

Lecture 3: Bar Graphs

September 14, 2026

Course Administration

- 1 Tutorial quiz 2

Course Administration

- ① Tutorial quiz 2
- ② Hopefully your policy brief proposal is in
 - I will give feedback by next week
 - Happy to discuss issues in office hours
- ③ Make sure you're checking Piazza

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- ④ Graded tutorial quiz 1
- ⑤ How to treat Chang reading
- ⑥ Anything else?

Feedback from Tutorial 1 Quiz

Find ward level snowbound from these data

nbhd.id	ward.id	share.snowbound
1	1	0.660
2	1	0.397
3	1	0.928
4	2	0.859
5	2	0.894
6	2	0.203

How many rows should ward-level data have?

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Which two commands do you need to get here?

- `group_by(.data = DATAFRAME, variable.list)`
- `summarize(.data = DATAFRAME, new.var = mean(share.snowbound))`

Next Week's Good Bad and Ugly

Post by Wednesday noon by linking on google sheet. Earlier is ok.

Finder	Commenter
Logan B.	Harini M.
Chloe B.	Veronica H.

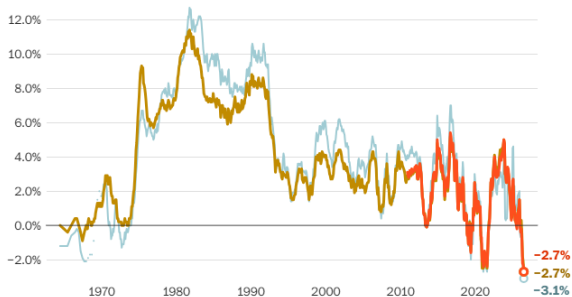
For next week, choose a bar graph!

Jacob on Harini's Choice

Drug prices have not fallen this fast in six decades

Annual % change in consumer prices, not seasonally adjusted

— Medical care commodities — Medicinal drugs — Prescription drugs



Source: U.S. Bureau of Labor Statistics

FEDERICA COCCO / THE WASHINGTON POST

Federica Cocco, "Prescription drug prices record sharpest drop in more than 60 years" *Washington Post*, August 13, 2026, [\[link\]](#).

Plan for Today

Few Chaps. 6 (p. 87-95), 9 and 10 (p. 210-217)

- ① General graph design
- ② What do bars do and where do they come from?
- ③ Bits of bars
- ④ Variations: grouped, stacked, and lollipops
- ⑤ Giant numbers from WSJ
- ⑥ Example: Mediocre to better bar
- ⑦ Examine a mistaken bar

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R

- 1 Graphing in R via ggplot
- 2 Parts of ggplot
- 3 Bars via ggplot
- 4 Titles and axis scaling
- 5 Factor re-ordering
- 6 Summary statistics
- 7 Date variables

General Graph Design

All of the Elements that Create a Chart

ggplot2 Theme Elements

`theme(element_name = element_function())`

- `element_text()`
- `element_line()`
- `element_rect()`
- `element_blank()`

Axis elements:

- `axis.ticks`
`element_line()`
- `axis.title`
`element_text()`
- `axis.text`
`element_text()`
- `axis.line`
`element_line()`

Plot elements:

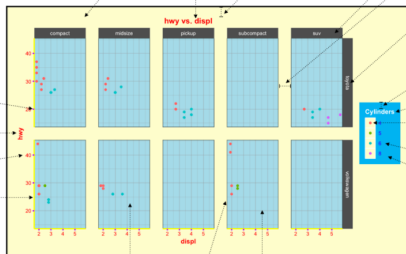
- `plot.background`
`element_rect()`
- `plot.title`
`element_text()`
- `plot.margin`
`margin()`

Facetting elements:

- `strip.background`
`element_rect()`
- `panel.spacing`
`unit()`
- `strip.text`
`element_text()`

Legend elements:

- `legend.margin`
`margin()`
- `legend.title`
`element_text()`
- `legend.key`
`element_rect()`
- `legend.text`
`element_text()`
- `legend.background`
`element_rect()`



- `panel.background`
`element_rect()`
- `panel.grid`
`element_line()`
- `panel.border`
`element_rect(fill = NA)`

Panel elements:

henrywang.nl

Derived from "ggplot2: Elegant Graphics for Data Analysis"

Thank you Henry [Wang].

