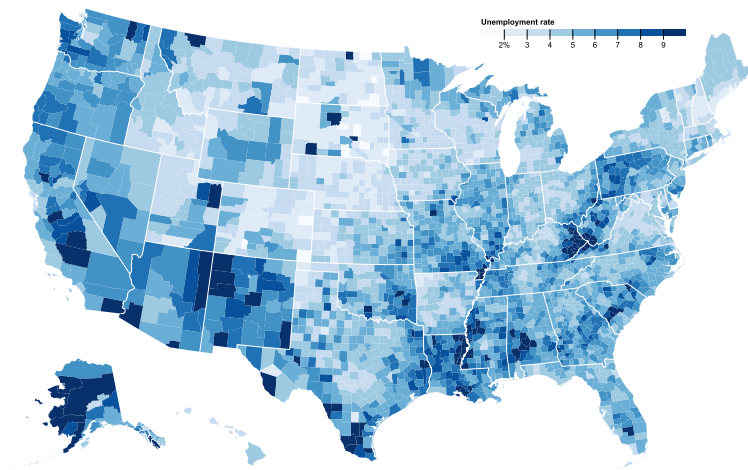
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- Examples?
 - ACA adoption or not
 - type of procurement legislation

Choropleth with Intensity



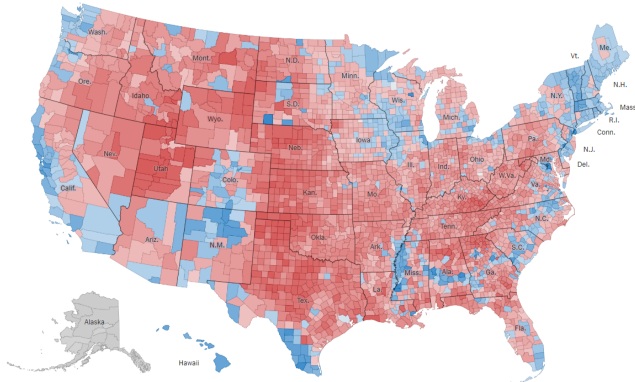
From <https://www.youtube.com/watch?v=PkmAiINPdrI>

Choropleth with Intensity



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

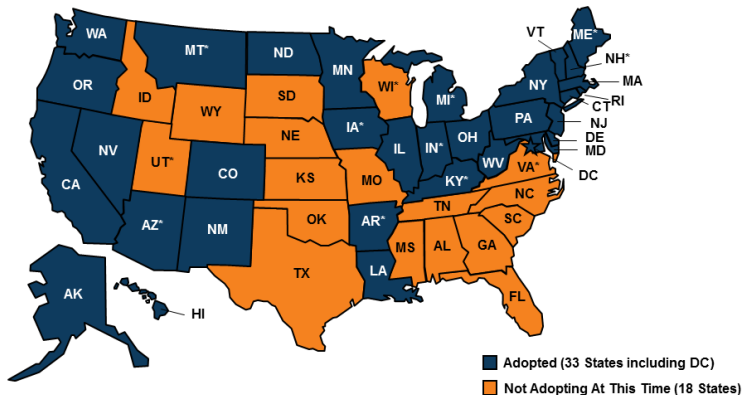
Choropleth with Divergent Scale



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.

Strengths and Weaknesses of Choropleth Maps

What do you think?

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What do you think?

- Strengths
 - Relatively easy to interpret
 - Can be flexible in how you determine categories and scales
- Weaknesses
 - Associates area of administrative unit with magnitude conveyed
 - Can be hard to see all areas
 - Shows only one variable or type

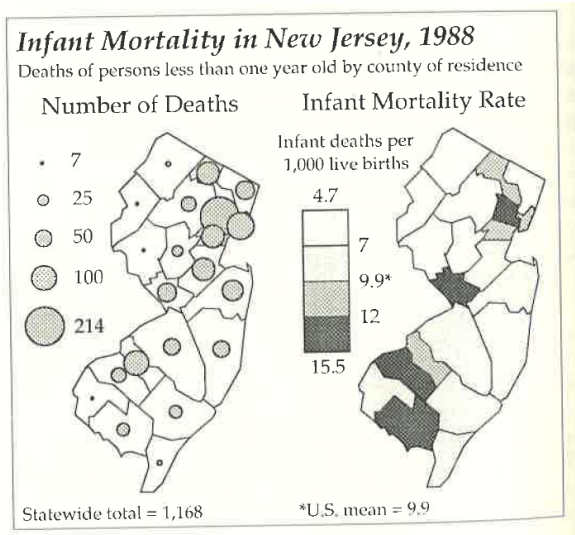
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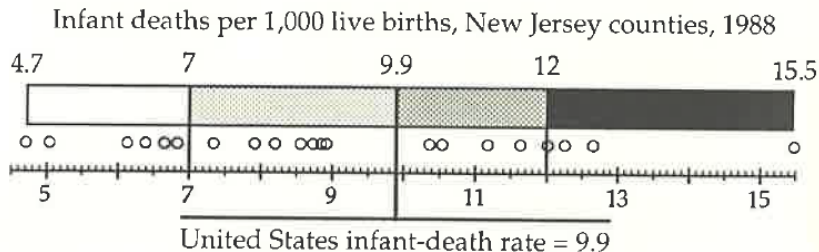
Best for situations where you want to convey relative, not absolute, magnitude; and for categorical definitions where space matters

