Data for All: Making Visualizations Accessible for Diverse Populations

Office of Institutional Research, Planning & Assessment
October 20, 2022

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Design with perceptibility, flexibility, and cognitive load in mind.

Perceptibility

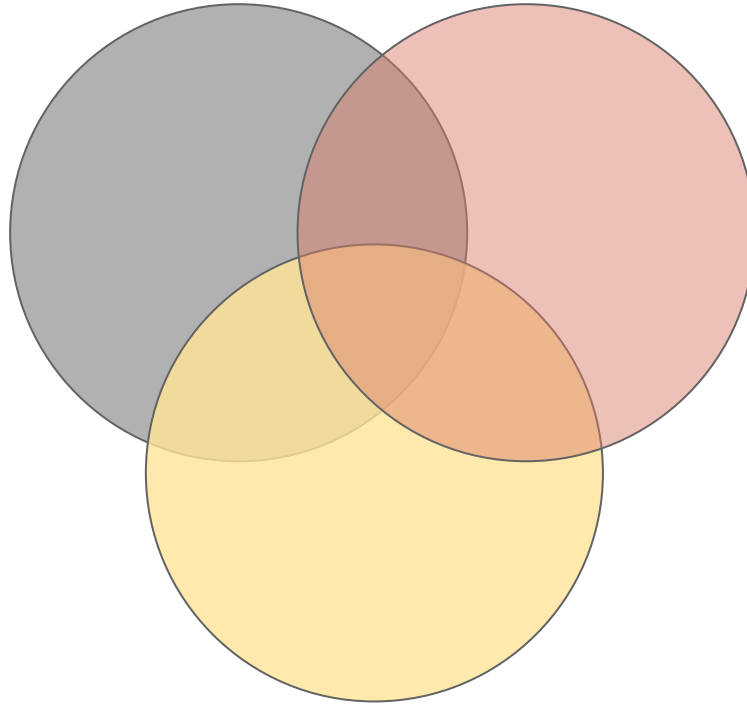Can people access the information?

Flexibility

Can people with different learning styles and needs understand the information?

Cognitive load

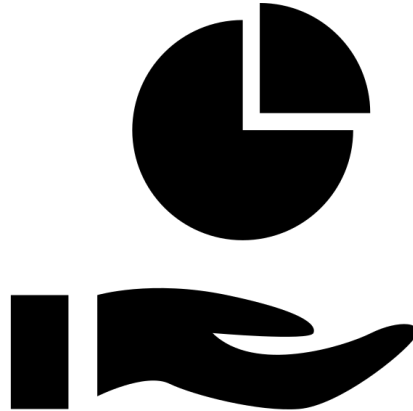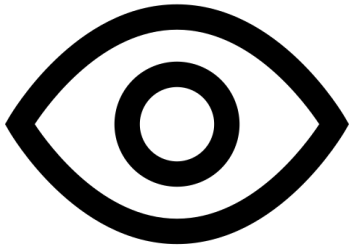How much work does it take to figure out what's going on?

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These elements often overlap.

Perceptibility

Perceptibility

Legibility - Font

Stylized Script

Ƨʇʎlızɘd Ƨcɿıqʇ

TIGHTSPACINGversus W I D E S P A C I N G

Big VS Small

Support:

OpenScholar Documentation

W3C

Legibility - Font Types

Gill sans (uppercase i, lower case L and the number 1): Ill

Imposter letters:

Verdana (uppercase i, lower case L and the number 1): Il1

Mirror letters: db qp   db qp

Humanist vs Grotesque Typefaces: Calibri
Helvetica

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Distinguishable characters: MEDIUM Article