Few: Three Primary Ways to Convey Information

- ① Form
- ② Color
- ③ Spatial Position

Leading to Two Key Rules for All Graphics

- 1 Avoid 3D

Leading to Two Key Rules for All Graphics

- ① Avoid 3D
- ② Maintain visual correspondence to quantity

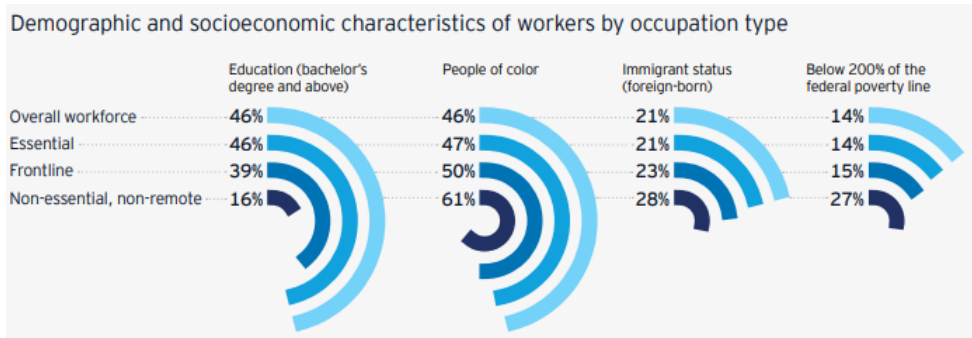
Leading to Two Key Rules for All Graphics

- ① Avoid 3D
- ② Maintain visual correspondence to quantity – how do we see quantity?

Leading to Two Key Rules for All Graphics

- ① Avoid 3D
- ② Maintain visual correspondence to quantity – how do we see quantity?
 - length
 - 2-d spatial position

When You Don't Maintain Visual Correspondence to Quantity



Remote Work in the Capital Region, 2021, Greater Washington Partnership.

Bar Charts

Bars Outline

Big idea: relative size

- ① What do bars do and where do they come from?
- ② General principles for bar charts
- ③ Variations: grouped, stacked, and lollipops
- ④ Giant numbers from WSJ
- ⑤ Example: Mediocre to better bar
- ⑥ A bar mistake

1. What Does a Bar Chart Do?

Bars compare quantities across categories

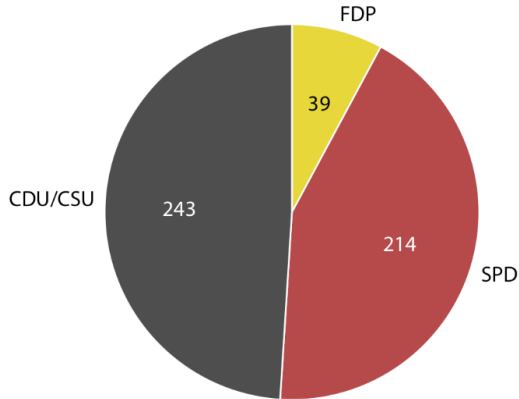
1. What Does a Bar Chart Do?

Bars compare quantities across categories

- Quantities can be shares or levels
- Design can emphasize rank order
- Highlight one level relative to others

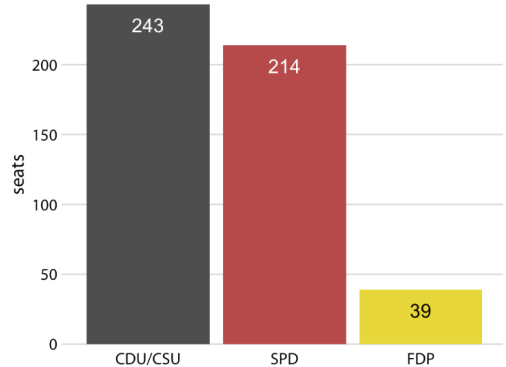
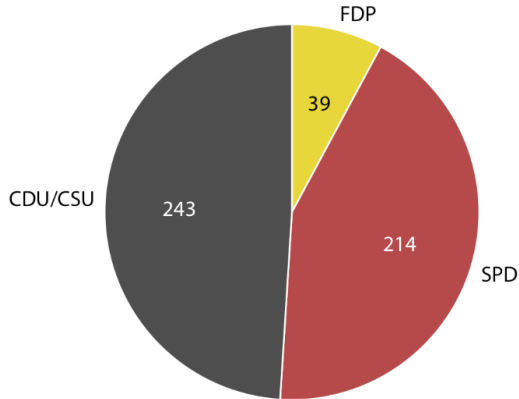
When Shape Doesn't Do What You'd Hoped

