

DESIGNING CHARTS & TABLES

How to Display Data that Enlightens and Informs

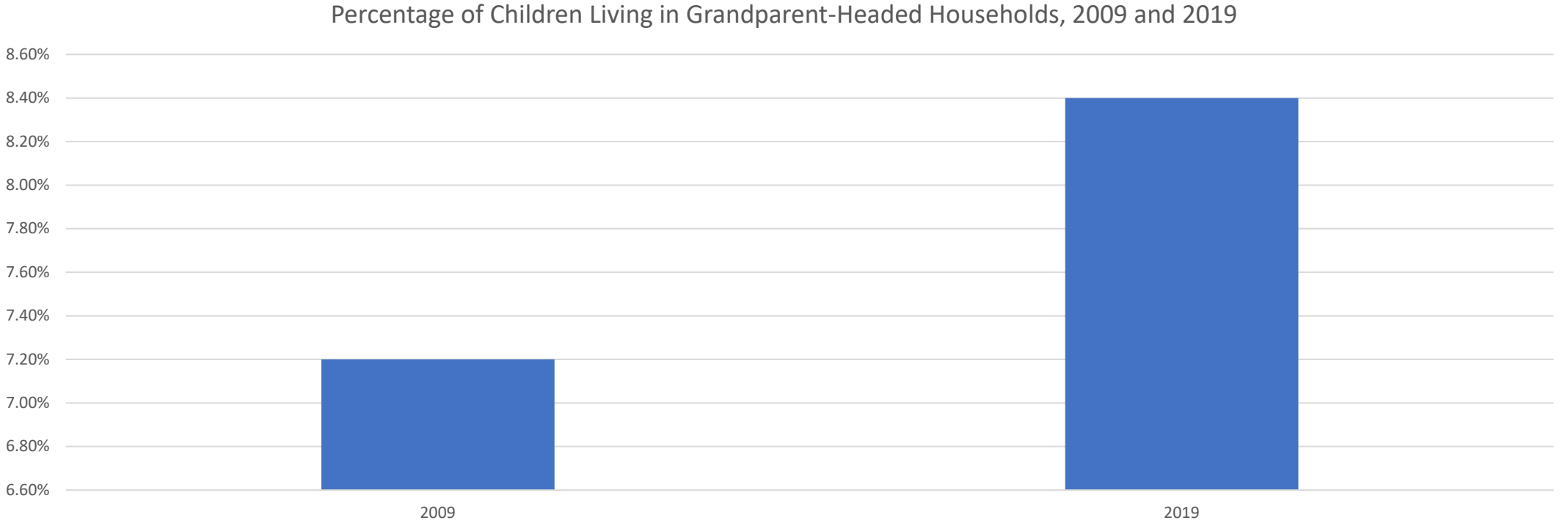
Krista K. Payne, PhD.

kristaw@bgsu.edu

CFDR Summer 2021 Workshop Series



RANK THIS CHART





TODAY'S WORKSHOP

GOAL:

Help you to use charts and tables to more effectively...

- tell data stories
- communicate results
- clarify ideas

WHY WORDS AREN'T ALWAYS ENOUGH

First, you will need to provide support above the usual level. If you do not have a device for this elevation, you will need to obtain one. Before you provide the elevation support, you will want to decrease the later resistance for all the critical contact points. After the elevation device has been utilized, you can complete the rotation of the critical contact points and exchange the impacted element. You will then want to re-engage the critical contact points and remove the device. You may continue to use the replacement element. If it is not adequate for long-term use, you may want to repair or replace the original element, at which point you will need to repeat the process.

Design for How People Learn, p. 45, by Julie Dirksen, 2016.

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TWO ELEMENTS, TWO PURPOSES

CHARTS

- Provide insights based on the shape(s) of the data.
- ***Tell stories.***
- Enlighten and inform the reader.

TABLES

- Provide precise values.
- Use to supply data.

PRACTICE & EXPERIENCE

NOVICE



MASTER



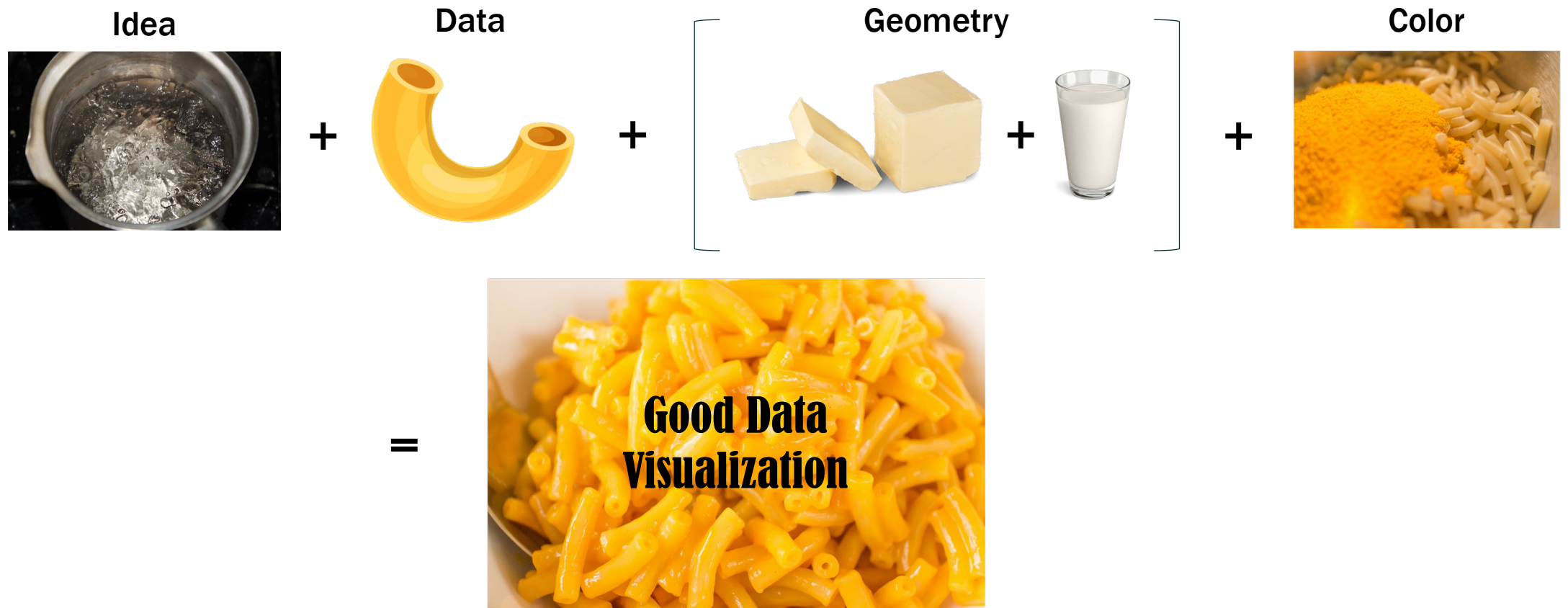


THE RECIPE

Cooking Up A Good Data Viz

THE RECIPE

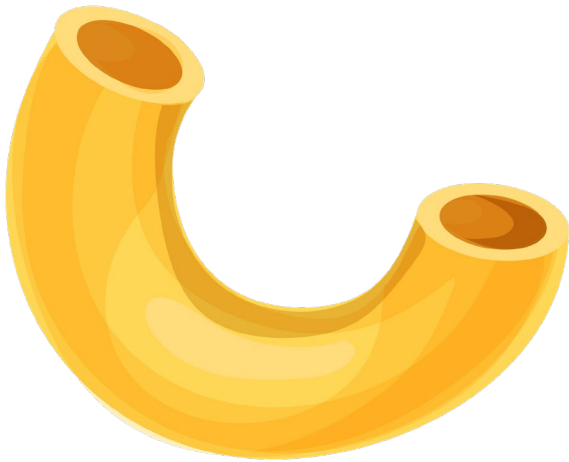
COOKING UP A GOOD DATA VIZ



THE RECIPE

COOKING UP A GOOD DATA VIZ

Data



- What format?
- What applications/
programs are needed?
- What structure?

THE RECIPE

COOKING UP A GOOD DATA VIZ

Geometry



Your Visual Cues

- Position
- Length
- Angles
- Direction
- Area or Volume

THE RECIPE

COOKING UP A GOOD DATA VIZ

Color



The Other Visual Cue –

*I like to think of color as the **secrete sauce**.*

- Accessibility?
- Branding strategy?
- Add to the story?

COLOR ACCESSIBILITY

- Approximately 4.5% of the population has some type of color insensitivity.
- Section 508 of the Rehabilitation Act of 1973 sets a legal standard for the contrast level necessary between text and its background.

COLOR ACCESSIBILITY

- Approximately 1% of the population has some form of color insensitivity.
- Section 508 of the Rehabilitation Act is the legal standard for the accessibility of digital content and its background.

**IT'S THE
LAW!**

COLOR ACCESSIBILITY

BEST PRACTICES

- **Ratio:** Text and interactive elements should have a color contrast ratio of at least **4.5:1**.
- **Color as indicator:** Color should **NOT** be the only indicator. For example, underline links, or mark a required field with an asterisk.
- **Color blindness:** Red/green color blindness is the most common, so avoid green on red or red on green.

COLOR ACCESSIBILITY

ON-LINE RESOURCES

<https://webaim.org/resources/contrastchecker/>

<http://colorsafe.co/>

<https://colorable.jxnblk.com/ffffff/6b757b>

<https://contrastchecker.com/>

**COLOR
BRANDING**

Powerful!

COLOR BRANDING



COLOR BRANDING

FedEx

#250C77

#ED642B

#FFFFFF

COLOR BRANDING

DUNKIN'

#FF6E0C

#F20C90

COLOR BRANDING

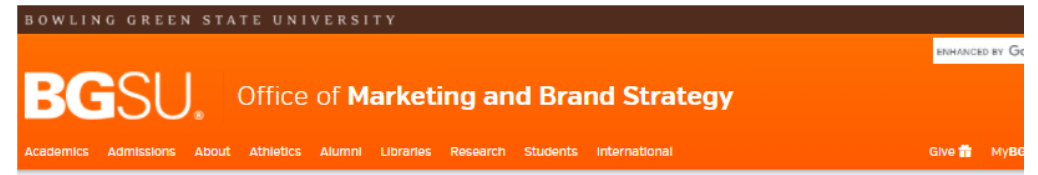


#4F2C1D

#FF7300

COLOR BRANDING

This is a screenshot of the
BGSU official identity colors
page.