Contrast

Contrast Checker

Color

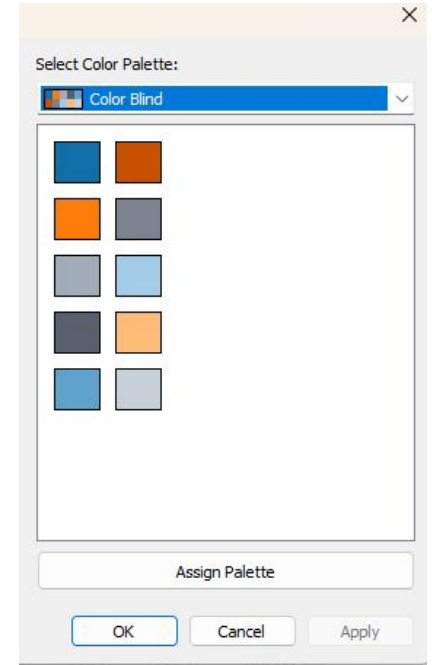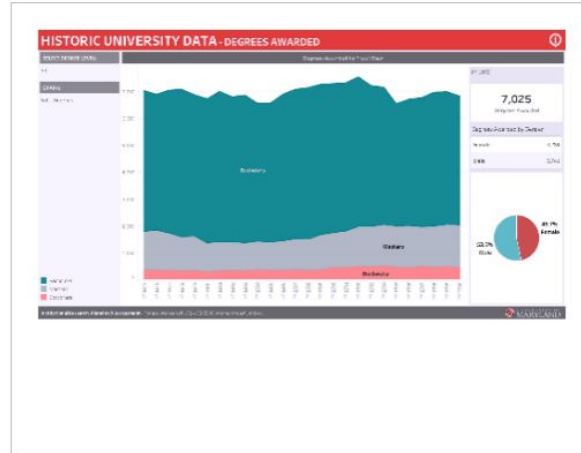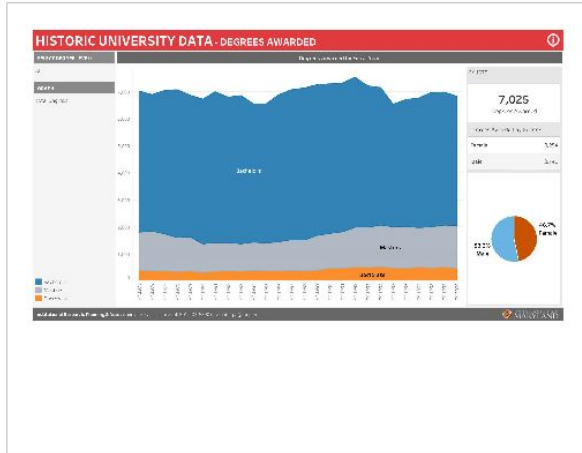| DEUTAN	PROTAN	TRITAN	BLACK/WHITE
Green-Weak/Deuteranomaly	Red-Weak/Protanomaly	Blue-Weak/Tritanomaly	Monochromacy/Achromatopsia
Green-Blind/Deuteranopia	Red-Blind/Protanopia	Blue-Blind/Tritanopia	Blue Cone Monochromacy

Original

Simulated

https://pilestone.com/pages/color-blindness-simulator-1

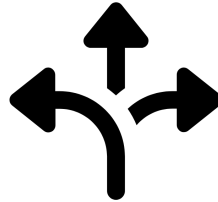# Compatibility

- <u>Screen Readers</u>

- Closed Captioning

Flexibility

Three ways to build in flexibility

Provide descriptive text
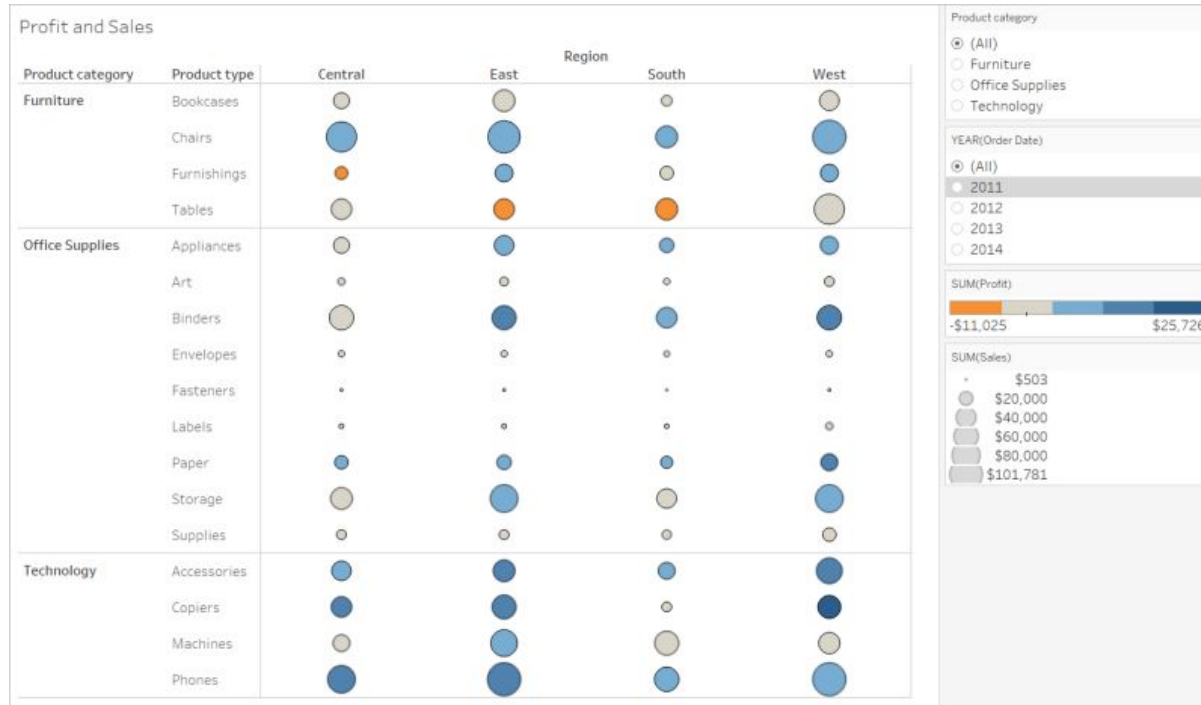
Present information in multiple ways

Use alt text

Provide descriptive text.