Eighth Bundestag, 1976-1980, Seats by Party: Claus Wilke's [Fundamentals of Data Visualization](#)



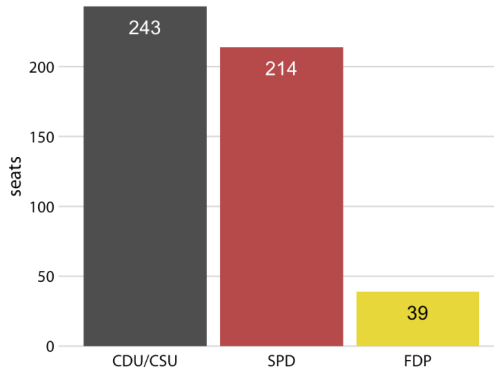
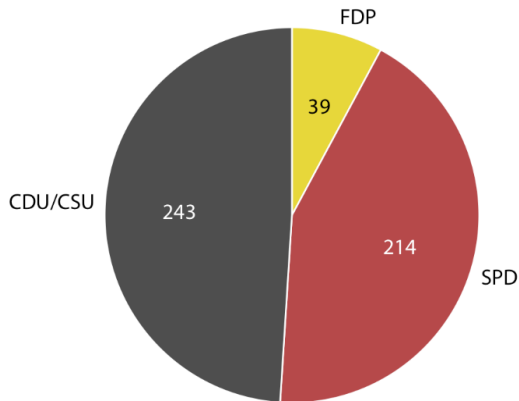
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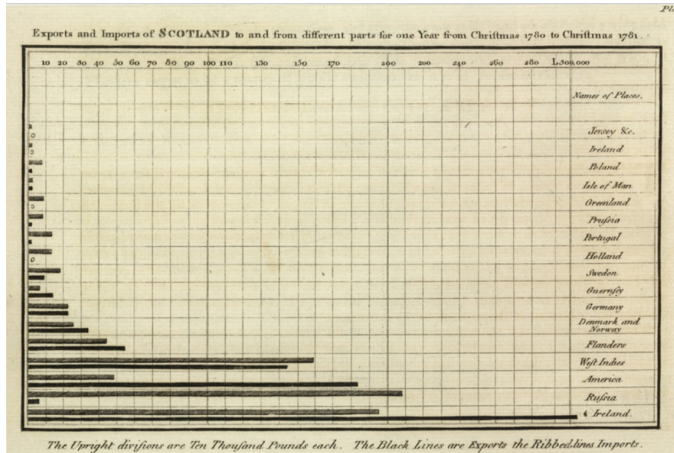
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Without the numbers, could you rank the grey and red pie pieces ?

The First Bar Chart



Playfair, William, 1786. *The Commercial and Political Atlas*

An Aside on William Playfair

- 1759-1823
- 5th of 8 children
- Largely educated by [his brother](#) who became a famous mathematician
- Apprenticed to inventor of steam engine
- Engaged in multiple successful and then unsuccessful business ventures

- Late 1790s in debtor's prison
- Blackmailer
- May have stormed the Bastille
- Primary inventor of statistical graphics
 - bar chart
 - line chart
 - pie chart (not so great)
- Motivated by Priestly's sensation

See also [here](#).

2. General Principles for Bar Charts

- Orientation
- Proximity
- Fills
- Borders
- Base value

Taken from Few Ch. 10, p. 210

Orientation & Proximity

Orientation: Bars horizontal or vertical?

- Horizontal better to fit in long labels
- Vertical better if axis is time

Orientation & Proximity

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Proximity – How close should the bars be?

- You want mostly bars, not mostly white space
- But not touching bars
- Why not touching bars?

