Understanding Data Accessibility for People with Intellectual and Developmental Disabilities (IDD)

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David Burlinson, Emily Shea Tanis, Danielle Albers Szafir

1.What is Accessibility? （#a11y）

a. 无障碍设计

b. 设计亲和力

1.What is Accessibility? （#a11y）

a. The quality of being easy to **obtain** or **use**. (ability to access)

b. The quality of being easy to **understand**.

Accessibility

HCI

Computing

Disability

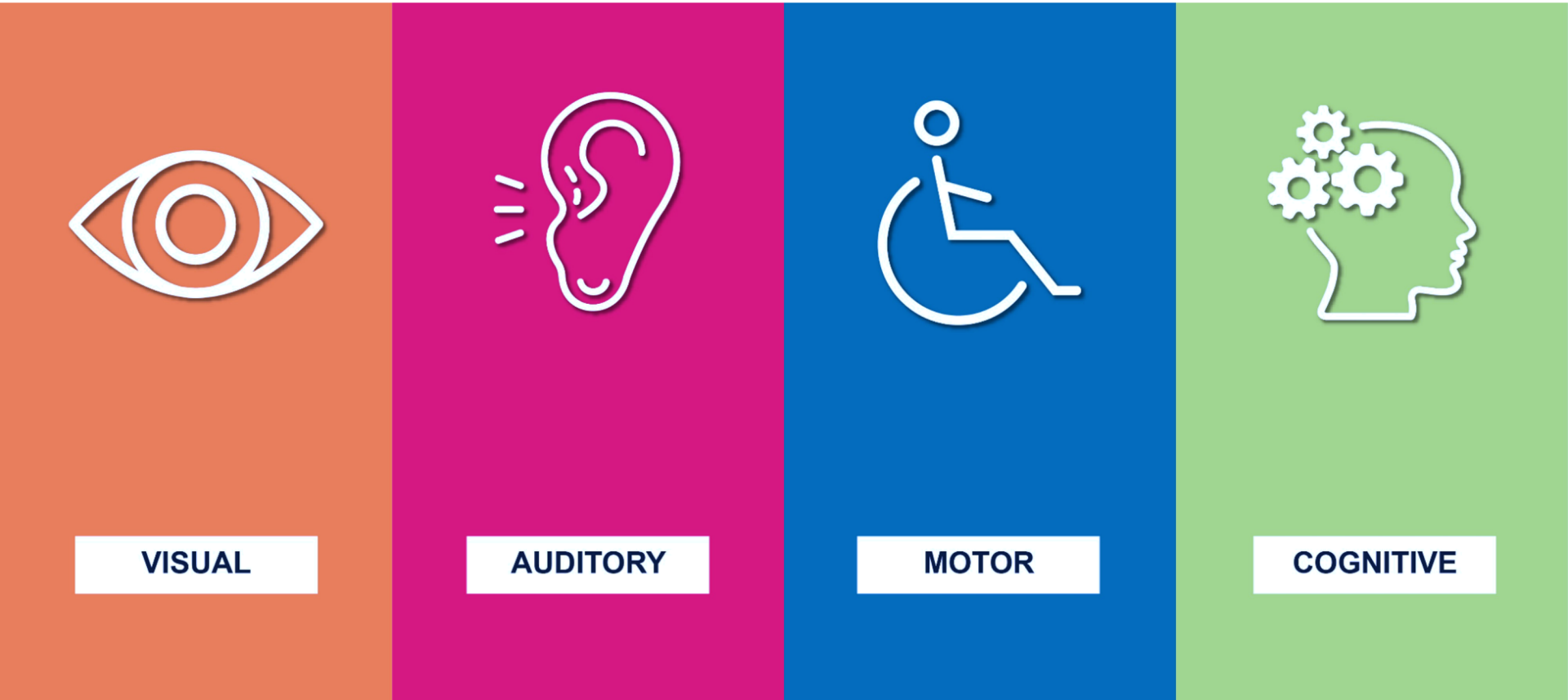




Web

UX

Accessibility by Disability



Web Accessibility

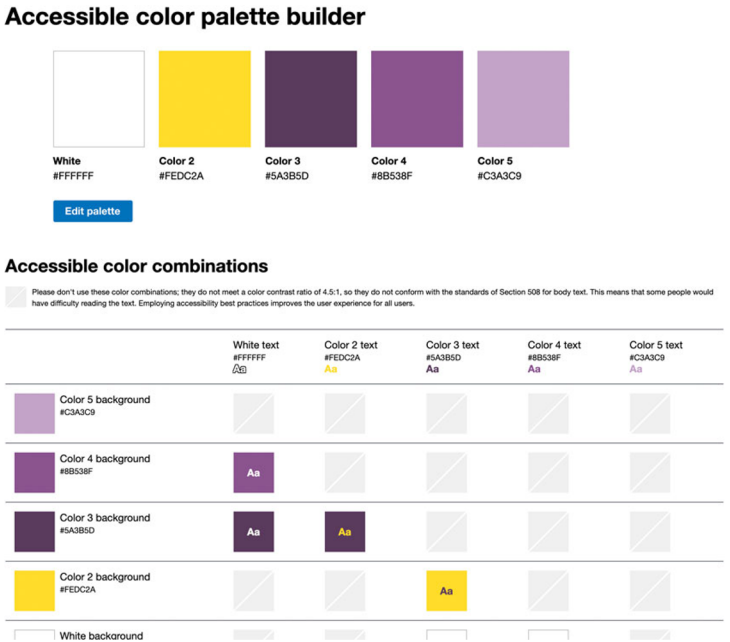
2.Data Visualization Accessibility

Color Blindness

Visual Impairment

2.Data Visualization Accessibility

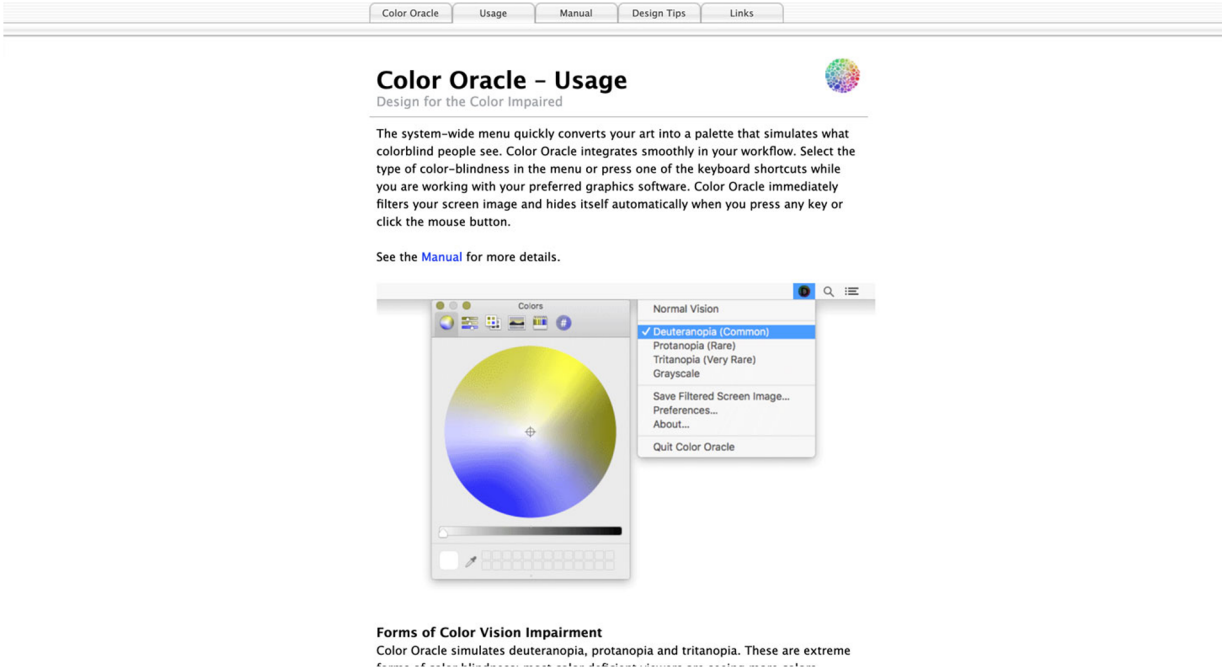
Color Blindness



Accessible Color Palette Builder -
User Defined Color Palette

2.Data Visualization Accessibility