Brand Standards and Guidelines

Purpose of Graphic Standards

The Official Identity Colors

The BGSU Logo

The BGSU Signatures

How to obtain the BGSU Logo or
Signature

Other University Logos

Academic & Administrative Logotypes

Intercollegiate Athletics Logos

Use of Additional Graphics

Web Identity Guidelines

Useful Apps

Use of University Logos on
Merchandise

University Stationery

Name Badge and Tag Standards

Equal Opportunity Statement

BGSU Employment Advertisements

Definitions of Terms

Disability Statement

Contact Us

Marketing and Brand Strategy
419-372-2616
marketing@bgsu.edu

The Official Identity Colors

[Bowling Green State University](#) / [Marketing and Brand Strategy](#) / [Brand Standards and Guidelines](#) / [The Official Identity Colors](#)

BGSU Orange

The principal identity color of BGSU is orange. When possible, this color should appear on any visual communication. BGSU orange was chosen because it is a medium value color so it can be used on either a light or dark background. In addition, white and black type also remains very legible when printed on the BGSU orange. In most cases, the BGSU orange should be used as an accent color with black since black is a more legible text color.

The BGSU orange is the only color, other than black, that is permitted for use on University stationery and business correspondence ([University stationery](#)).

The formulas for the BGSU orange are dependent on what form of media is being employed. The formulas for the BGSU orange are:



Pantone® color: PMS 021
Process formula: 65M/90Y*
RGB formula: R:255/G:115/B:0*
HTML color # FF7300*

BGSU Brown

The secondary identity color of BGSU is brown. Variations of brown are permitted and the user may choose to use the BGSU brown because it may appear more legible.

The formulas for the BGSU brown are:



Pantone® color: PMS 4625
Process color: 30C/72M/74Y/80K*
RGB formula:
R:79/G:44/B:29*
HTML color # 4f2c1d*

Basic identity colors

Both black and white may be used with or as a substitute for the official identity colors.

* These are the recommended PMS color equivalents [See "Definitions of terms"]. Note: The colors reproduced in this document were created using process colors.

COLOR BRANDING

- This is a screenshot of the BGSU web identity guidelines page.
- These guidelines take accessibility into account.

Web Fonts

Verb is the primary type font and Helvetica Neue is the secondary type font on BGSU web style sheets. Each end-user's Internet browser will select the appropriate typeface for their system.

Font colors can vary; for light background areas, black, brown, and grey are permissible. For dark background areas, white and tan are permissible. Orange should only be used as a font color for links on a webpage.

Black: RGB: [0,0,0], HTML: #000000
Grey: RGB: [102,6,0], HTML: #666666
Brown: RGB: [79,44,29], HTML: #4F2C1D

White: RGB: [255,255,255], HTML: #FFFFFF
Tan: RGB [245,231,216], HTML: #F5E7D8
Orange Link: RGB [244,121,51], HTML: #FF7300

Web Colors

BGSU's color values are stated in the **Official Identity Colors**. A palette of acceptable web colors has been selected to complement the official identity colors and only these web colors can be used on official BGSU web sites.

Primary BGSU Brand Colors

BGSU Orange

RGBA Color: 244,121,51,1.0
HTML Color: #FF7300

BGSU Tan

RGBA Color: 245,231,216,1.0
HTML Color: #F5E7D8

BGSU Brown

RGBA Color: 79,44,29,1.0
HTML Color: #4F2C1D

Supporting BGSU Colors

Light Grey

RGBA Color: 242,242,242,1.0
HTML Color: #F2F2F2

Dark Grey

RGBA Color: 63,63,63,1.0
HTML Color: #3F3F3F

Black

RGBA Color: 0,0,0,1.0
HTML Color: #000000

For Web guidelines, use policies, templates and resources contact the Office of Marketing and Brand Strategy at 419-372-2616.

Outside groups and affiliations must work through the Office of Marketing and Brand Strategy to create any web presence within the BGSU brand.

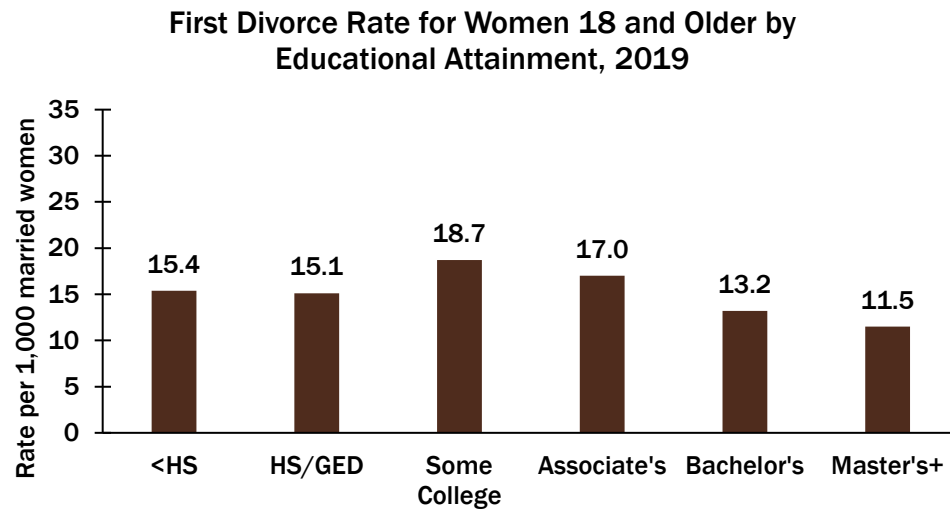
COLOR STORY

With accessibility and branding in mind...

Use color to make important ideas come forward.

COLOR STORY - 1

1. GRAY IS YOUR FRIEND

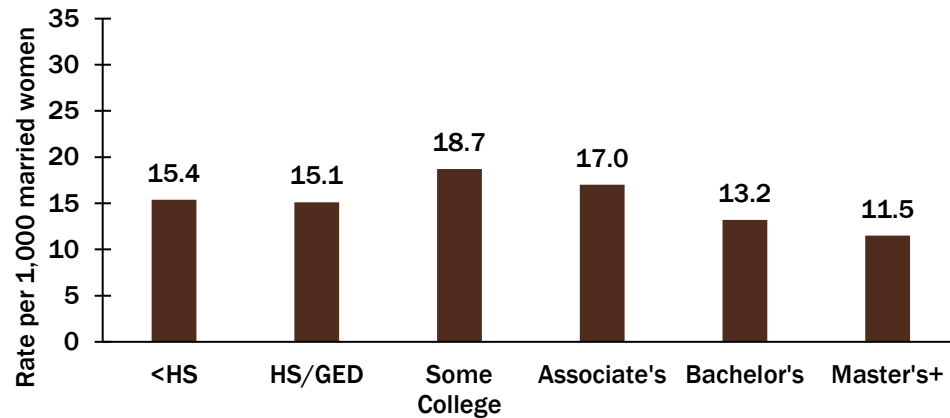


Data Source: U.S. Census Bureau, American Community Survey, 1-year Estimates, 2019

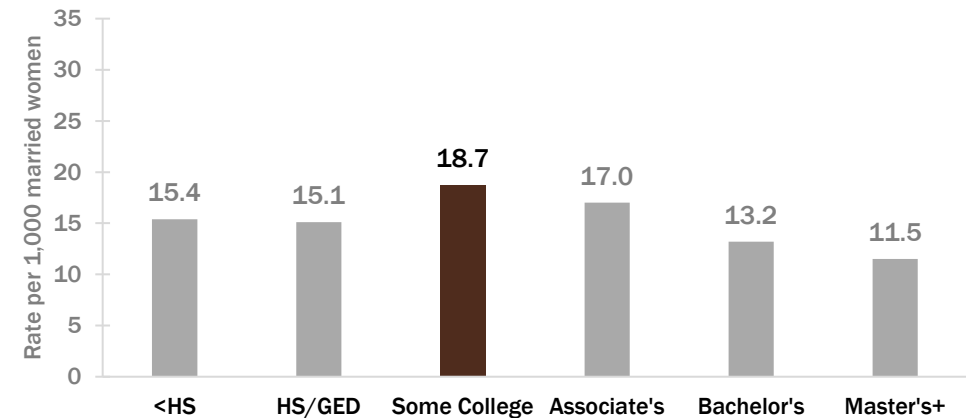
COLOR STORY - 1

1. GRAY IS YOUR FRIEND

First Divorce Rate for Women 18 and Older by Educational Attainment, 2019



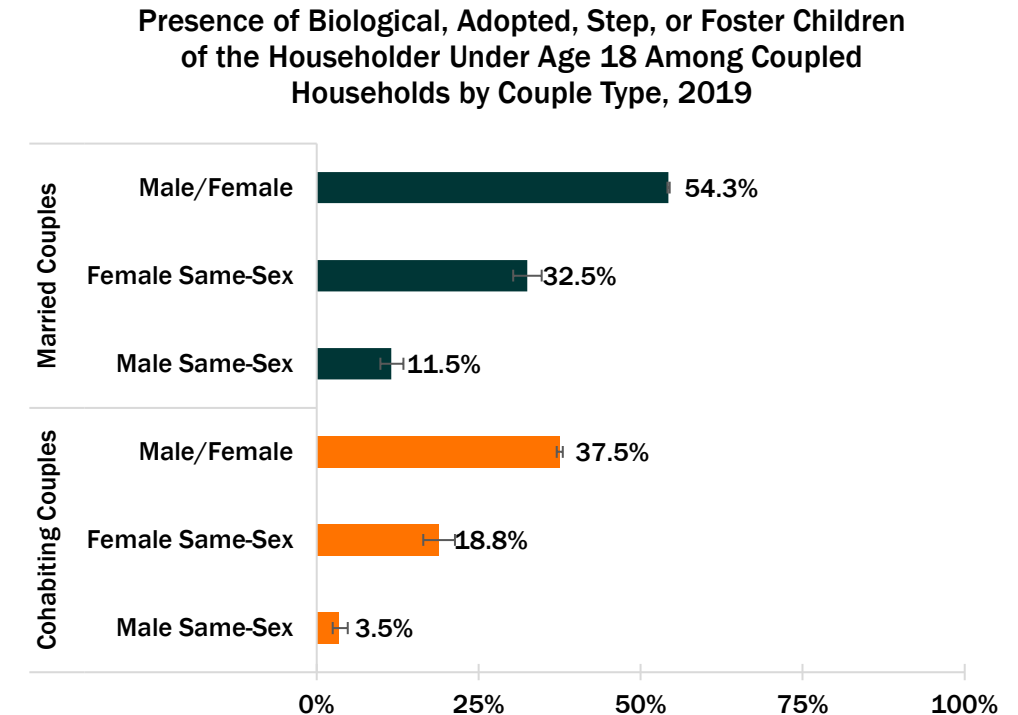
First Divorce Rate for Women 18 and Older by Educational Attainment, 2019



COLOR STORY - 2

2. CONTRASTING DATA → USE CONTRASTING COLORS

Two colors from different segments of the color wheel are contrasting colors (AKA complementary or clashing colors).