Orientation & Proximity

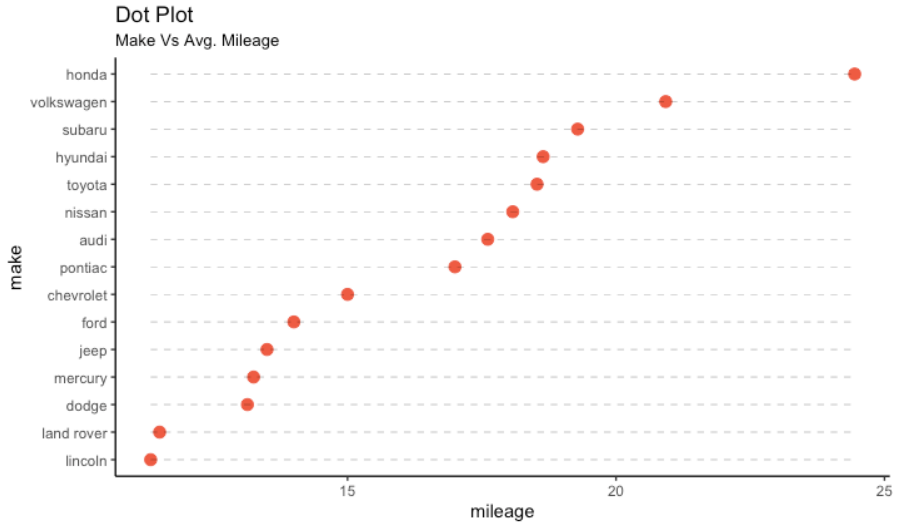
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- Why not touching bars?
- **Rank when you want to highlight ordering**

Ranked Almost-Bars



source: mpg

Fills

Do Not

- Use color as decoration
- Use hashed or lined fills

Do

- As much as possible, put legend directly on the graph
- Highlight with color

Fills

Fills

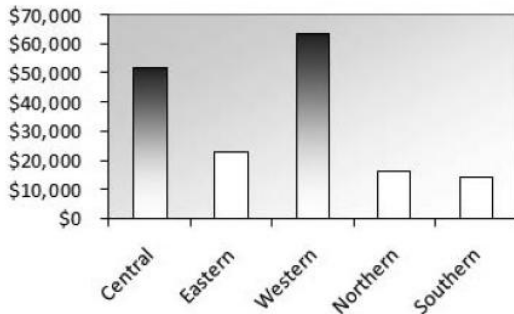
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An Uninspiring Example



Fill source is [Excel 2007](#)

Borders and Base Value

Borders

- Use sparingly to highlight
- Colors are better for highlighting

Borders and Base Value

Borders

- Use sparingly to highlight
- Colors are better for highlighting

Base Value

Bars Must Start at Zero!

Borders and Base Value

Borders

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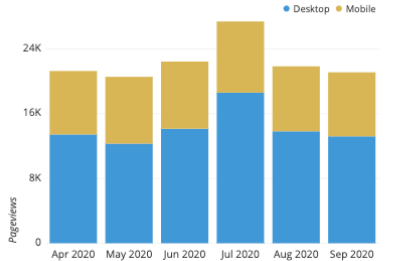
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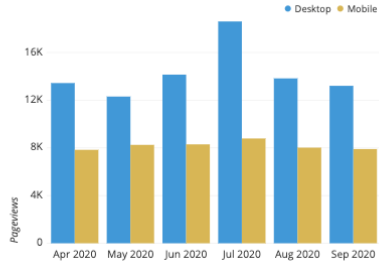
Why?

3. Bar Variations

Stacked bars



Grouped bars



Thank you [Atlassian](#).

3. Why Choose a Particular Bar Variation?

Stacked bars

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Stacked bars

- Shows parts of whole
- Emphasizes comparison of totals

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Lollipops

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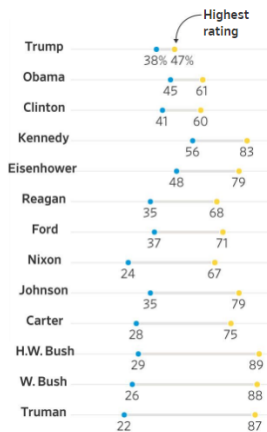
Lollipops

- Can work like a bar
- Can also show within-group differences

The Power of Lollipops

Americans Locked In

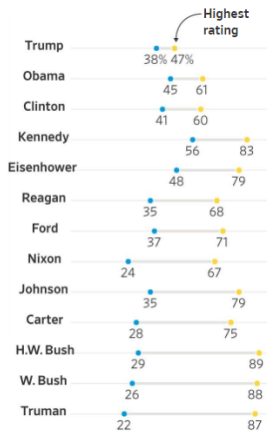
President Trump's job approval rating has held unusually steady throughout his term, moving up and down in the tightest range on record.