Source: Author Views for Accessibility, Tableau

Provide descriptive text.

Source: Author Views for Accessibility, Tableau

Make titles meaningful.

BEFORE

AFTER

Current Status - IAD Airport

IAD flights: **normal activity** with majority on time or close

Source: An accessible makeover, Storytelling with Data

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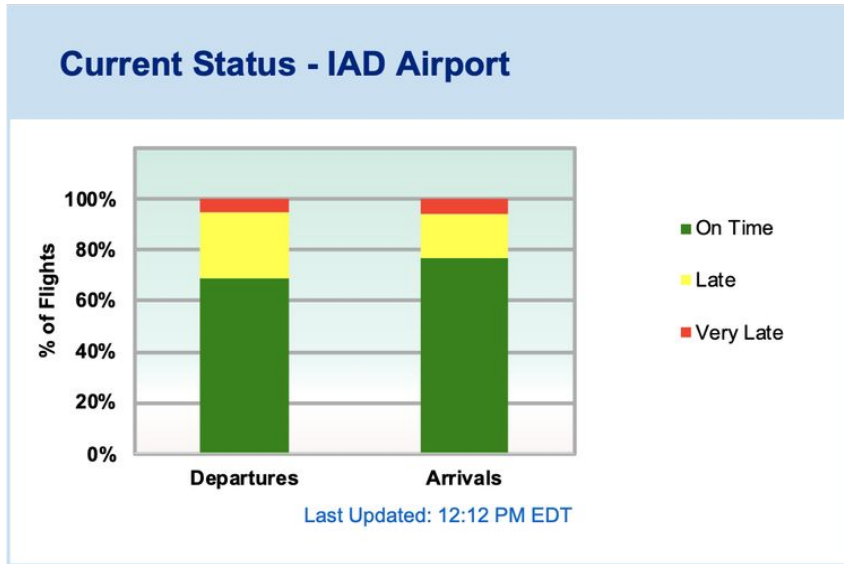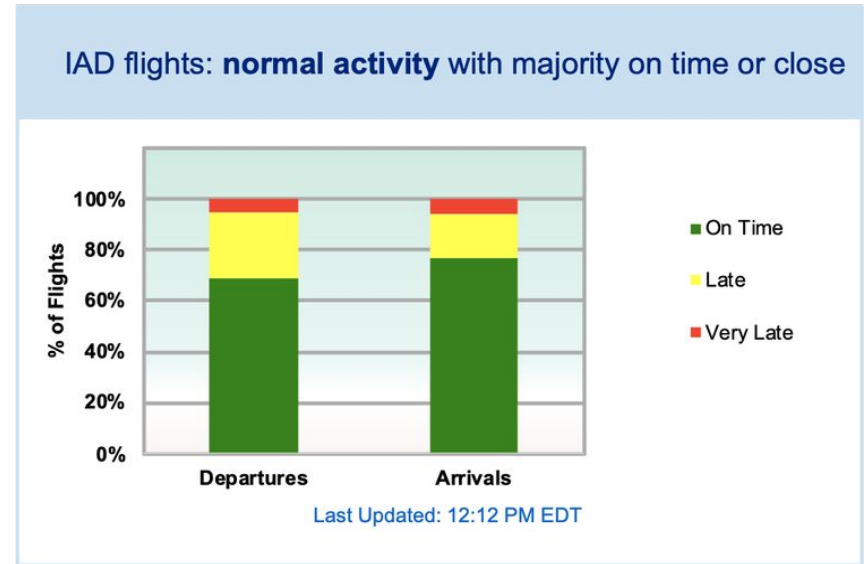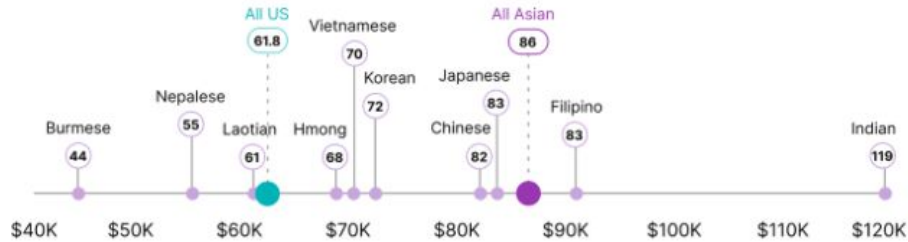
Provide descriptive text in captions.