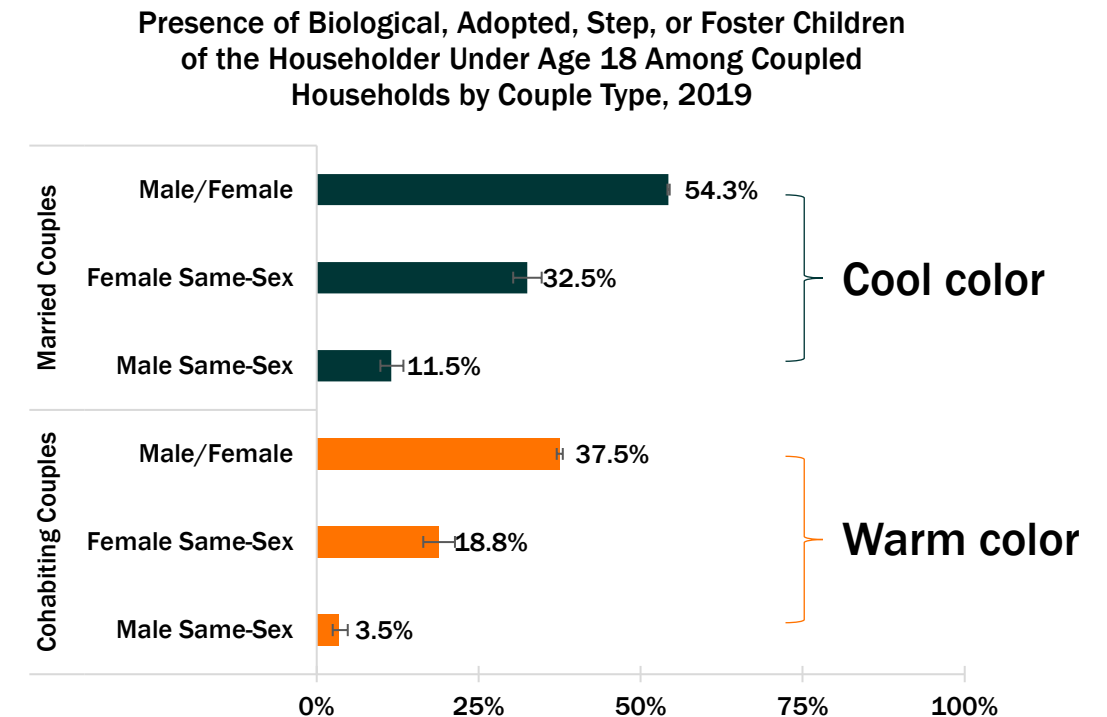


Data Source: U.S. Census Bureau, American Community Survey, 1-year Estimates, 2019

COLOR STORY - 2

2. CONTRASTING DATA → USE CONTRASTING COLORS

Two colors from different segments of the color wheel are contrasting colors (AKA complementary or clashing colors).



Data Source: U.S. Census Bureau, American Community Survey, 1-year Estimates, 2019



**WE INTERRUPT
THIS PROGRAM**

EMERGENCY BROADCAST SYSTEM

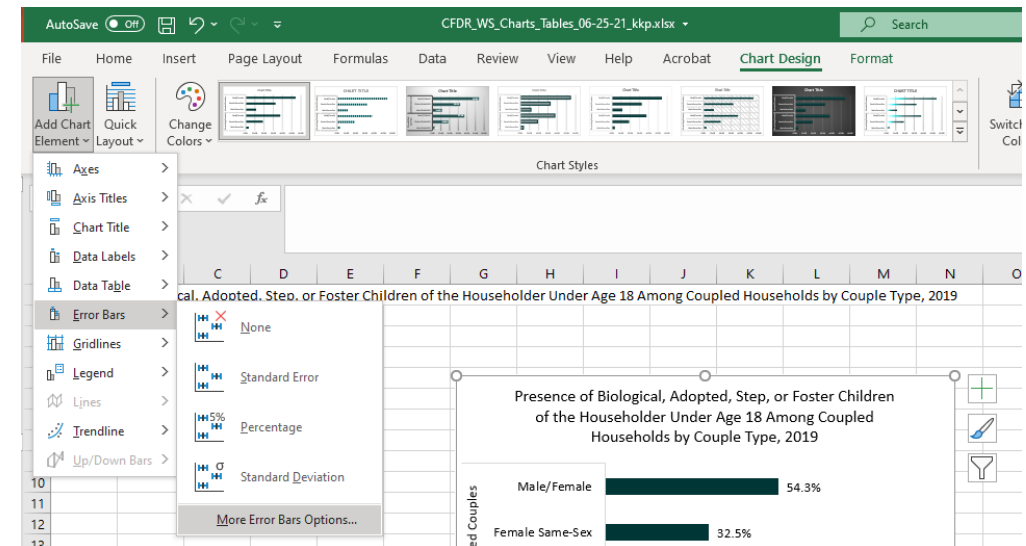
CONFIDENCE INTERVALS

HOW DO YOU ADD THEM IN EXCEL?

DATA

		Est	LB	UB
Cohabiting Couples	Male Same-Sex	3.5%	1.0%	1.3%
	Female Same-Sex	18.8%	2.3%	2.6%
	Male/Female	37.5%	0.5%	0.5%
Married Couples	Male Same-Sex	11.5%	1.7%	1.9%
	Female Same-Sex	32.5%	2.2%	2.2%
	Male/Female	54.3%	0.2%	0.2%

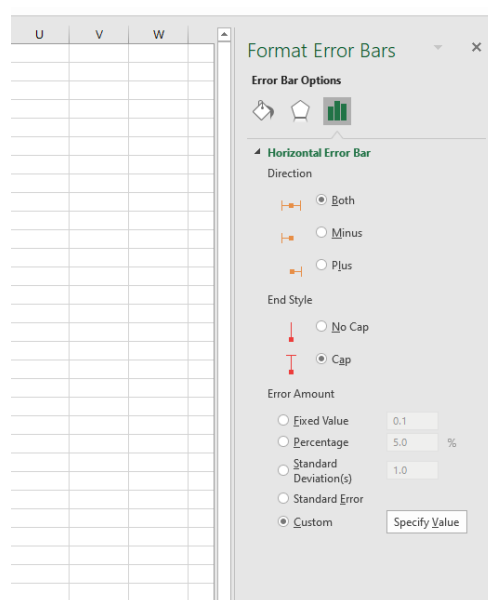
ADD CHART ELEMENT



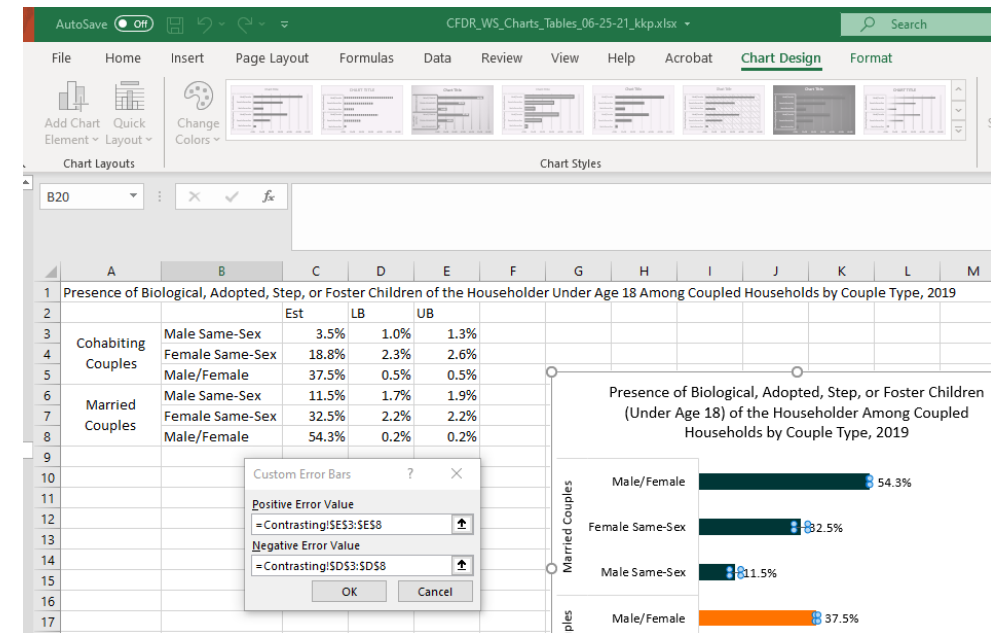
CONFIDENCE INTERVALS

HOW DO YOU ADD THEM IN EXCEL?

FORMAT ERROR BARS



SPECIFY VALUES



Welcome back to your regularly scheduled programming...