B.4. Combination of Count and Intensity Information



Better Yet, the Histogram Legend

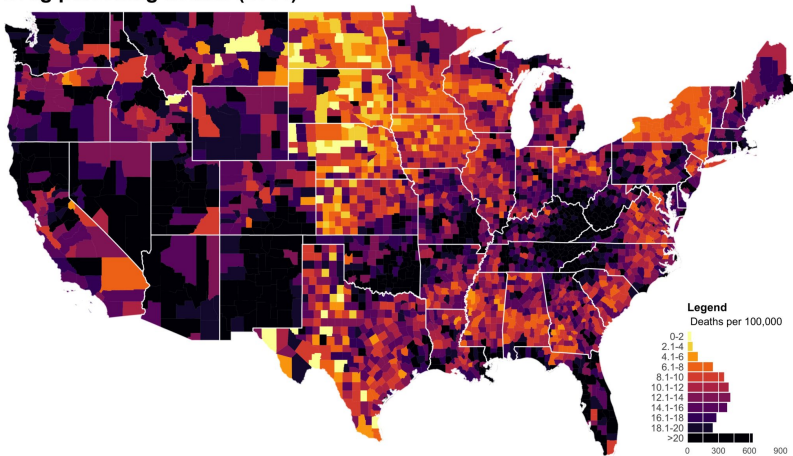
What does this add that the choropleth cannot convey?



Monomnier, Figure 6.10

Another Histogram Legend

Drug poisoning deaths (2014)



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

C. Size vs Intensity

Monmonier on Count vs. Intensity Data

- Monmonier says never use a choropleth map for count data
 - Why?

Monmonier on Count vs. Intensity Data

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 - Why?
 - Because size should be the “principle visual variable” for such maps
- M. says use a choropleth for intensity

Monmonier on Count vs. Intensity Data

- Monmonier says never use a choropleth 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

D. Best Practices

D. Best Practices

- ① Categories
- ② Colors
- ③ Histogram legend
- ④ Worst practices

D.1. 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
 - you care little about comparison between values

D.1. How to select categories?

Potential category types

- Equal interval
- Quantile
- Natural breaks

D.1. How to select categories?

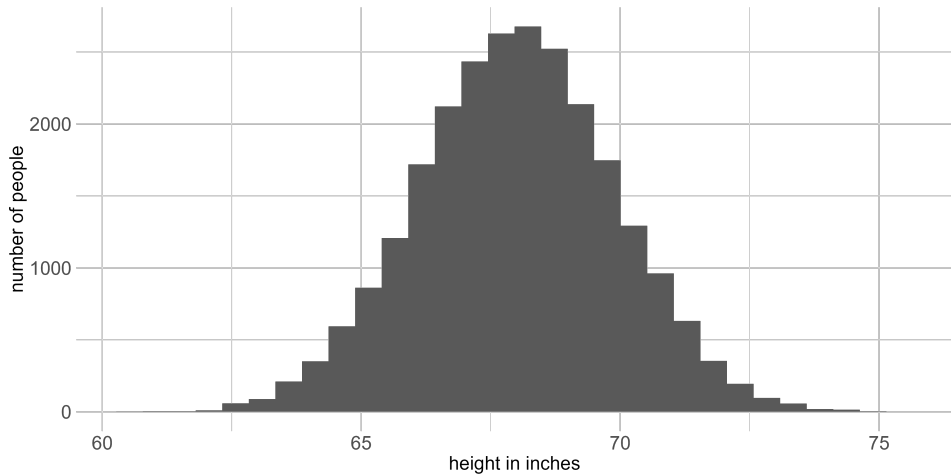
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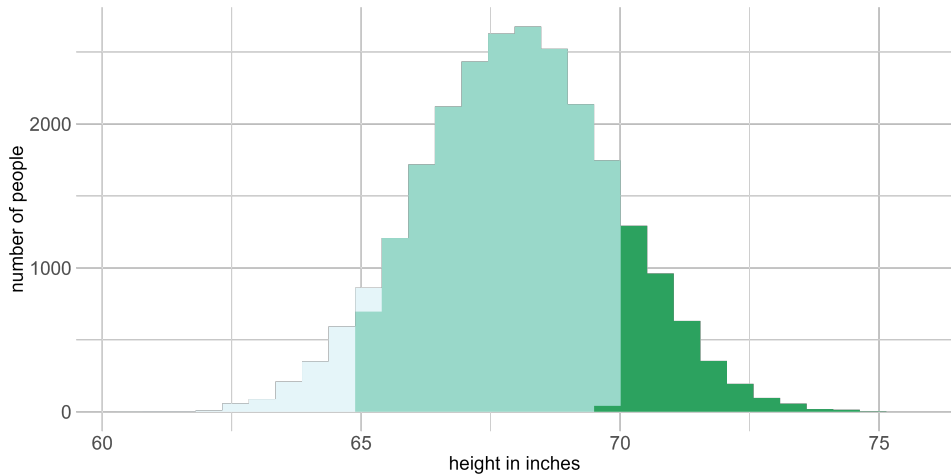
Use data to show example

