

# Lecture 7: Maps, 2 of 2: How to Map Data

March 16, 2026

# Course Administration

## ① Tutorial 5 quiz

# Course Administration

- ① Tutorial 5 quiz
- ② Ok to switch lectures 8 and 9?
  - this pushes the workshop one week later
- ③ Sign up for consultations in lieu of lecture 11!
  - Sign up for April 2, 9 or 10 – link at lecture 11
  - If more slots needed, let me know
- ④ In-class workshop April 6 (?): handout online, linked under lecture 6
- ⑤ Last Monday and Wed. of class – April 27 and 29 – are in-person presentations
- ⑥ Anything else?

## Next Week's Assignment

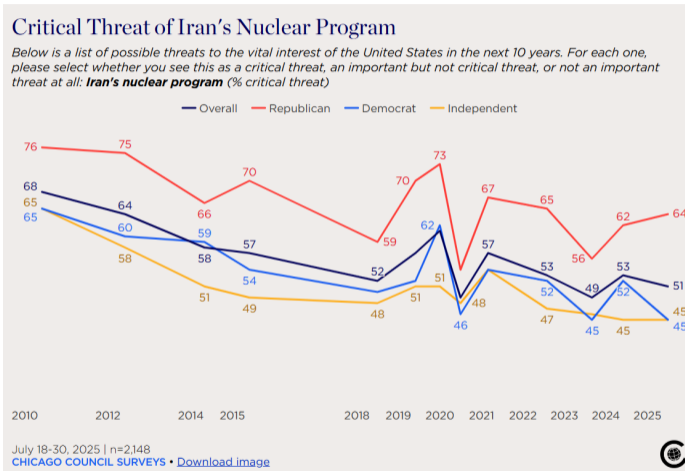
**Find a choropleth or dot density or other data map.**

Finder	Commenter
Thomas	Elizabeth
Elizabeth	George

## This Week's Good Bad and Ugly

Finder	Commenter
Halle	Philip
Philip	Elly

# Philip on Halle's Example: US Public Opinion on Iran



Dina Smeltz , Craig Kafura , and Lama El Baz, *Majority of Americans Say Congress' Approval Needed for US Strikes in Iran*, Chicago Council on Global Affairs, March 3, 2026

## Elly on Philip's Example: Eurozone Inflation



Suss, Joel, "Eurozone inflation just below target in February," *The Financial Times*, March 3, 2026. [\[link\]](#)

## Map Half of Lecture

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

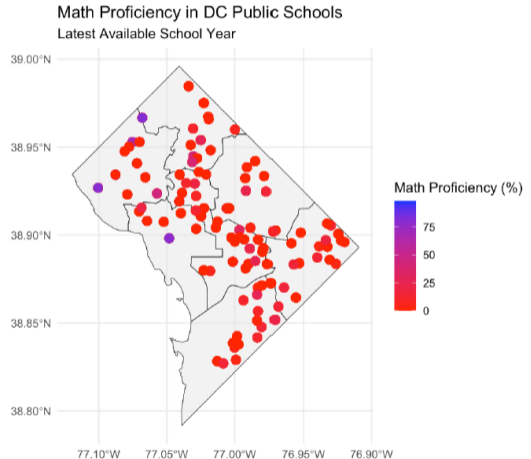
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Today: more on how to show data in maps

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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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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