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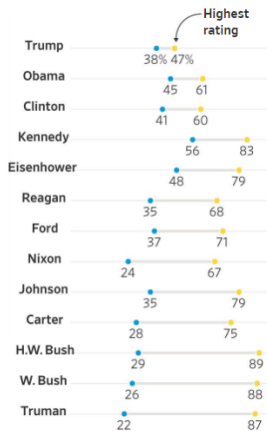


What is the point?

The Power of Lollipops

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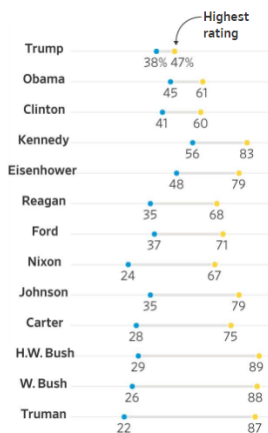
What is the point?

What is this doing that a bar cannot?

The Power of Lollipops

Americans Locked In

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What is the point?

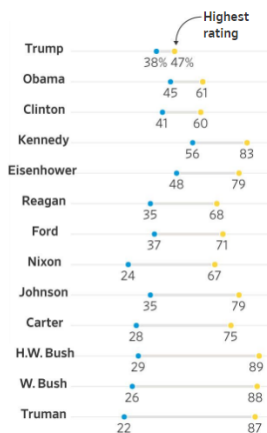
What is this doing that a bar cannot?

What info does this convey?

The Power of Lollipops

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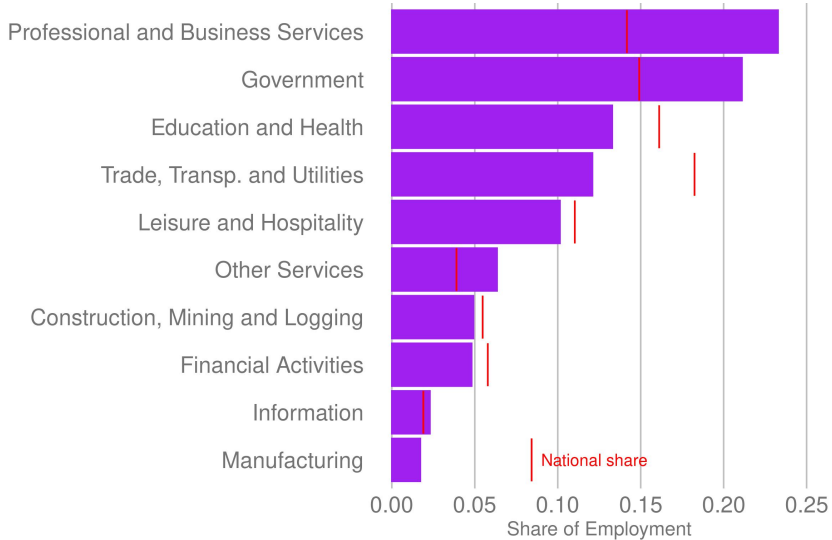
What is the point?

What is this doing that a bar cannot?

What info does this convey?

- max and min
- approximately the variance
- by administration
- so a trend in variance!
- note the point in the title

Showing More than One Number Per Bar



When the Number is Too Big for a Bar

People really have trouble with big numbers

- is \$2 billion a large part of a \$4 trillion budget?

When the Number is Too Big for a Bar

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Microsoft plan for conveying big numbers, from *WSJ*

- attribute
- scaling factor
- reference

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“a conservation group that reclaimed about 100 million acres of land across the Earth.
... How big do you think that is?”