Color Blindness



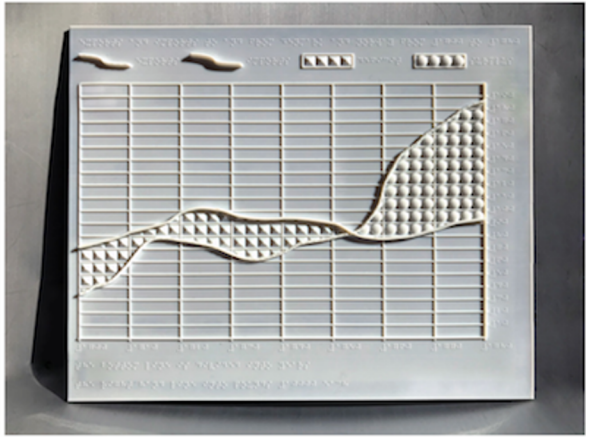
Color Oracle -
Colorblind Simulator

2.Data Visualization Accessibility

Color Blindness

Colorable -
Text/Background Contrast Ratio Checker

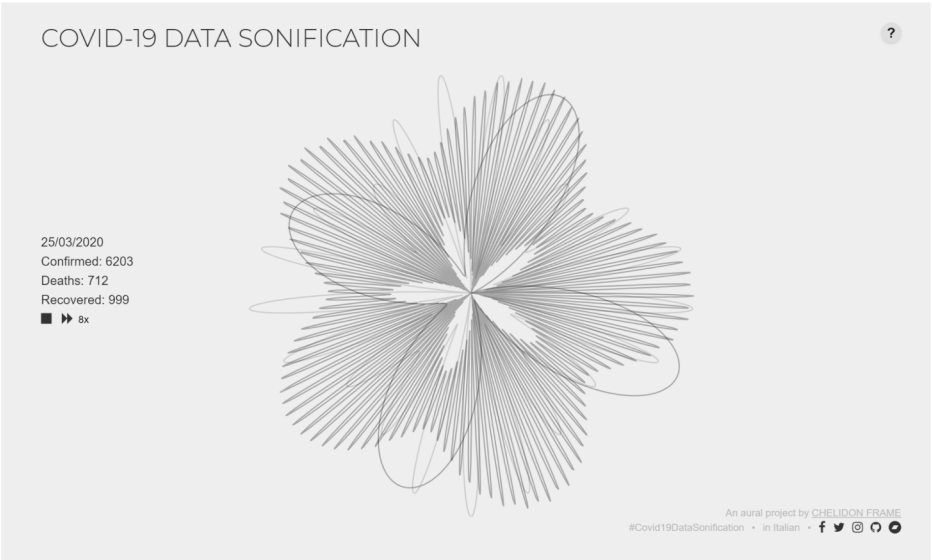
2.Data Visualization Accessibility



Visual Impairment

3D Printed Tactile Translation Of A Time-series Chart By William Playfair

2.Data Visualization Accessibility



Covid19 Data Sonification

Visual Impairment

2.Data Visualization Accessibility

≠ Visual Accessibility

2.Data Visualization Accessibility

Data visualization is the graphical representation of information and data. By using visual elements like charts, graphs, and maps, data visualization tools provide an **accessible** way to **see** and **understand** trends, outliers, and patterns in **data**.

3.Can People with IDD Use Visualization?