COLOR STORY - 3

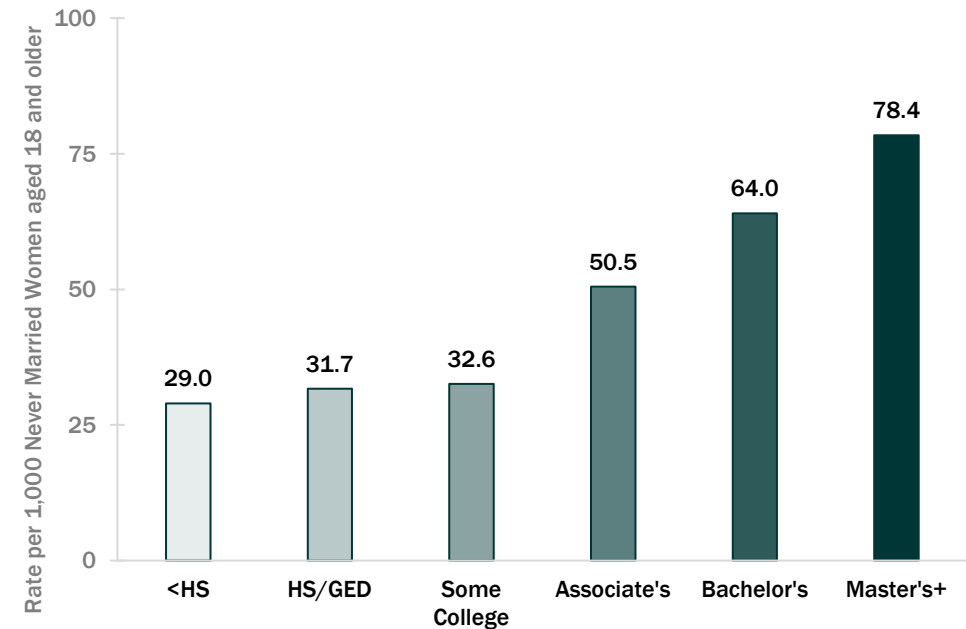
4. Data ranges →

Use low saturation/ paler/
whiter colors for lower values

and

Use higher saturation/ richer/
darker colors for higher values

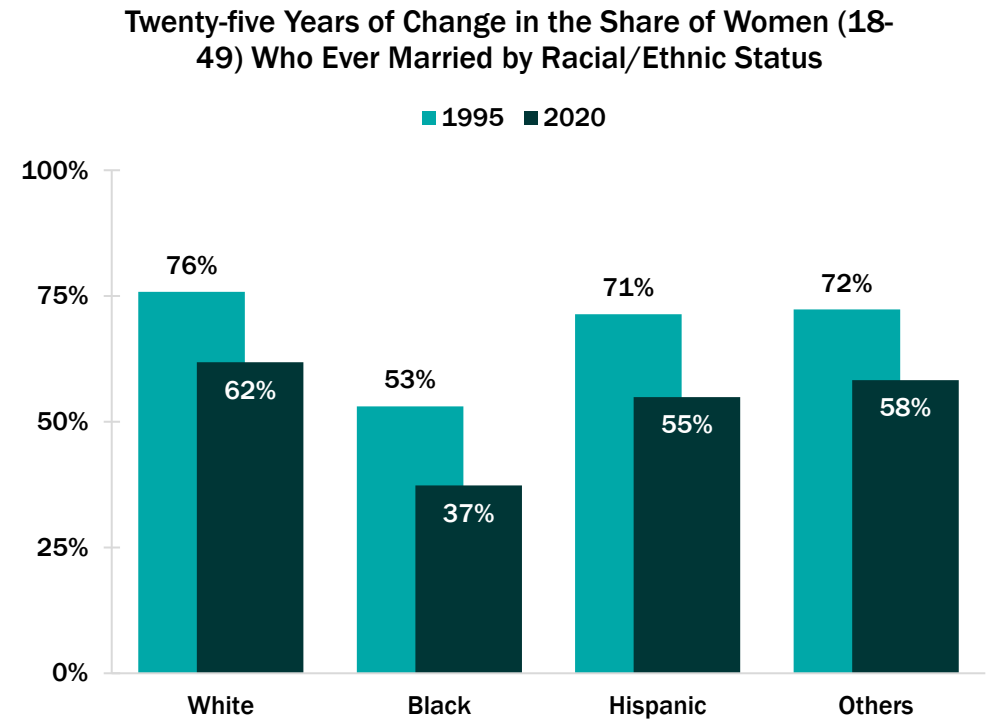
First Marriage Rate for Never-Married Women 18 and Older by Educational Attainment, 2019



Source: NCFMR analyses of U.S. Census Bureau, American Community Survey, 1-yr. est., 2019

COLOR STORY - 4

3. Groups of data → Use the same or similar colors



Source: NCFMR analyses of Current Population Survey (IPUMS) 1995 and 2020 March Supplements

COLOR STORY - 5

5. Don't use too many colors.

→ Find the “lowest common denominator” that allows you to still tell your story.

CHARTS

CATEGORICAL DATA

GOAL: Bring structure to data by grouping people, places and things

CATEGORICAL DATA

Uses visual cues such as position, length, angles, direction, area or volume, and color

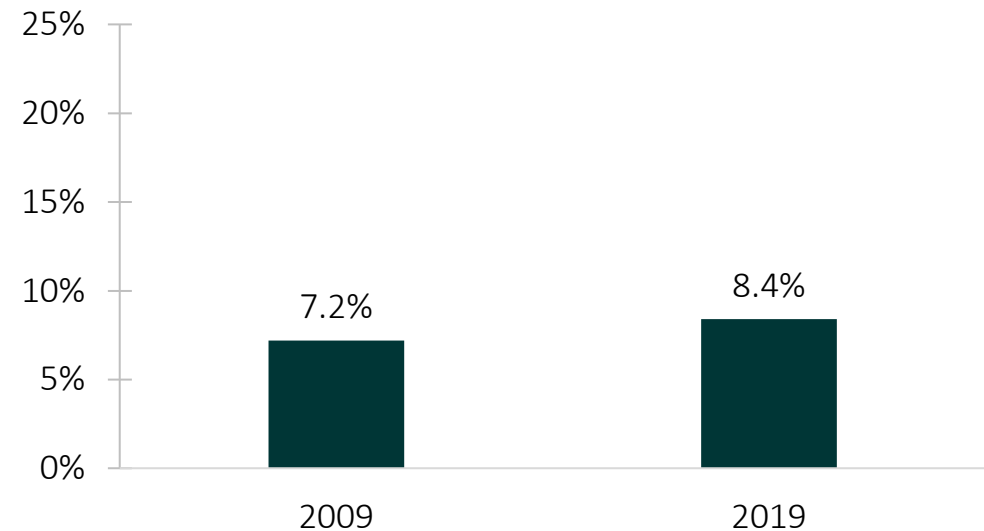
CATEGORICAL DATA

Categories

BAR GRAPH

Useful for direct comparisons where length is used as the visual cue

Percentage of Children Living in Grandparent-Headed Households, 2009 and 2019



Data Source: U.S. Census Bureau, American Community Survey, 1-year Estimates, 2009 and 2019

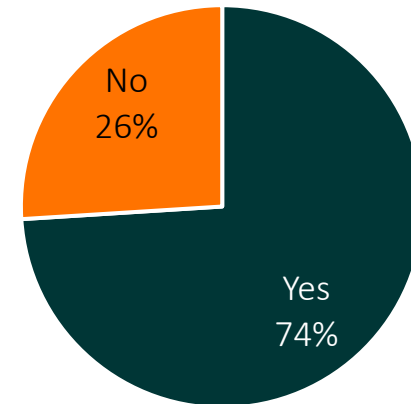
CATEGORICAL DATA

Parts of a Whole

PIE CHART

Parts sum to 100 and best if categories are kept to 3 or less

Children Living in Grandparent-Headed Households by Presence of Parent, 2019



Data Source: U.S. Census Bureau, American Community Survey, 1-year Estimates, 2019

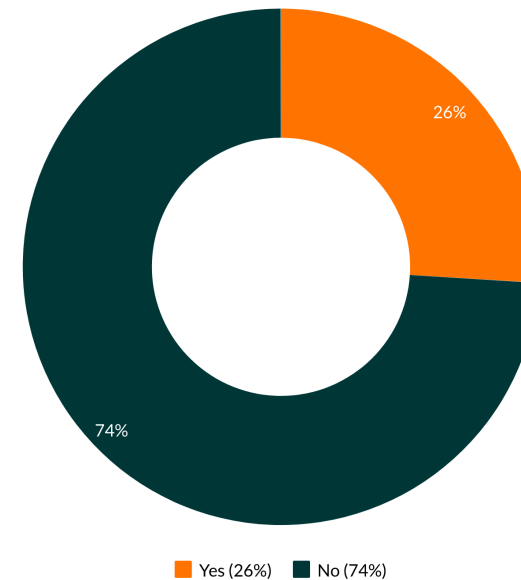
CATEGORICAL DATA

Parts of a Whole

DOUGHNUT CHART

Parts sum to 100 and best if categories are kept to 3 or less

Children Living in Grandparent-Headed Households
by Presence of Parent, 2019



Data Source: U.S. Census Bureau, American Community Survey, 1-year
Estimates, 2019

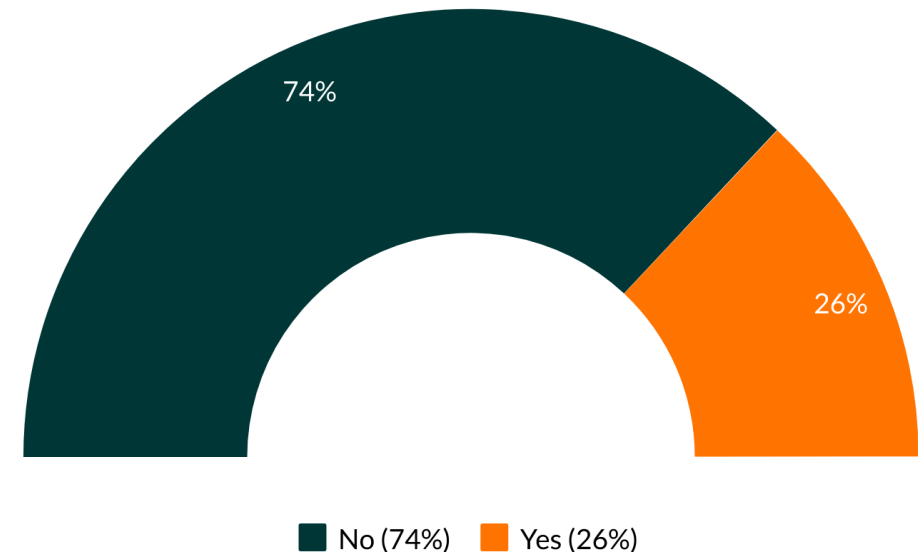
CATEGORICAL DATA

Parts of a Whole

GAUGE CHART

Parts sum to 100 and best if categories are kept to 3 or less

Children Living in Grandparent-Headed Households by Presence of Parent, 2019



Data Source: U.S. Census Bureau, American Community Survey, 1-year Estimates, 2019

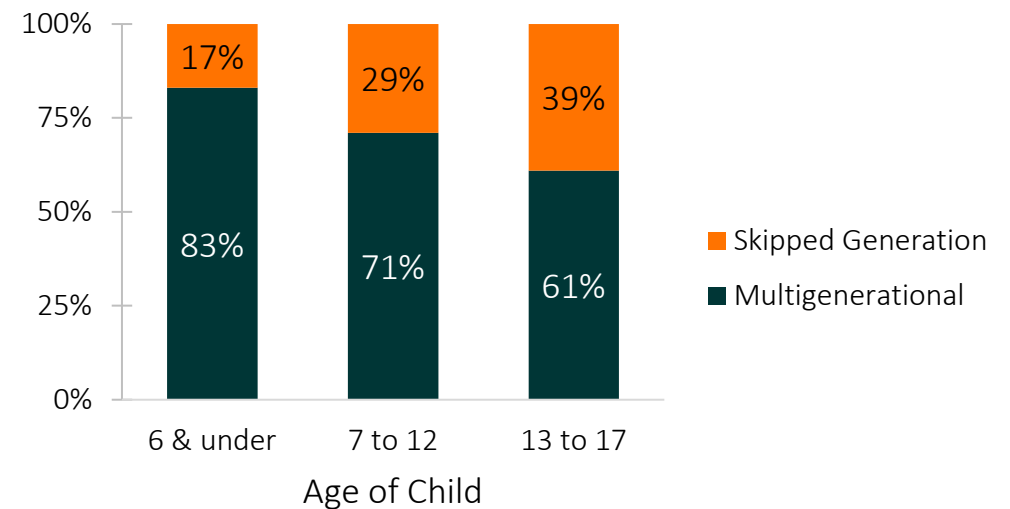
CATEGORICAL DATA

Parts of a Whole

STACKED BAR CHART

Each bar can sum to 100 or can be used to show raw counts

Children Living in Grandparent-Headed Households by Presence of Parent and Age of Child, 2019



Data Source: U.S. Census Bureau, American Community Survey, 1-year Estimates, 2019

CATEGORICAL DATA

BEWARE of defaults when using Excel!

- **REMEMBER** - position and length are visual cues.