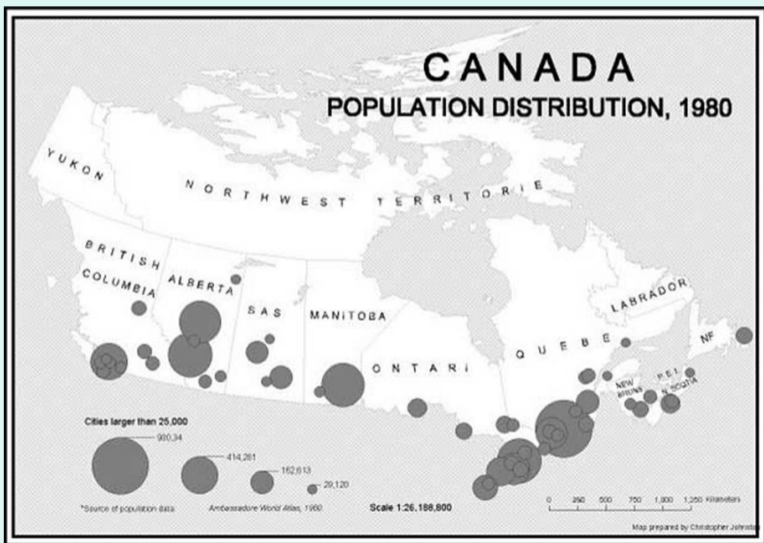
## B.1. Graduated Symbols

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- Or at point location
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  - 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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  - 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
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Best for situations where you want to convey absolute, not relative, magnitude

# Best Practices for Graduated Symbol Maps

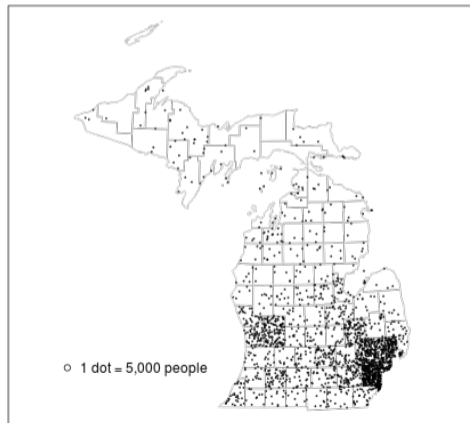
- Use them to convey magnitude
- Make symbols large enough to distinguish
- Be careful of overlap

## 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

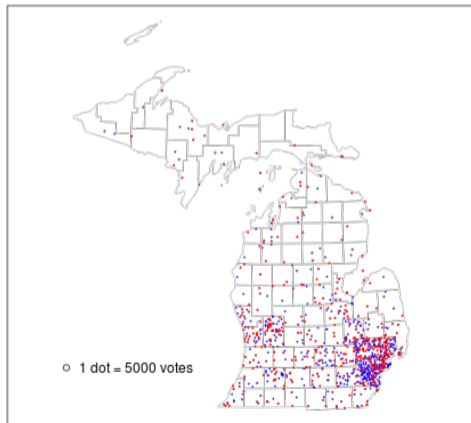
Michigan 2010 Population  
Dot Density Map



From [https://msu.edu/~ashton/classes/866/notes/lect20/dot\\_mapping.html](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](https://msu.edu/~ashton/classes/866/notes/lect20/dot_mapping.html)

# Strengths and Weaknesses

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- 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
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  - share in poverty
  - share covered by health insurance

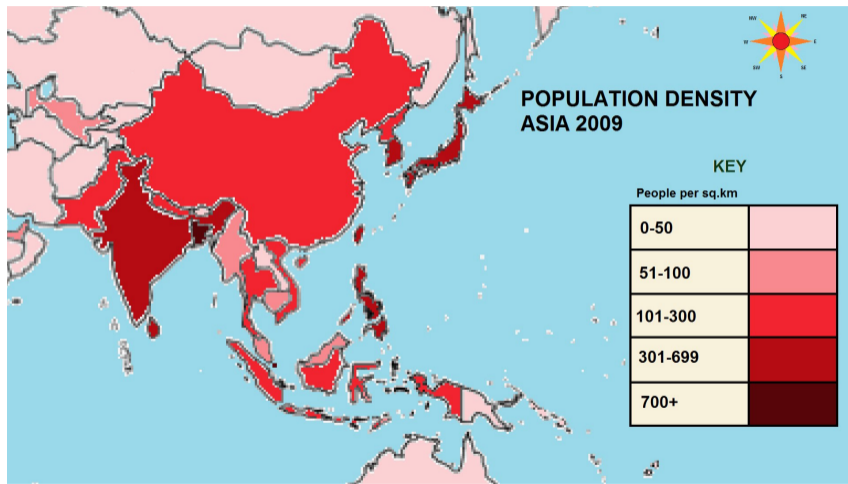
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- or broken up into categories: classed
- Also used to show categorical differences across space
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## B.3. Choropleth Maps