Median household income among Asian origins group in the U.S.

Median annual household income, 2019, by origin group

All US 61.8
Vietnamese 70
All Asian 86
Korean 72
Nepalese 55
Japanese 83
Burmese 44
Laotian 61
Hmong 68
Chinese 82
Filipino 83
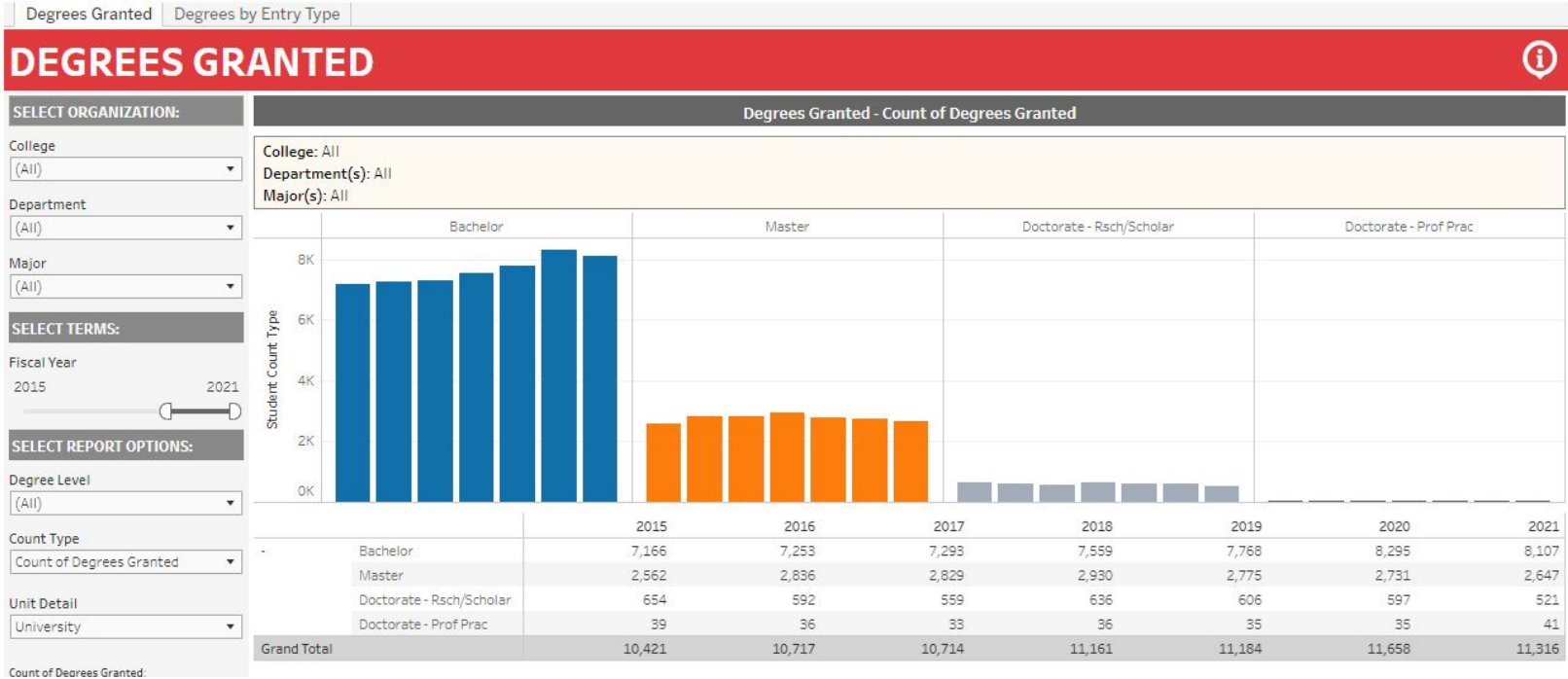Indian 119

$40K $50K $60K $70K $80K $90K $100K $110K $120K

Note: Figure for all Asians include mixed-race and mixed-group populations, regardless of Hispanic origin. Bhutanese, Malaysian, and Mongolian household income estimates are not shown due to insufficient sample sizes. "Chinese" includes those identifying as Taiwanese. Source: Pew Research analysis of 2017-2019 American Community Survey (IPUMS)
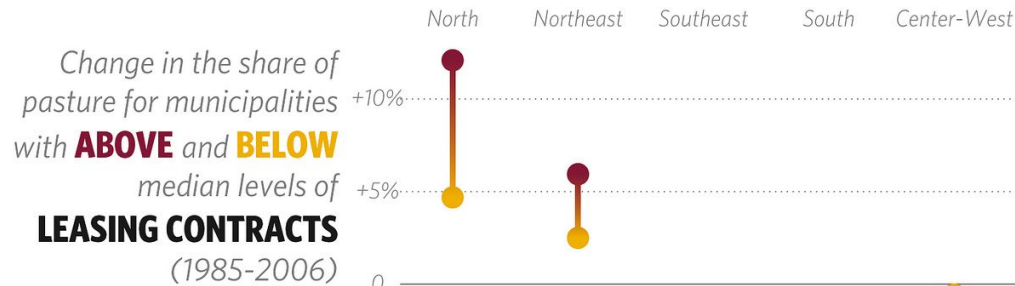
FIGURE IS ADAPTED FROM "INCOME INEQUALITY IN THE U.S. IS RISING MOST RAPIDLY AMONG ASIANS," PEW RESEARCH CENTER.