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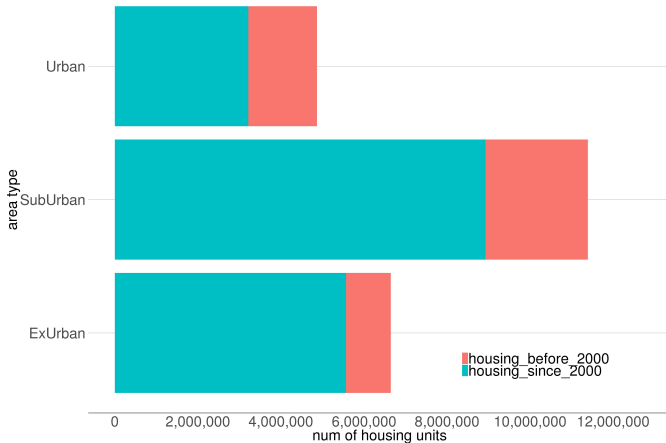
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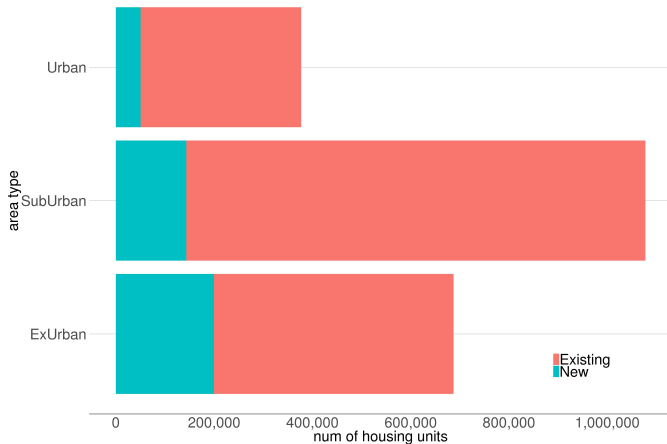
“a conservation group that reclaimed about 100 million acres of land across the Earth.
... How big do you think that is?”

About as big as (1.15x = scaling factor)
California (reference)

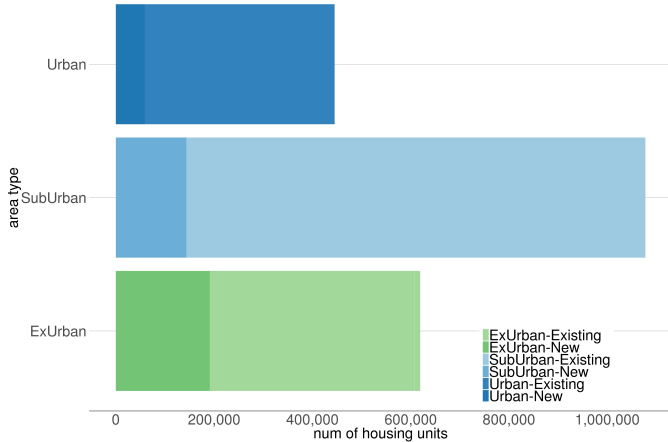
Going From a Bad Bar Chart to a Decent One