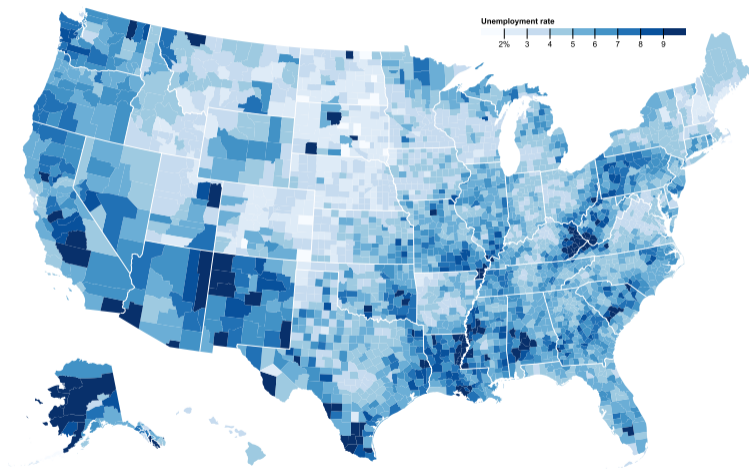
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- Examples?
  - ACA adoption or not
  - type of procurement legislation

## Choropleth with Intensity



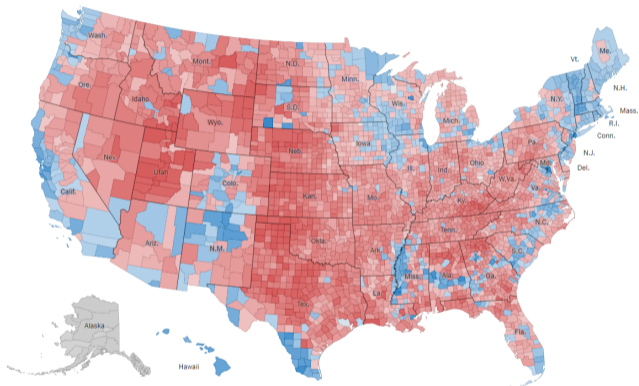
From <https://www.youtube.com/watch?v=PkmAiINPdrI>

# Choropleth with Intensity



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

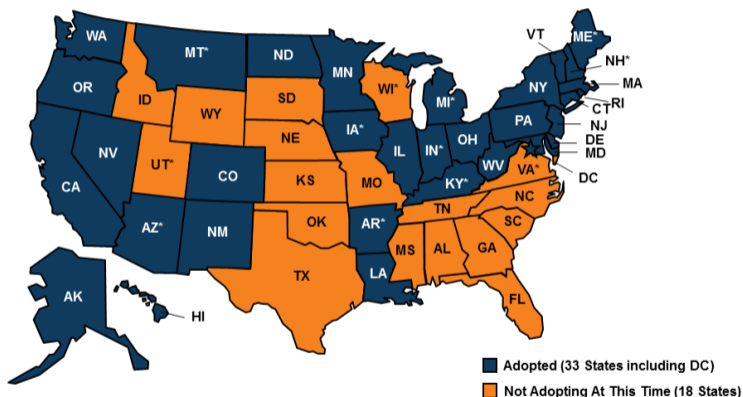
## Choropleth with Divergent Scale



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.