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Source: AAPI Heritage Month: Rethinking the Asian American Identity, Culture Amp

16

Present information in multiple ways.

Present information in multiple ways.

Change in the share of pasture for municipalities with **ABOVE** and **BELOW** median levels of **LEASING CONTRACTS** (1985-2006)

North   Northeast   Southeast   South   Center-West

+10%
+5%
0
-5%
-10

Municipalities with a high share of **LAND UNDER RENTAL** in the **NORTH** region increased their share of pastureland by 12%, whereas municipalities with low share of land under rental increased their share of pastureland by 5%. The **NORTHEAST** follows the same pattern.

In the **SOUTHEAST** and **SOUTH**, land under rental has very little or no effect. Finally, in the **CENTER-WEST** high-share land under rental municipalities decreased their shares of pastureland when compared to low-share land under rental municipalities.

Source: Tim Varga

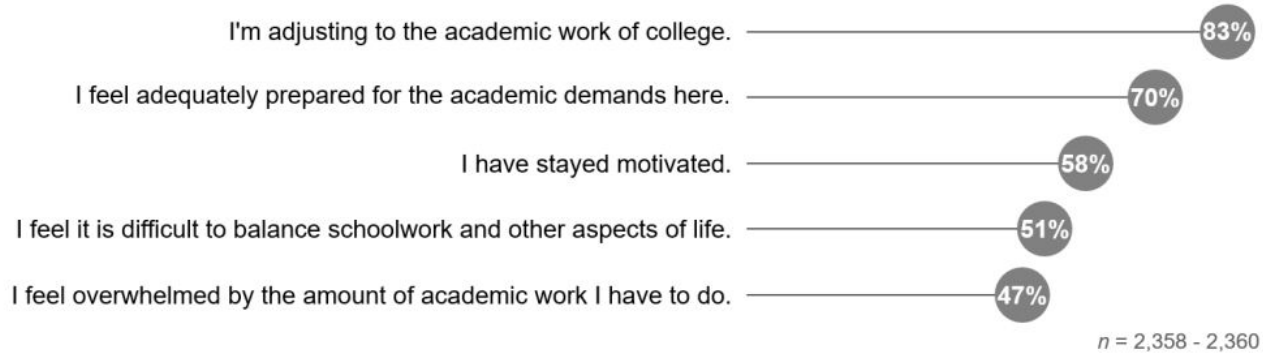# Present information in different ways.
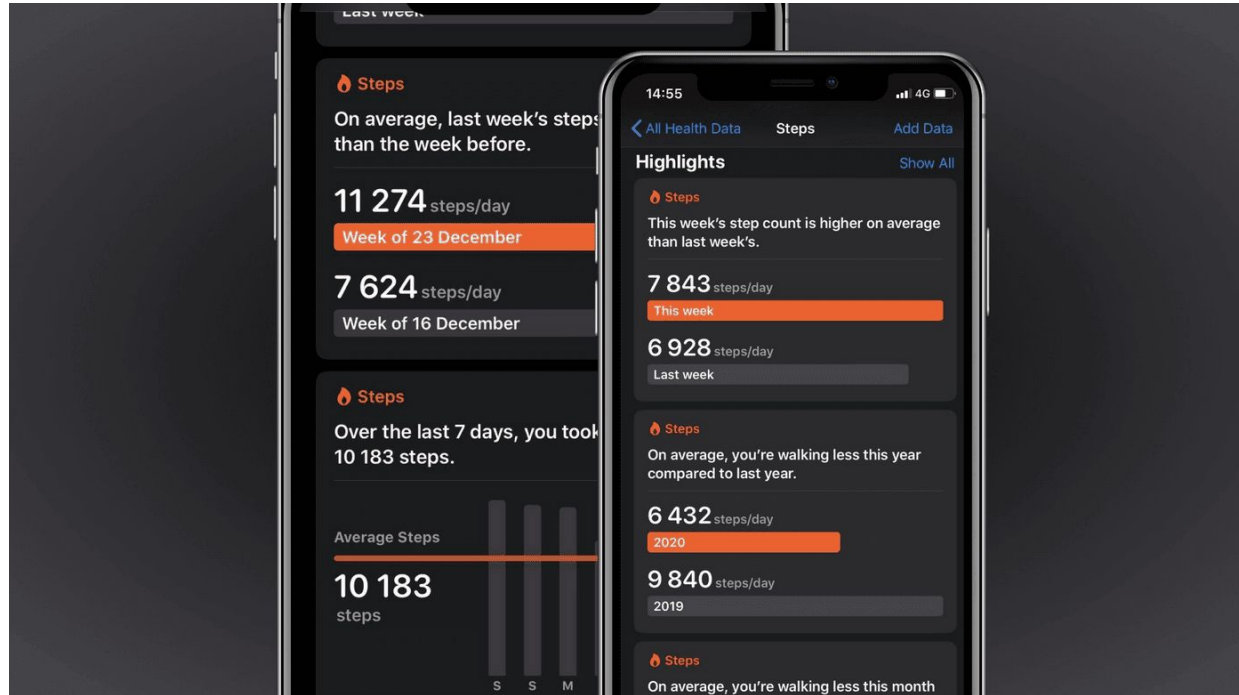
Use alt text for images.