- “synthetic” height data
- from Hong Kong
- based on real data
- [documentation](#) lacking

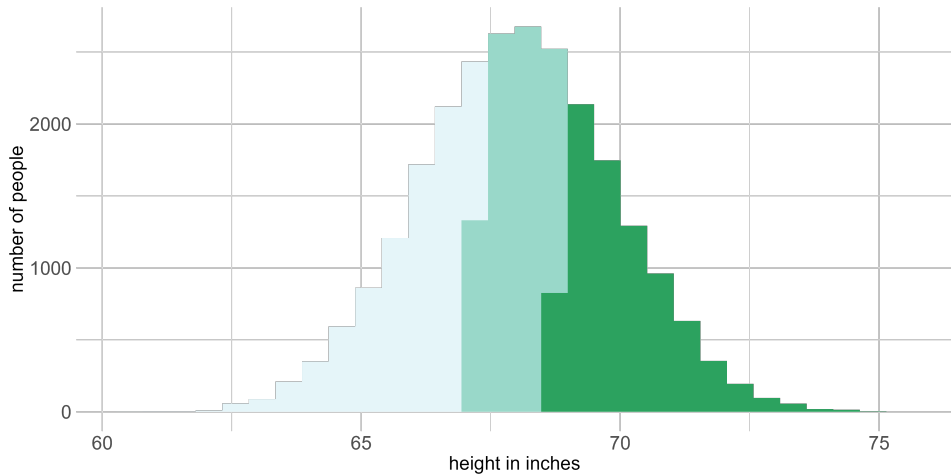
Histogram for Height



Is this Equal Interval or Terciles?



And Terciles



D.2 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

Three Types of Color Fills

Categorical

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Categorical

CATEGORICAL 6-COLOR



Three Types of Color Fills

Categorical

Sequential

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Three Types of Color Fills

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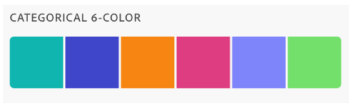
Sequential

SEQUENTIAL FOREST



Three Types of Color Fills

Categorical



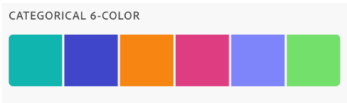
Sequential



Diverging

Three Types of Color Fills

Categorical



Sequential



Diverging



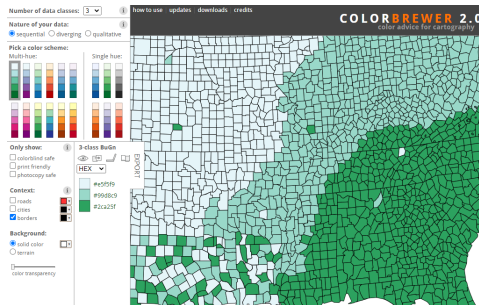
More Color Rules, From Adobe

- ① Use categorical colors for categories, not ordered items
- ② Use sequential colors for ordered items, not categories
- ③ Use diverging colors for ordered items where the middle matters
- ④ Don't use more than 6 categorical colors
- ⑤ Use darker colors for larger numbers

See full page on data visualization colors [here](#)

Use ColorBrewer

- Named after Cynthia Brewer
- <http://colorbrewer2.org/>
- 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!