GEOMETRY: LENGTH & POSITION MATTERS

Figure A

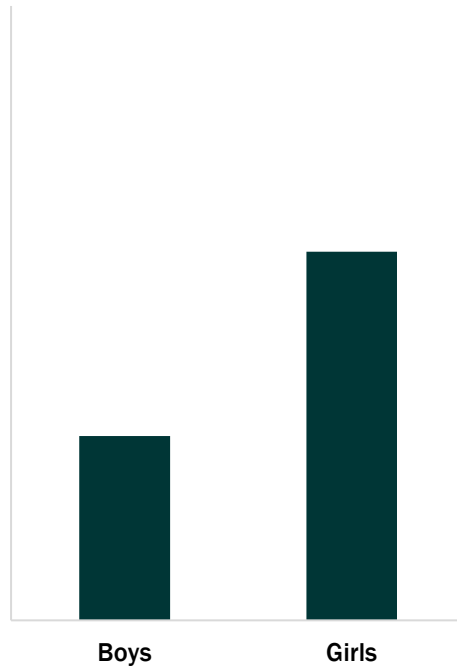


Figure B

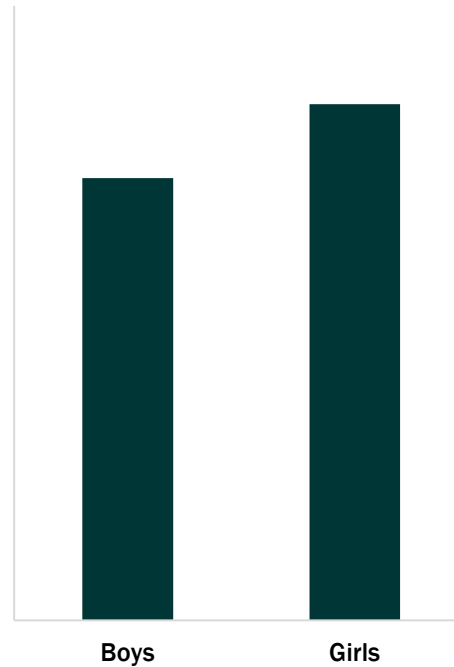
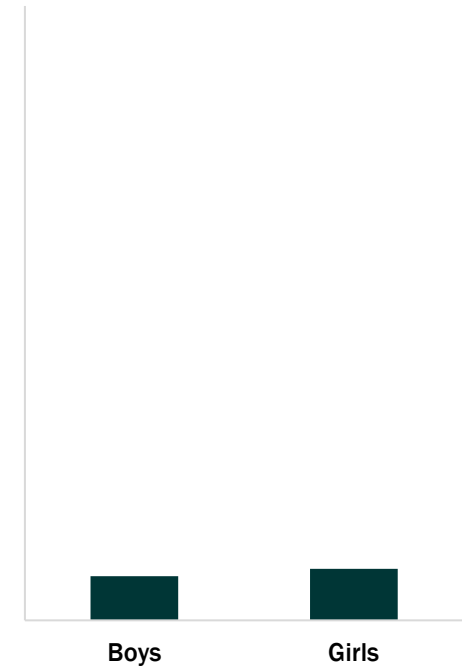


Figure C



Source: NCFMR analyses of the American Community Survey 1-year estimates, 2019

GEOMETRY: LENGTH & POSITION MATTERS

Figure A

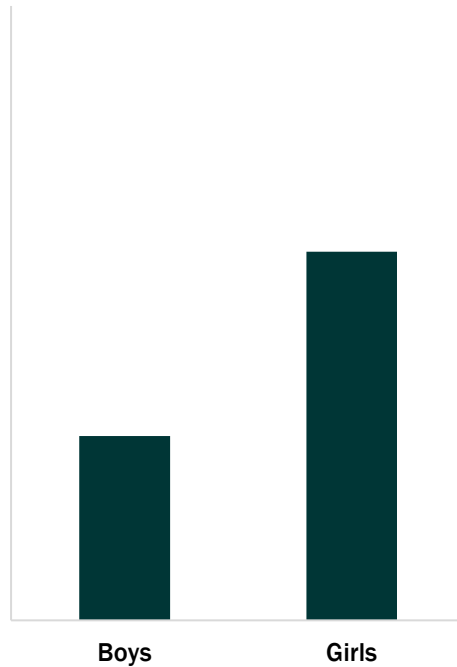


Figure B

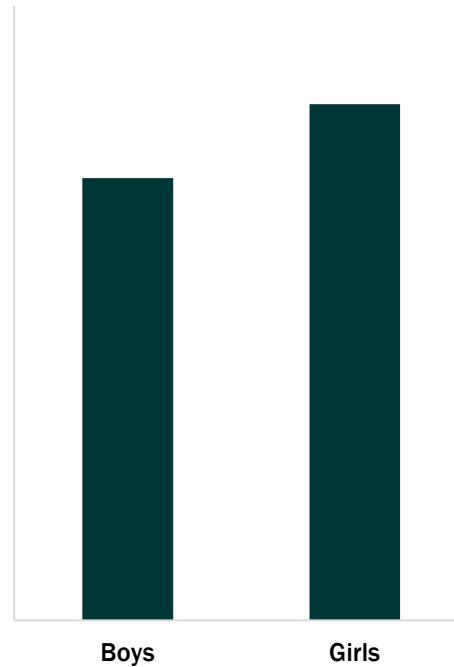
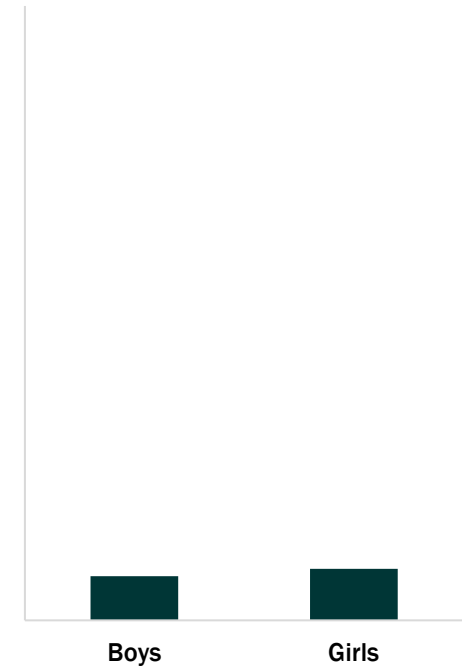


Figure C



Source: NCFMR analyses of the American Community Survey 1-year estimates, 2019

GEOMETRY: LENGTH & POSITION MATTERS

Figure A. Axis starting at 6% and ending at 10%

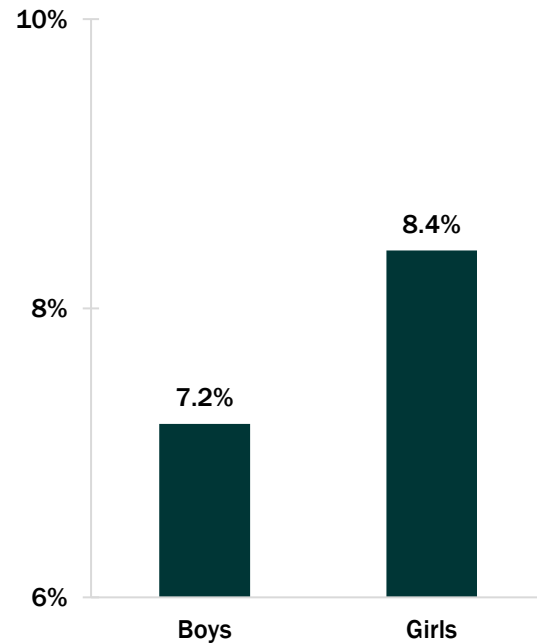


Figure B. Axis starting at 0% and ending at 10%

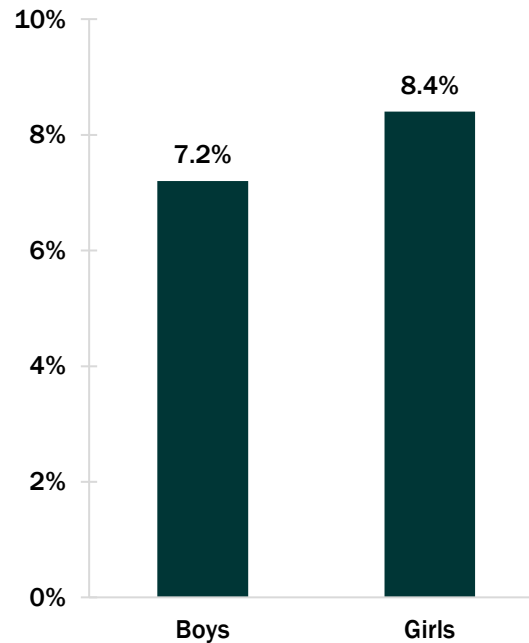
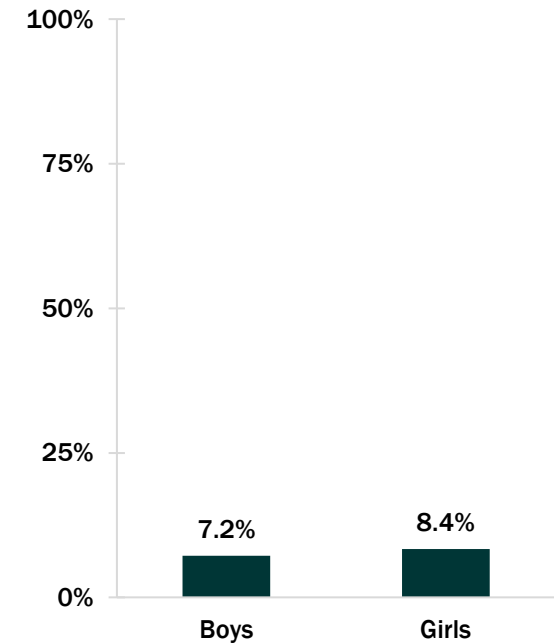


Figure C. Axis starting at 0% and ending at 100%



TIME SERIES DATA

GOAL: See what has passed, what is different, what is the same, and by how much



TIME SERIES DATA

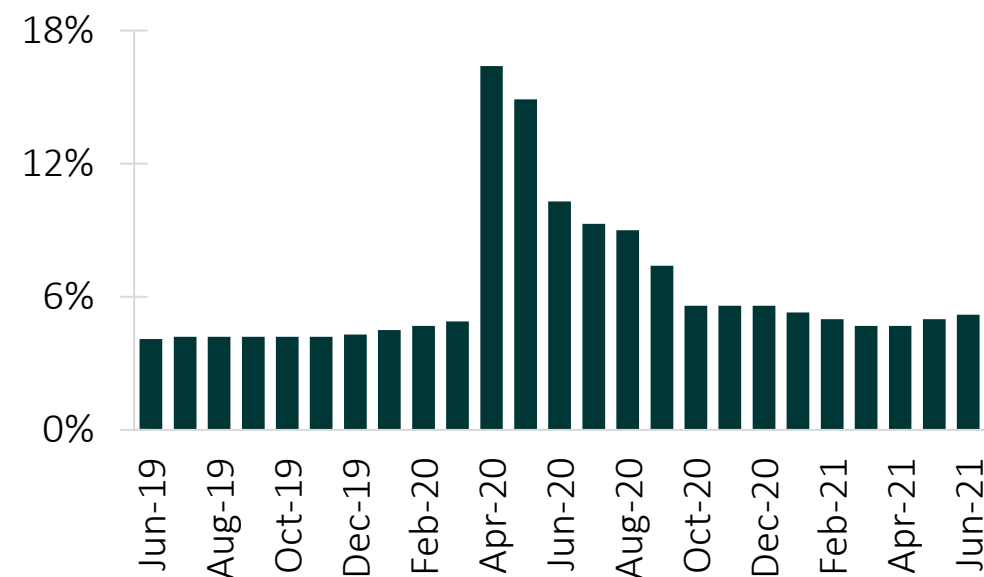
Uses visual cues such as length, direction, and position