# Strengths and Weaknesses of Choropleth Maps

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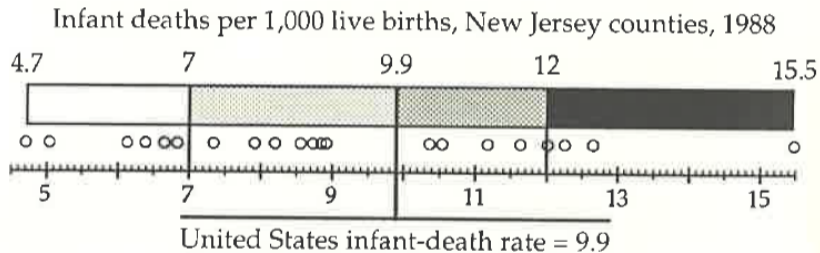
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Best for situations where you want to convey relative, not absolute, magnitude; and for categorical definitions where space matters



## Better Yet, the Histogram Legend

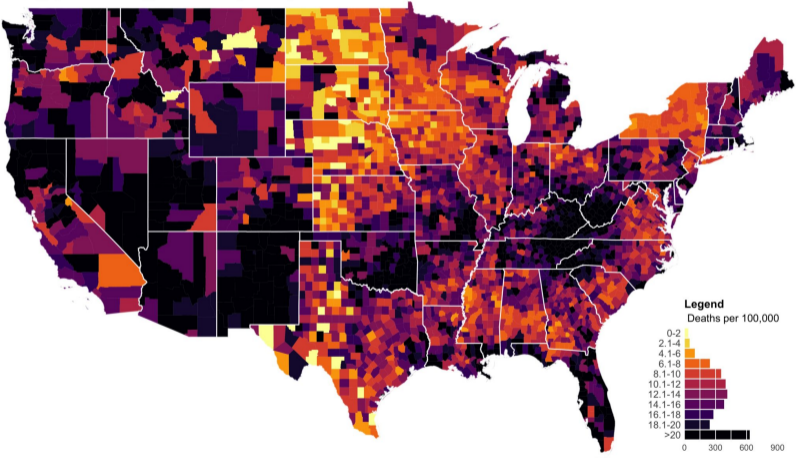
What does this add that the choropleth cannot convey?



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?

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    - 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

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- 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?

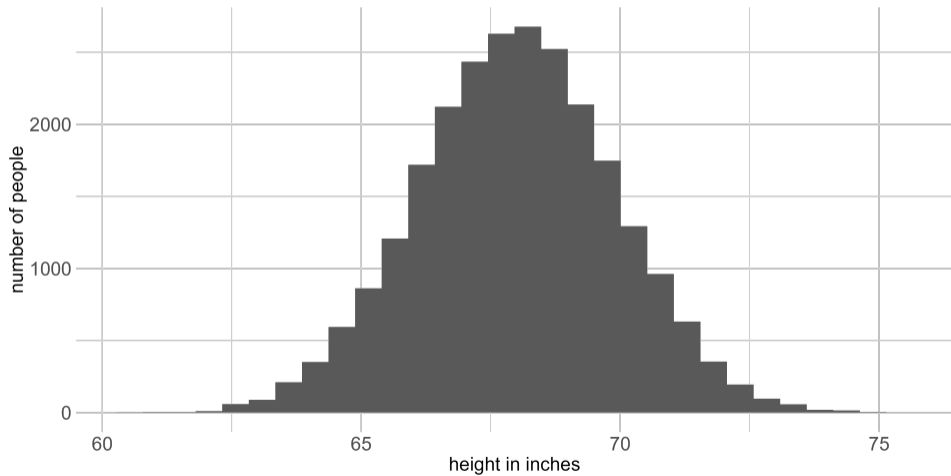
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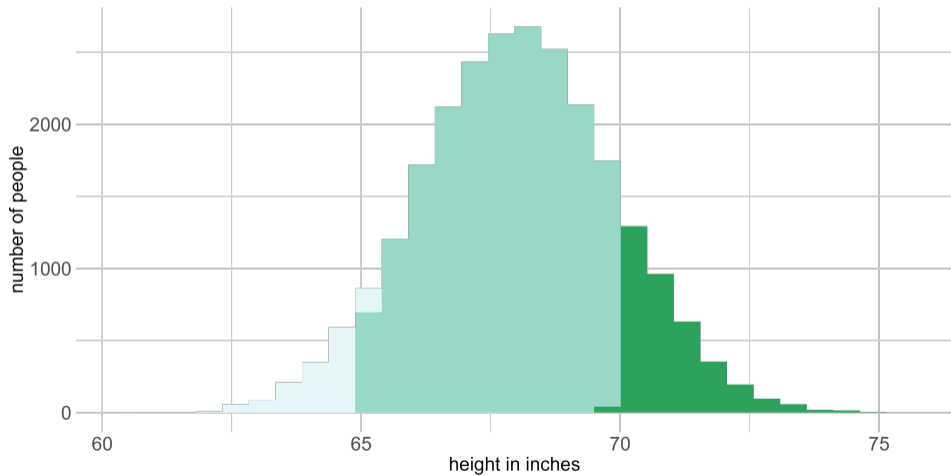
### Use data to show example