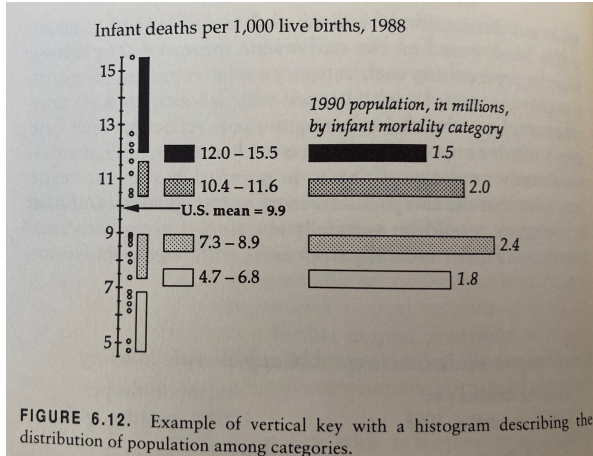
And a Knock-Off of ColorBrewer is MetBrewer!



- Blake Robert Mills
- made a package that
- takes color from the Met in NYC
- also from MoMA
- `library(MetBrewer)`
- `color.list <-
met.brewer('VanGogh1', n=3,
type='discrete')`



D.3. Histogram Legend



Why is this even better than the previous?

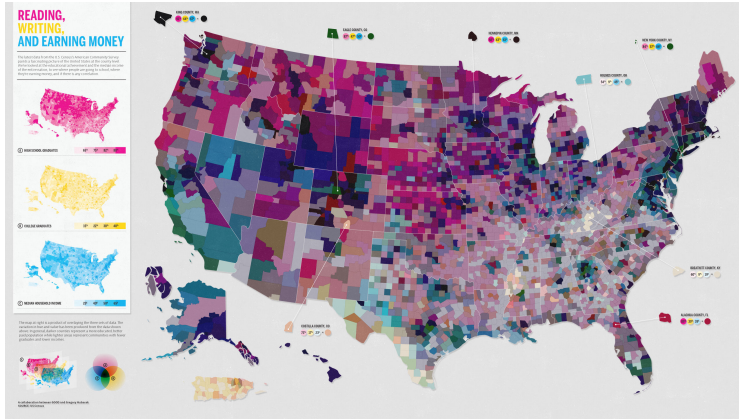
D.4. Worst Practices

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

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

Beautiful Confusing Map

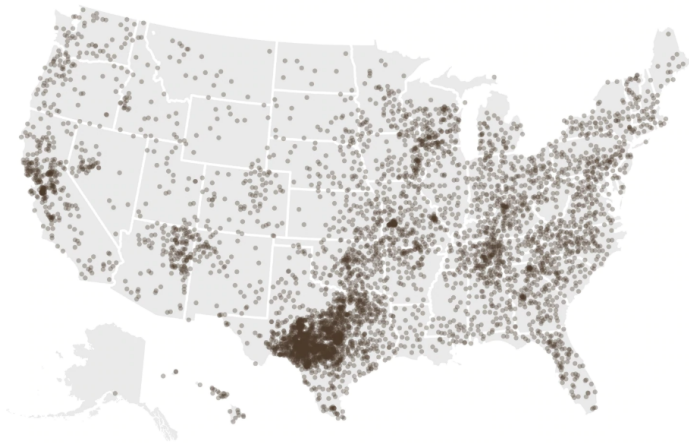


From <https://gis.stackexchange.com/questions/3087/what-makes-a-map-be-classed-as-badly-designed>

E. Think About Goats

“This is Literally Every Goat in the United States”

One dot = 500 goats.



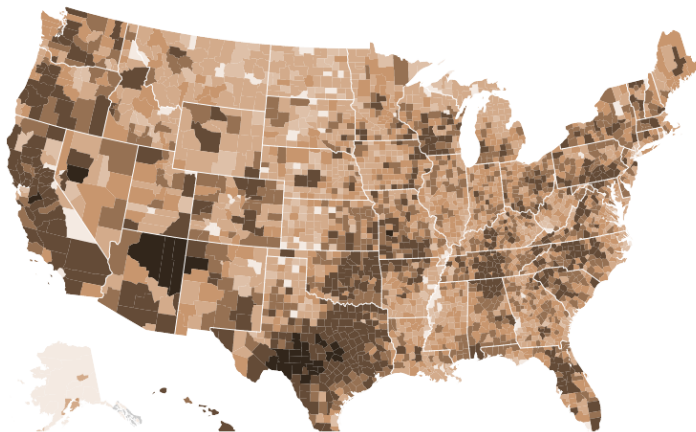
WASHINGTONPOST.COM/**WONKBLOG**

Source: USDA Agricultural Census

Except it is not! See [WP article](#)

Goats by County

Goat population, by county



These Maps in R

Next Lecture

- Next week: Line charts
- Read
 - Few, parts of Chapter 10, pages 217-200, Chapter 13
 - Chang, Chapters 4 and 7