TIME SERIES DATA

BAR GRAPH

Useful for discrete points in time

Ohio Monthly Unemployment Rate
June 2019-June 2021



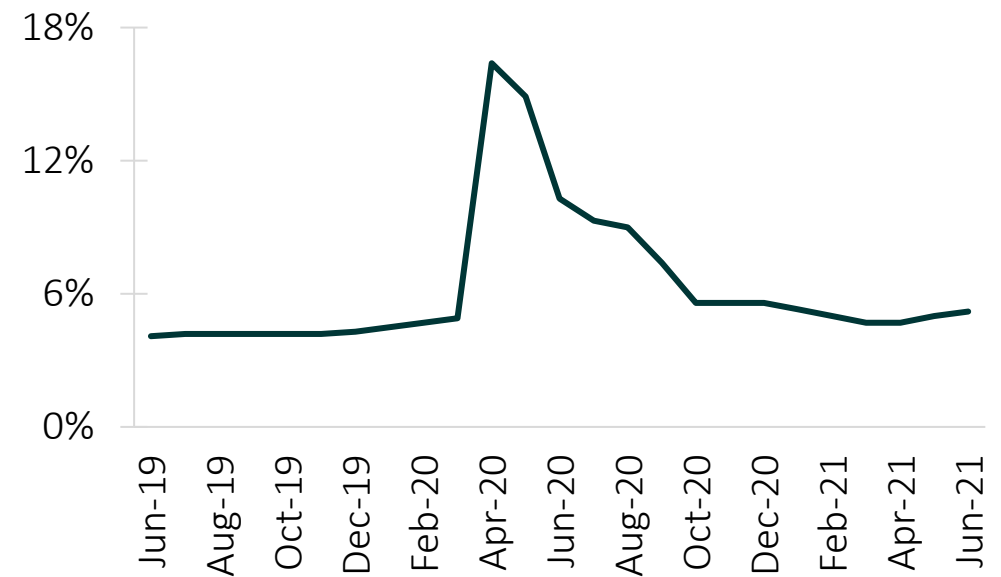
Data Source: Bureau of Labor Statistics

TIME SERIES DATA

LINE CHART

Lines can make it easier to see trends

Ohio Monthly Unemployment Rate
June 2019-June 2021



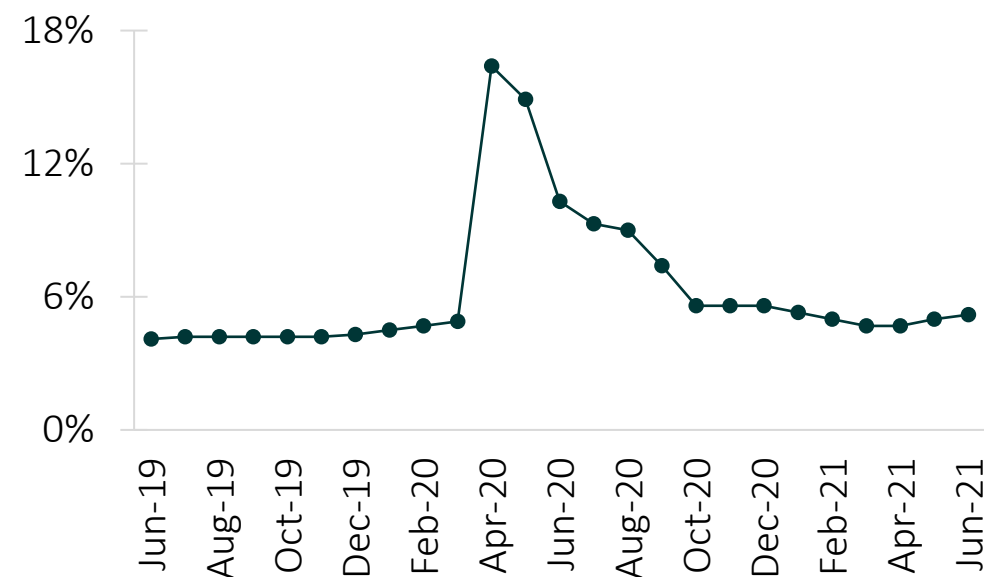
Data Source: Bureau of Labor Statistics

TIME SERIES DATA

DOT PLOT

Distinct points —adding a line
can emphasize trend

Ohio Monthly Unemployment Rate
June 2019-June 2021



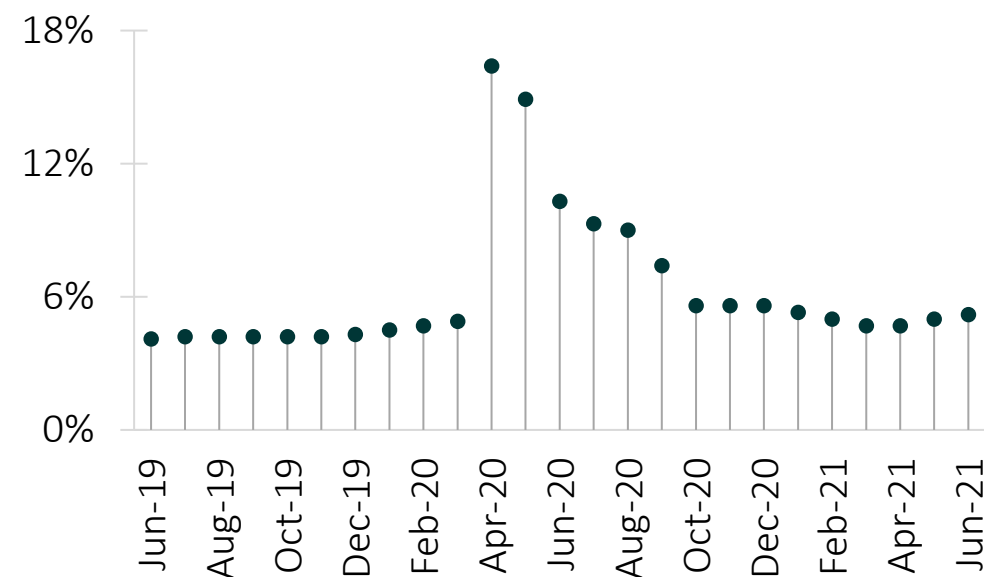
Data Source: Bureau of Labor Statistics

TIME SERIES DATA

DOT-BAR GRAPH

Draws focus to the endpoints more effectively than a bar graph

Ohio Monthly Unemployment Rate
June 2019-June 2021

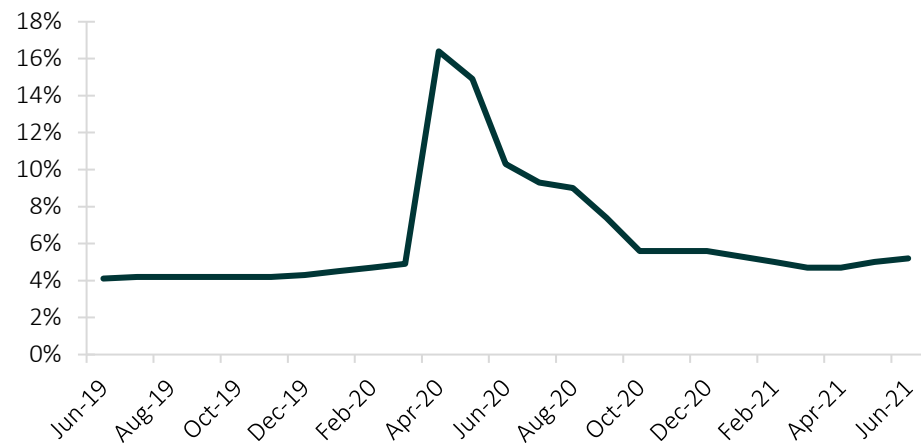


Data Source: Bureau of Labor Statistics

TIME SERIES DATA

BEWARE of line charts when you have **unequal time points**

Ohio Monthly Unemployment Rate
June 2019-June 2021

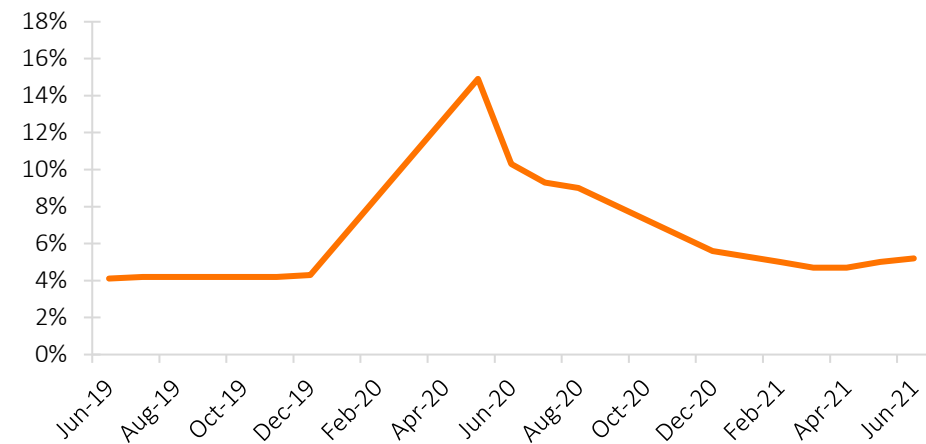


Data Source: Bureau of Labor Statistics

TIME SERIES DATA

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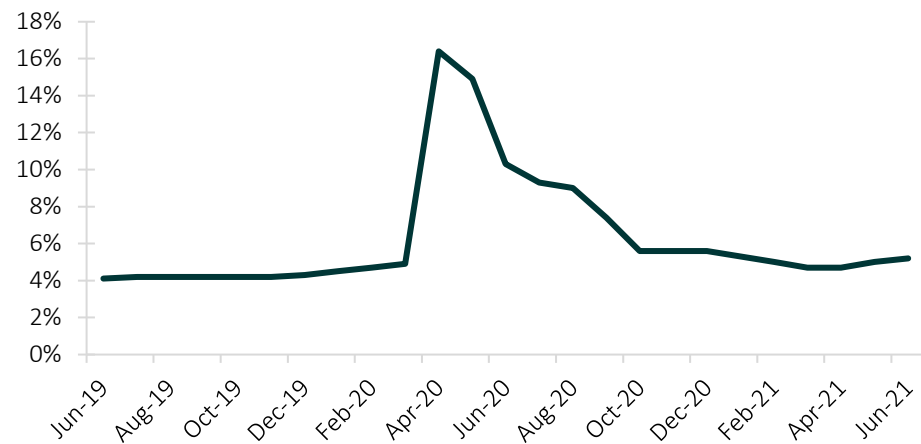