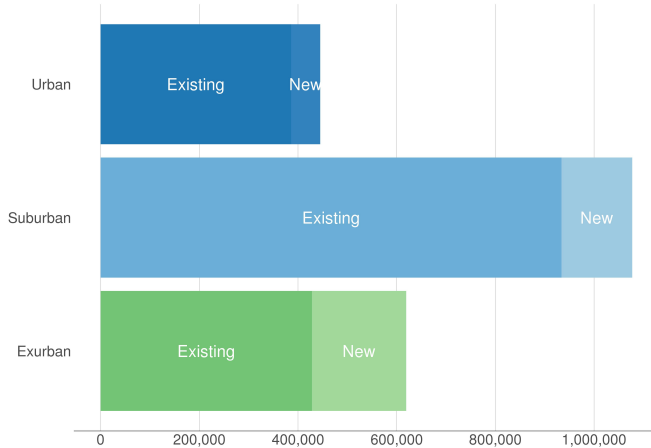
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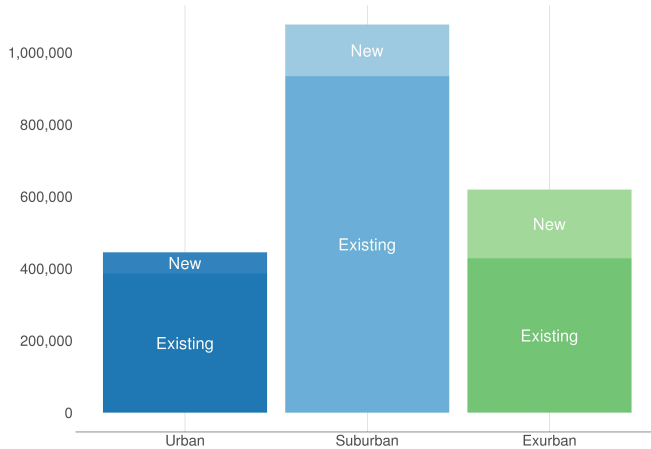
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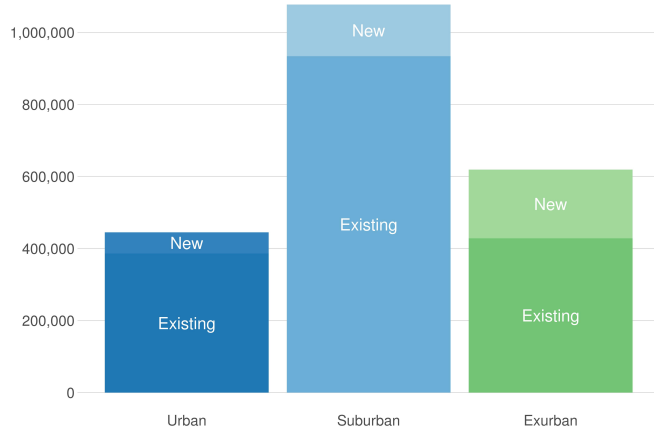
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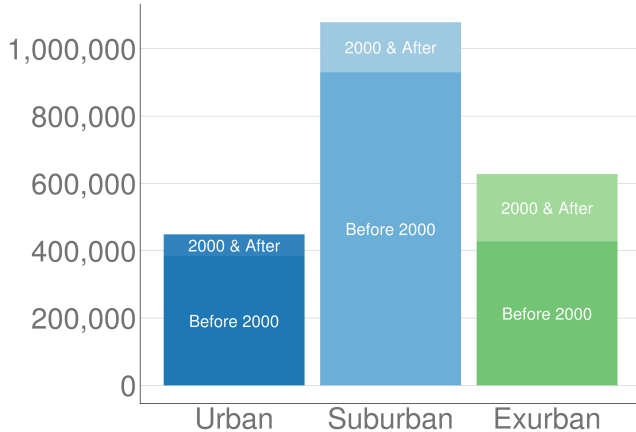
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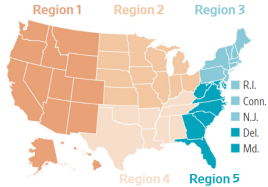
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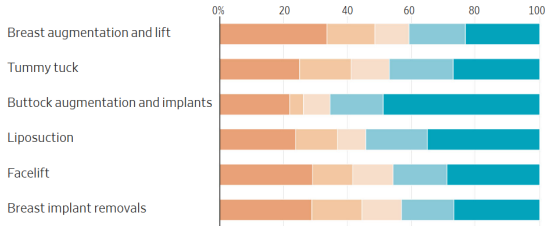
Going From a Bad Bar Chart to a Decent One



A Bar Mistake



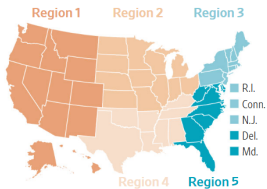
Share of plastic surgery procedures by type, 2024



Goal of article: show different plastic surgery types by region

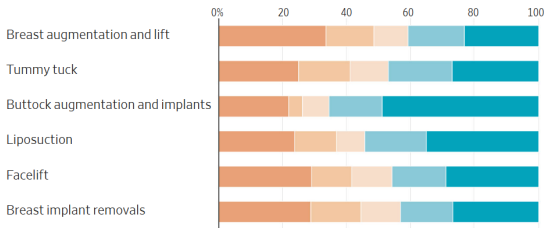
Why does this graph fail at this?

Potential Solutions

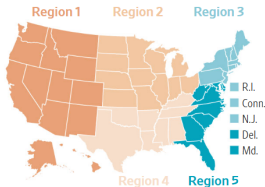


Solutions?

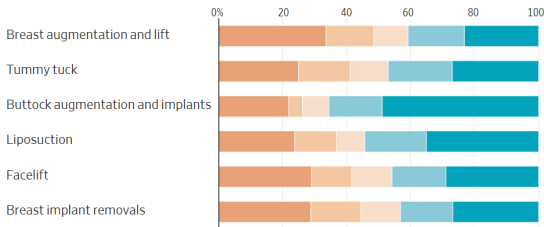
Share of plastic surgery procedures by type, 2024



Potential Solutions



Share of plastic surgery procedures by type, 2024



Solutions?

- Bars are region: share by type
- Report per capita surgery by region
- Report surgery relative to one region by type

R: Finally, Graphs!

Next Class

- I'm here till 5:20 for questions on anything
- Quiz on Tutorial 3
- Few, Chapter 6, pages 117-127
- Chang, Chapter 6 (through 6.5)