- “synthetic” height data
- from Hong Kong
- based on real data
- **documentation** lacking

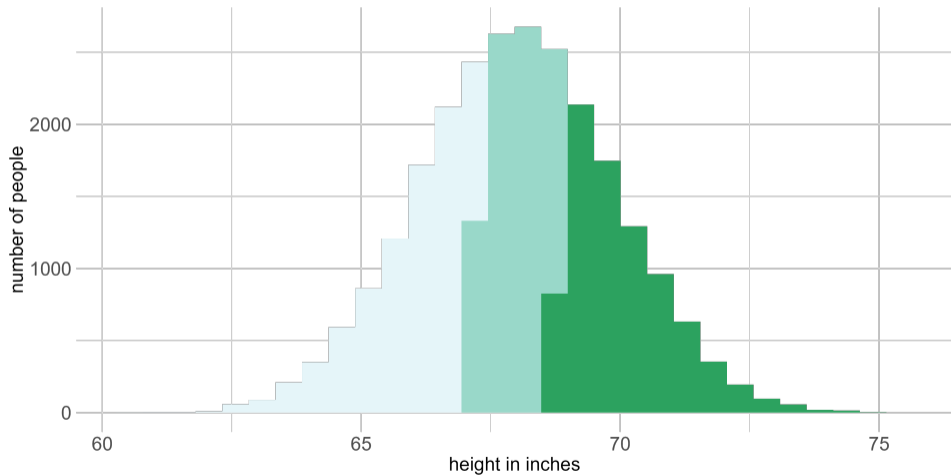
# Histogram for Height



## Is this Equal Interval or Terciles?



## And Terciles



## D.2 Colors

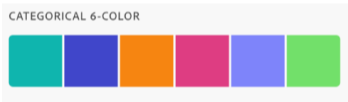
- Make the most intense color the largest value
- Avoid pattern fills if at all possible
- Make your legend a dot plot or histogram with the same colors
- Put anything else on map in a light color

# Three Types of Color Fills

Categorical

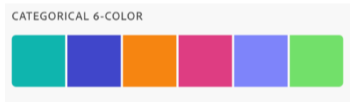
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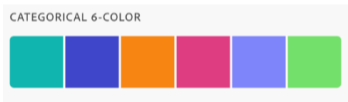
Categorical



Sequential

# Three Types of Color Fills

## Categorical

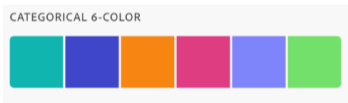


## Sequential



# Three Types of Color Fills

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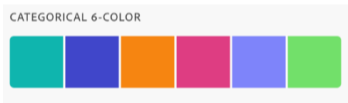
## Sequential



## Diverging

# Three Types of Color Fills

## Categorical



## Sequential



## Diverging



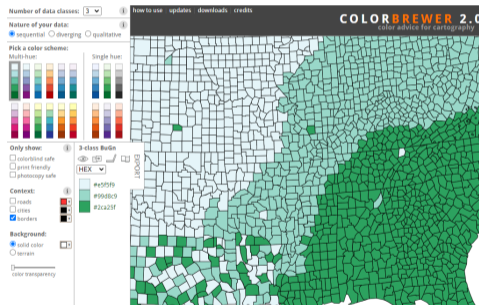
## More Color Rules, From Adobe

- 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!