Data Source: Bureau of Labor Statistics

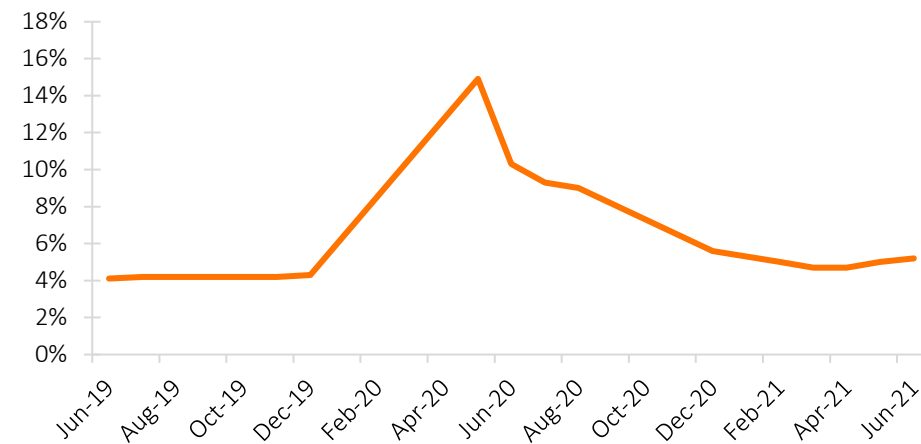
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Ohio Monthly Unemployment Rate
June 2019-June 2021



Ohio Monthly Unemployment Rate
June 2019-June 2021

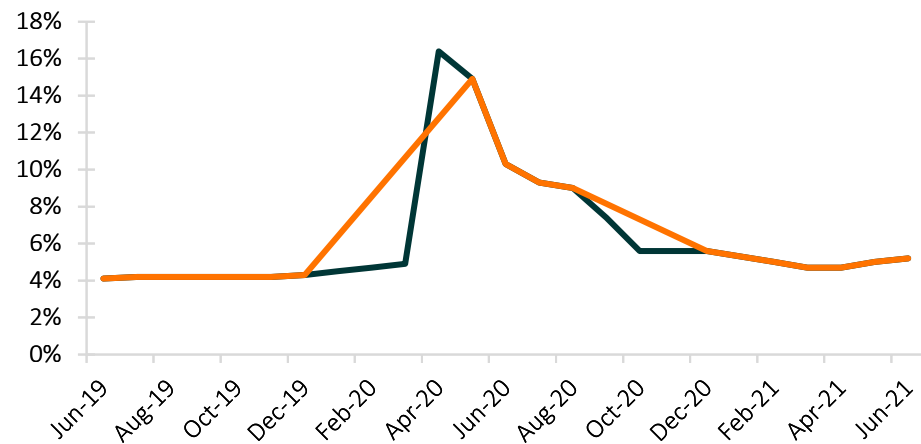


Data Source: Bureau of Labor Statistics

TIME SERIES DATA

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Ohio Monthly Unemployment Rate
June 2019-June 2021