alt= "**Chart type** of **type of data**
where **reason for including chart**"

Include a **link to data source**
somewhere in the text

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Source: Writing Alt Text for Data Visualization, Amy Cesal

Use alt text for images.

Indicate how much you agree or disagree with the following: | % Agree & Strongly Agree

I'm adjusting to the academic work of college. ⸺ 83%

I feel adequately prepared for the academic demands here. ⸺ 70%

I have stayed motivated. ⸺ 58%

I feel it is difficult to balance schoolwork and other aspects of life. ⸺ 51%

I feel overwhelmed by the amount of academic work I have to do. ⸺ 47%

n = 2,358 - 2,360

alt = "Horizontal lollipop chart of percent of respondents who agreed with survey questions where most respondents felt academically prepared for college."
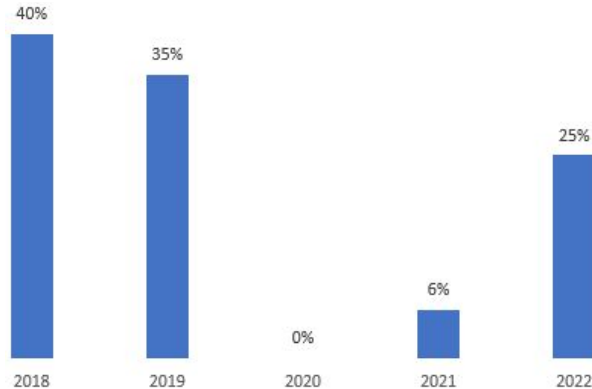
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Cognitive load

It's a data story, not a data swamp.

Create a narrative for your user to follow

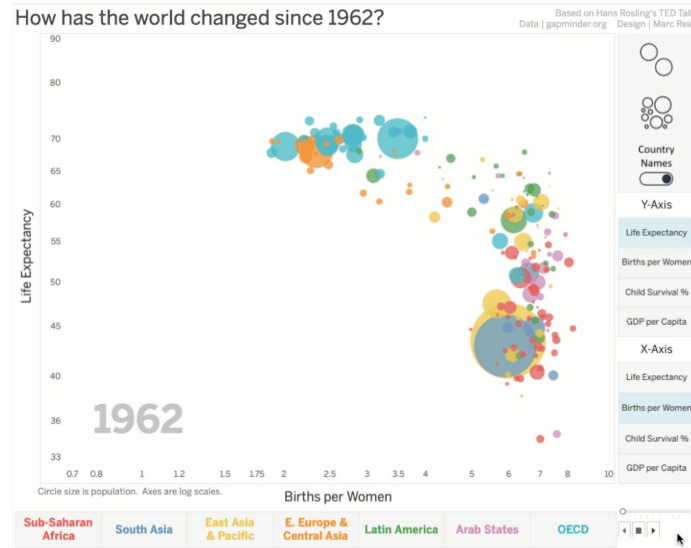Static Visualization: Do the sensemaking for your user