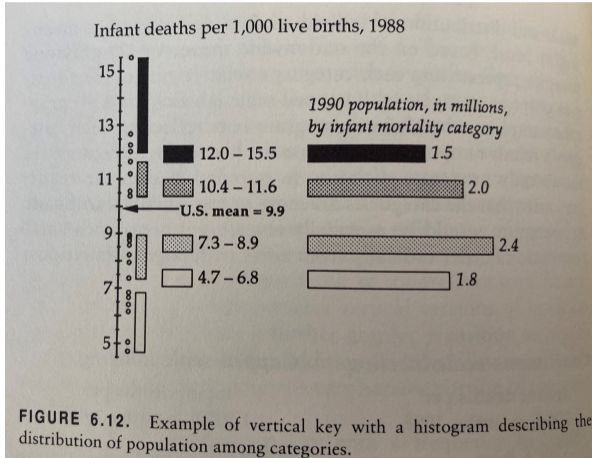
## And a Knock-Off of ColorBrewer is MetBrewer!



- 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”

## D.4. Worst Practices

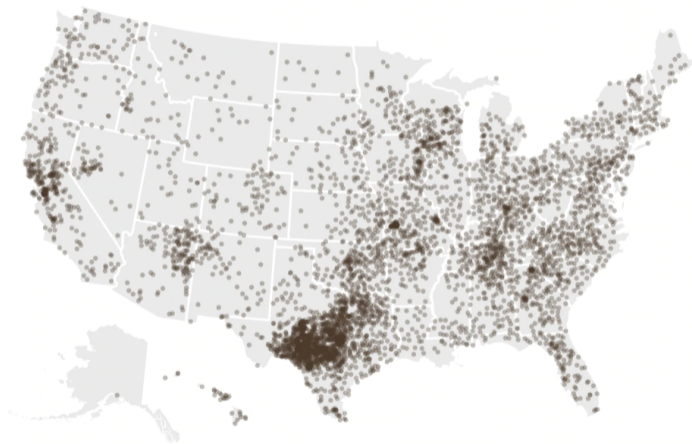
- Rainbow colors for classification
- Ones that are frequently bad ideas
  - Map total amounts
  - Map by geographic unit “geographic features that are continuous in nature” “... because their distributions are not controlled by political or administrative subdivisions” (DTB, p. 104)



## E. Think About Goats

# “This is Literally Every Goat in the United States”

One dot = 500 goats.



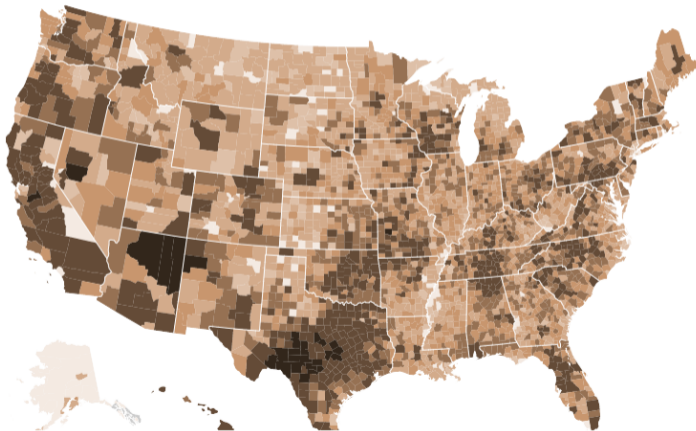
WASHINGTONPOST.COM/**WONKBLOG**

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