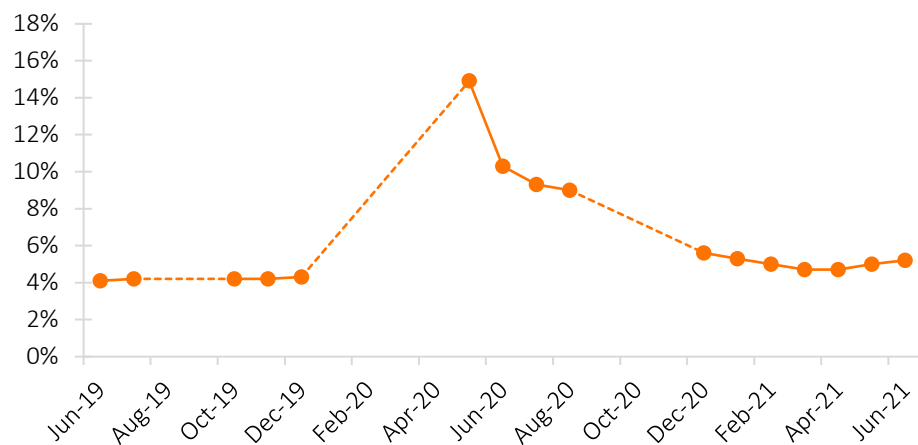


Data Source: Bureau of Labor Statistics

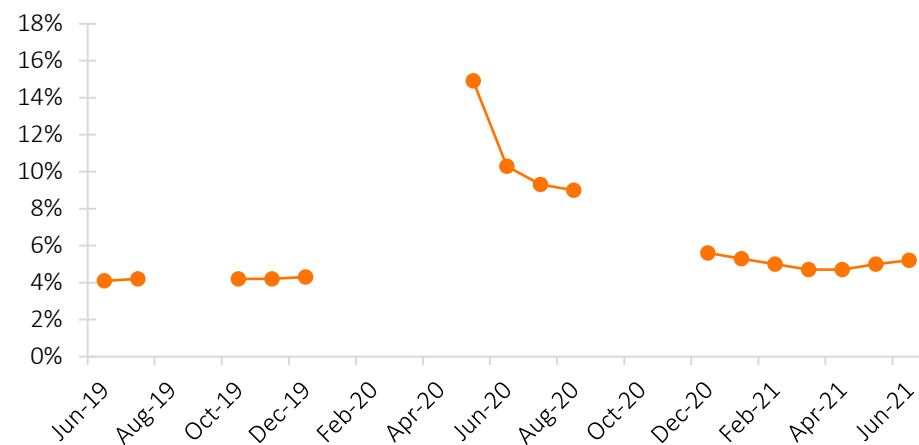
TIME SERIES DATA

BEWARE of line charts when you have unequal time points

Ohio Monthly Unemployment Rate
June 2019-June 2021



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June 2019-June 2021

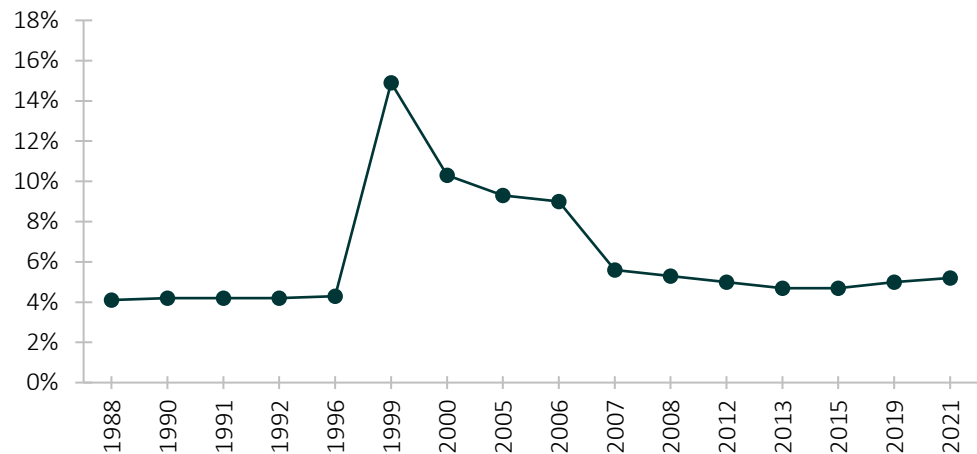


Data Source: Bureau of Labor Statistics

TIME SERIES DATA

LINE CHART

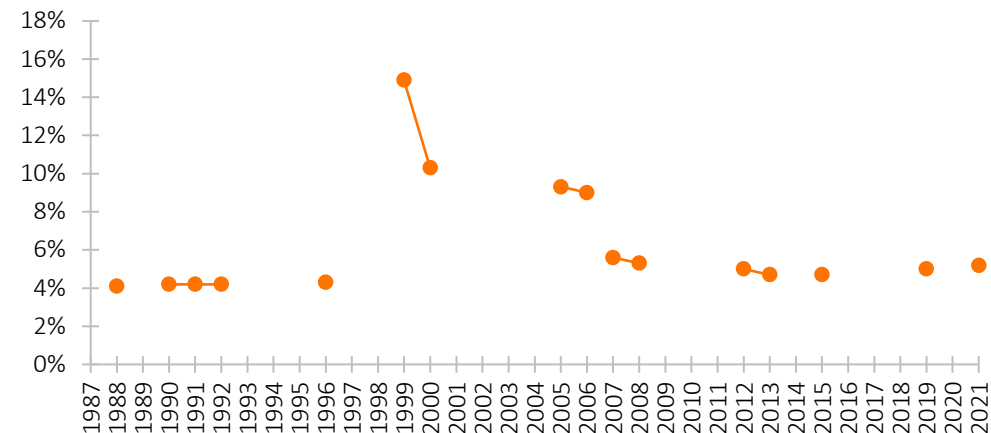
Unemployment Rate



Data Source: Bureau of Labor Statistics

SCATTER CHART

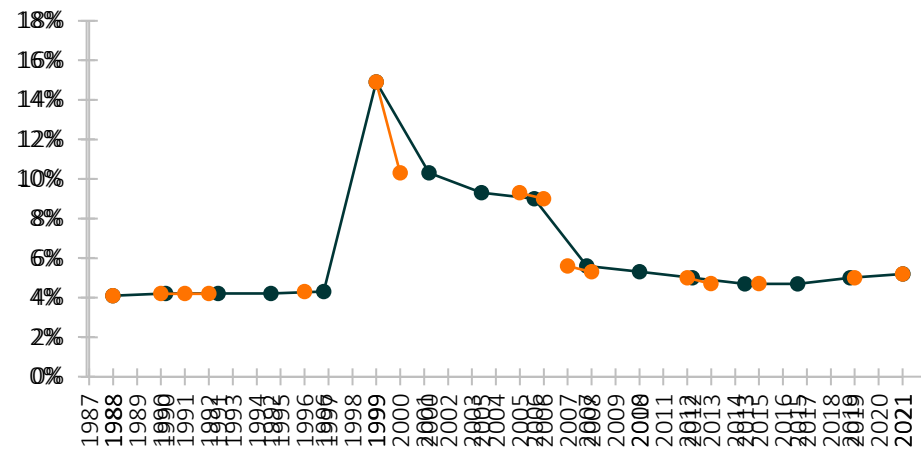
Unemployment Rate



TIME SERIES DATA

BEWARE of line charts when you have unequal time points

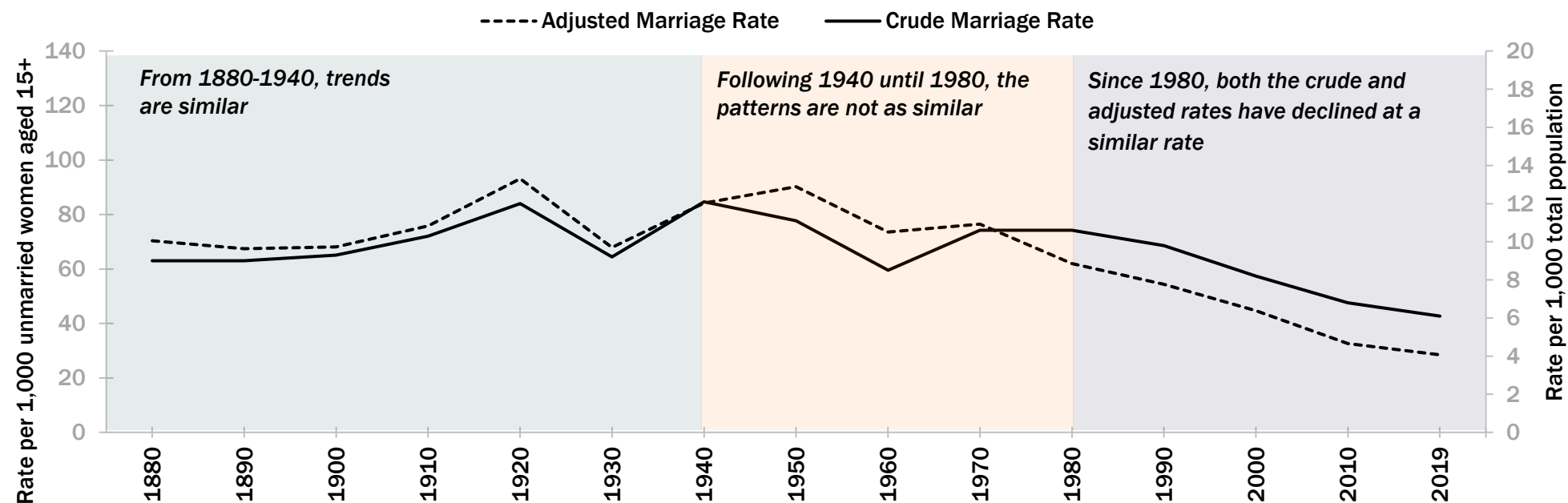
Chronic unemployment rate
June 1988-June 2021



Data Source: Bureau of Labor Statistics

ANNOTATE

Figure 1
U.S. Decennial Marriage Rates, 1880-2019



SPATIAL DATA

GOAL: Represent where (you) are, were (you)'ve been, where (you) want to go



SPATIAL DATA

MAPS!



SPATIAL DATA

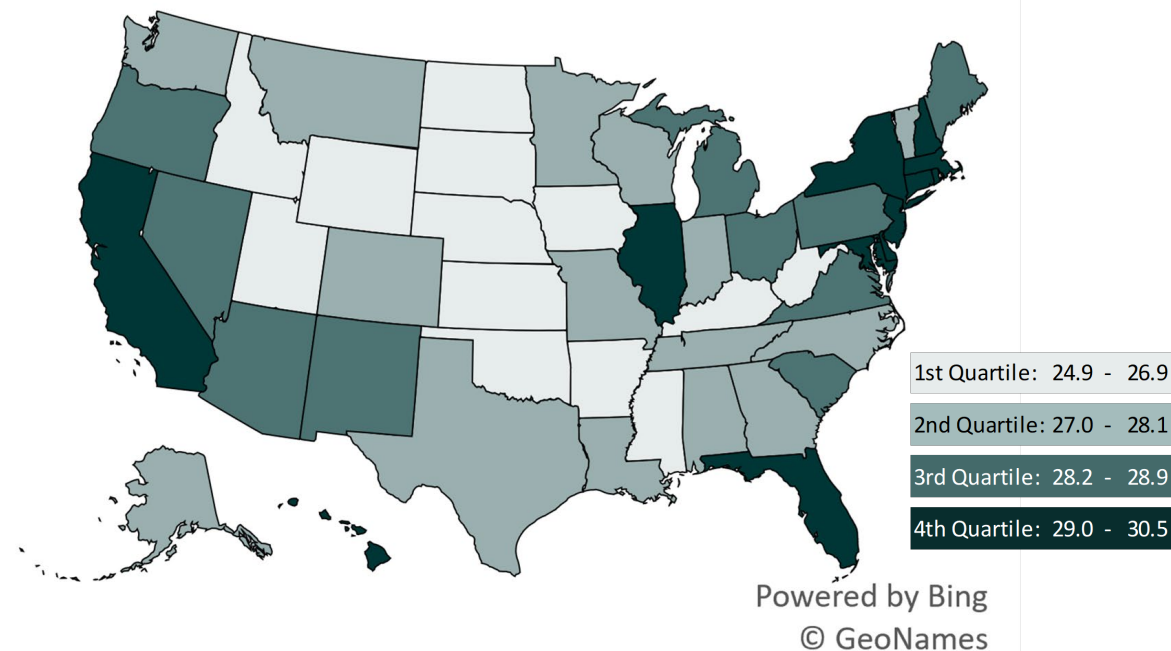
I  maps.

SPATIAL DATA

CHOROPLETH MAP

Defined regions colored by data

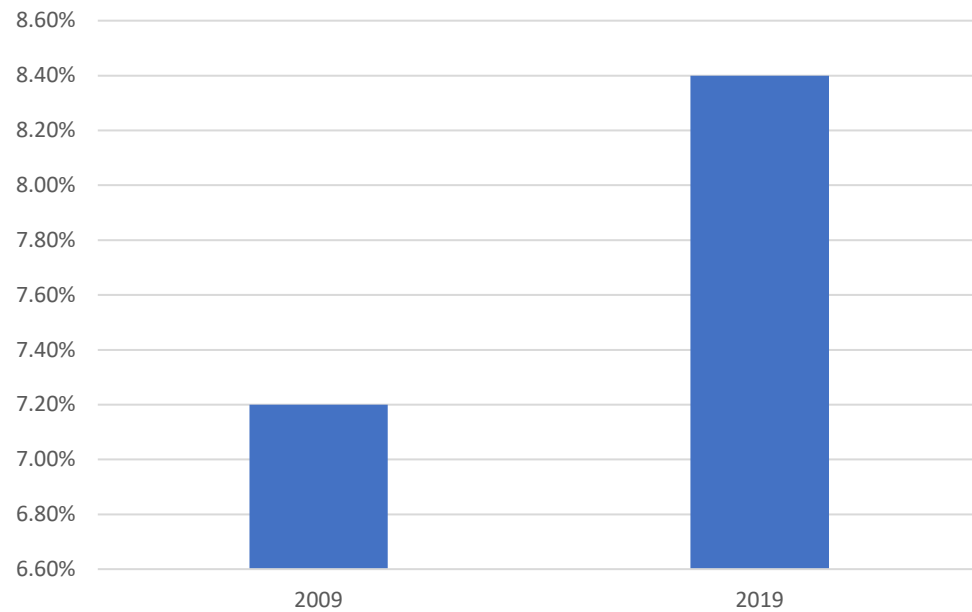
Women's State-Level Median Age at First Marriage by Quartile, 2019



Source: NCFMR analyses of the American Community Survey 1-year estimates, 2019

RANK THIS CHART

Percentage of Children Living in Grandparent-Headed Households, 2009 and 2019



Group Observations



TABLES

In ~~Excel~~ Word



TABLES

Where is your table going to be viewed and by whom?

TABLES

JOURNAL ARTICLE

Details About Submitting to JMF:

- **Call for Papers: Transformative Family Scholarship — Deadline July 15, 2021**
- **Guidelines for First Submission to JMF**
- **Guidelines for Resubmission to JMF**
- **JMF Style Guide**
- **Format for JMF Tables**
- **Responsibilities and Rights of Authors**
- **Frequently Asked Questions**

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- **Guidelines for Resubmission to JMF**
- **JMF Style Guide**
- **Format for JMF Tables**
- **Responsibilities and Rights of Authors**
- **Frequently Asked Questions**

TABLES

Professors in the Sociology Department at BGSU were asked:

What are the most common errors students make when creating tables?

1	
2	
3	

TABLES

Survey says...

DECIMAL POINTS	
2	
3	

TABLES

- **Format consistently—typically two digits**

	2015			2017		
Age of Younger Partner						
40-49	21.53	%		22.57	%	
50+	37.84	%		26.29	%	
Mean Age Gap	6.30			5.99		

DECIMAL POINTS

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TABLES

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TABLES

Survey says...

DECIMAL POINTS	
SIGNIFICANCE STARS	
3	

TABLES

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SIGNIFICANCE STARS	
3	



TABLES

Survey says...

DECIMAL POINTS	
SIGNIFICANCE STARS	
DATA SOURCE(S)	

TABLES

- **ALWAYS** put the data source at the bottom of your table (and your charts, too)

† $p < .1$; * $p < .05$; ** $p < .01$; *** $p < .001$

Source: Current Population Survey

Notes:

^a Marital and cohabitation status was included in the roster but not released.

^b Only 16 same gender couples who are both Black in the old roster data.

DECIMAL POINTS

SIGNIFICANCE STARS

DATA SOURCE(S)

P.S. FOREST PLOTS

<https://mbounthavong.com/blog/tag/forest+plots>



BUT WAIT, THERE'S MORE

DATA PRESENTATION

- Published papers
- Conference posters
- Blog posts
- Research briefs
- Infographics

DATA EXPLORATION

You can use data visualization
as an...

- Analysis tool!

SUGGESTED READING

- **Avoiding Data Pitfalls: How to Steer Clear of Common Blunders When Working with Data and Presenting Analysis and Visualizations.** Ben Jones
- **Data Points: Visualization that Means Something.** Nathan Yau
- **Data Story: Explain Data and Inspire Action Through Story.** Nancy Duarte
- **Design for How People Learn.** Julie Dirksen
- **Elevate the Debate: A Multilayered Approach to Communicating Your Research.** Eds. Jonathan A. Schwabish
- **Good Charts: The HBR Guide to Making Smarter, More Persuasive Data Visualizations.** Scott Berinato
- **How Charts Lie: Getting Smarter about Visual Information.** Alberto Cairo
- **How to Lie with Statistics.** Darrell Huff
- **Now You See It.** Stephen Few
- **Show Me the Numbers: Designing Tables and Graphs to Enlighten.** Stephen Few
- **Slide:ology: The Art and Science of Creating Great Presentations.** Nancy Duarte
- **Storytelling with Data: A Data Visualization Guide for Business Professionals.** Cole Nussbaumer Knaflitz
- **The Non-Designer's Design Book, 4th Edition.** Robin Williams
- **Turning Number into Knowledge.** Jonathan Koomey
- **Visualize This: The FlowingData Guide to Design, Visualization, and Statistics.** Nathan Yau