The percentage of students participating in Study Abroad
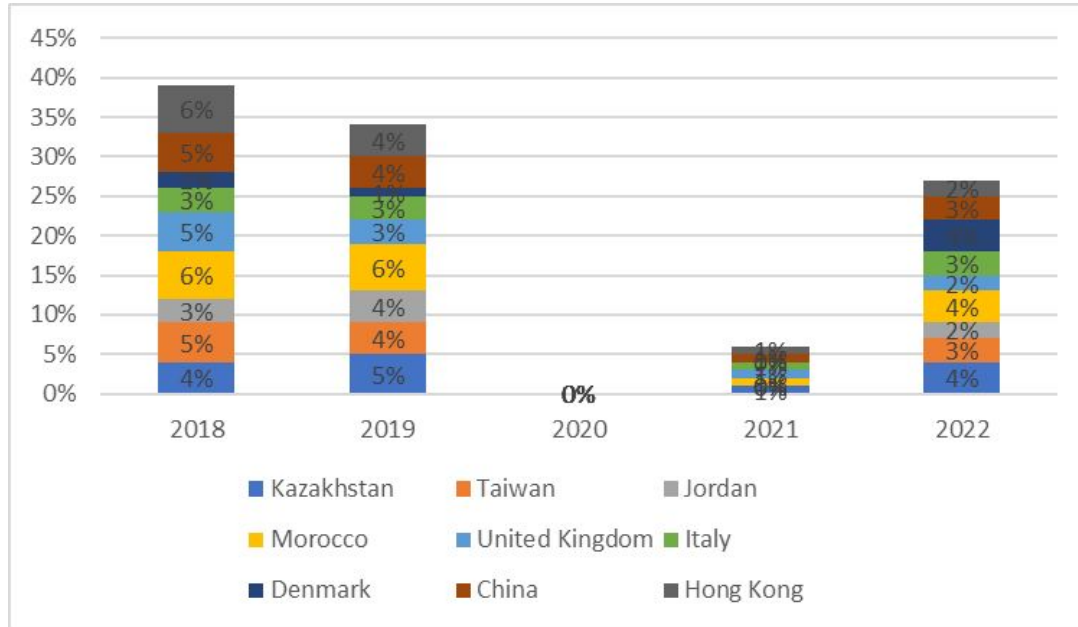Programs has not returned to pre-pandemic rates

Year	Percentage
2018	40%
2019	35%
2020	0%
2021	6%
2022	25%

(not real data)

It's a data story, not a data swamp.

Create a narrative for your user to follow

Dynamic Visualization: What questions can users answer by exploring the data?
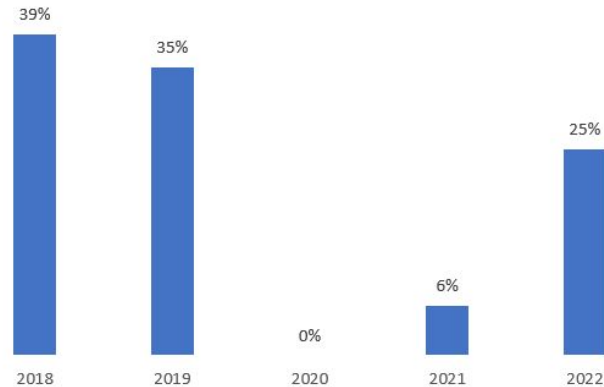

GIF source: tableau.com

The percentage of students participating in Study Abroad Programs has not returned to pre-pandemic rates. In 2022, program locations hosted 2% to 4% of the UMD population.

(not real data)

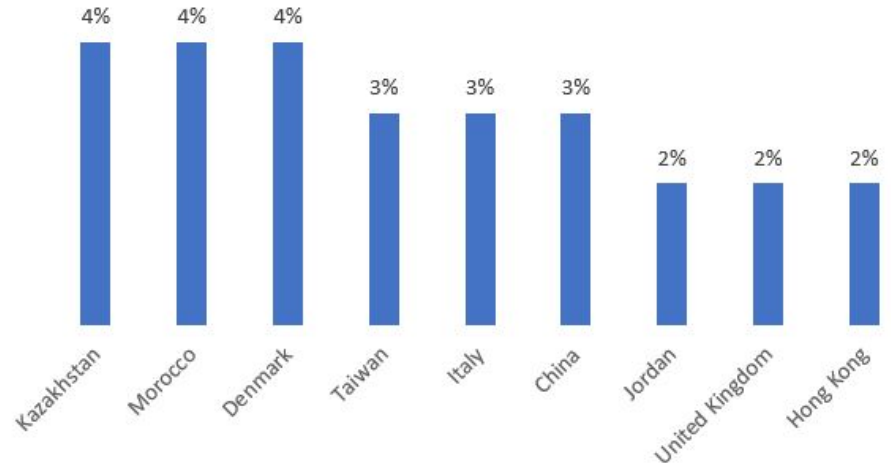# Highlight the main point.

- Make sure your viewers see the main point first
- If there are many key takeaways, present them sequentially

The percentage of students **participating in Study Abroad Programs** has not returned to pre-pandemic rates.
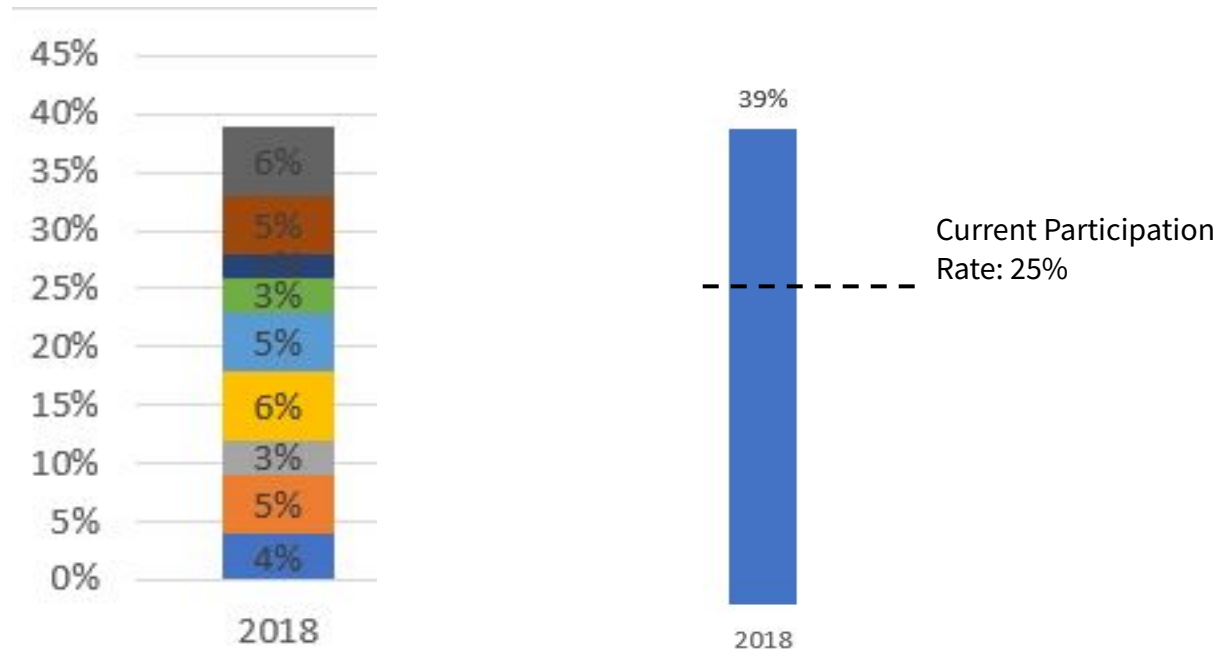
In 2022, **program locations** hosted 2% to 4% of the UMD population.

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(not real data)

Minimize the need for mental math and memorization.



Current Participation Rate: 25%

(not real data)

Counterbalance: Remove unnecessary content and visual distractions.

- Color coding by year and by program

- Y-axis, individual, and aggregate labels

- Gridlines

- Red 2019 bar

- Series lines

- Linear regression trend line

- Gray box around bar chart

The percentage of students participating in Study Abroad Programs has not returned to pre-pandemic rates.

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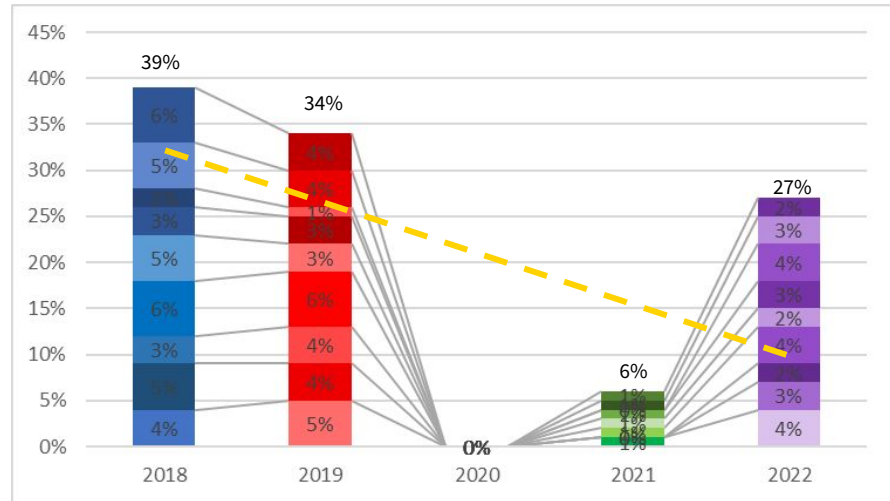
(not real data)

Mitigate User Error

- Have report documentation available
  - datadocs.umd.edu
- Integrate instructions or info buttons into the design
- Pilot design with multiple users
- Let users know when the report is broken
- Tell users how to fix the problem

Know your audience.

- What terms will they know? What terms need explanation?
- Have they encountered this type of data visualization before?
    - If not, can you facilitate interpretation with minimal scaffolding?
    - Alternatively, consider a more familiar or more intuitive visualization

For a wide audience, use the lowest common denominator in terms of literacy, language, and math skill levels

(actual report design; fake data)

There's a give and take to this process.

Image source: Forbes.com

Thank you!

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reports.umd.edu

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