3.Can People with IDD Use Visualization?

Yes!

Understanding Data Accessibility for People with Intellectual and Developmental Disabilities (IDD)

1,000,000,000

15 % of the population

1 in 6 children
in the US

What is IDD?

Related to Thought Process

Intellectual Functioning (e.g., reasoning, learning, problem-solving)

Adaptive Behavior (e.g., social & practical skills)

What is IDD?

Related to Thought Process

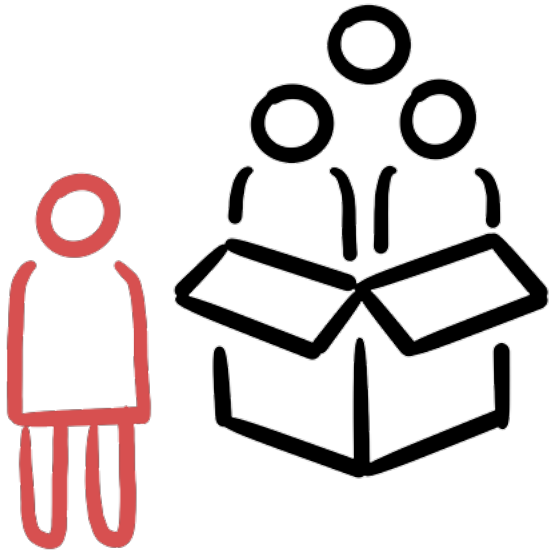
Intellectual Functioning (e.g., reasoning, learning, problem-solving)

Adaptive Behavior (e.g., social & practical skills)

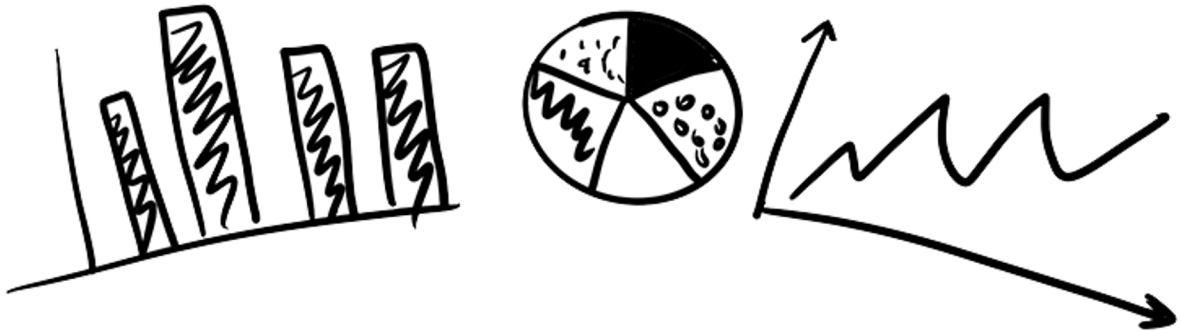
People with IDD

Struggle with abstract thinking, spatial reasoning

Have limited exposure to mathematical & statistical training



People with IDD been Excluded from Data Visualization



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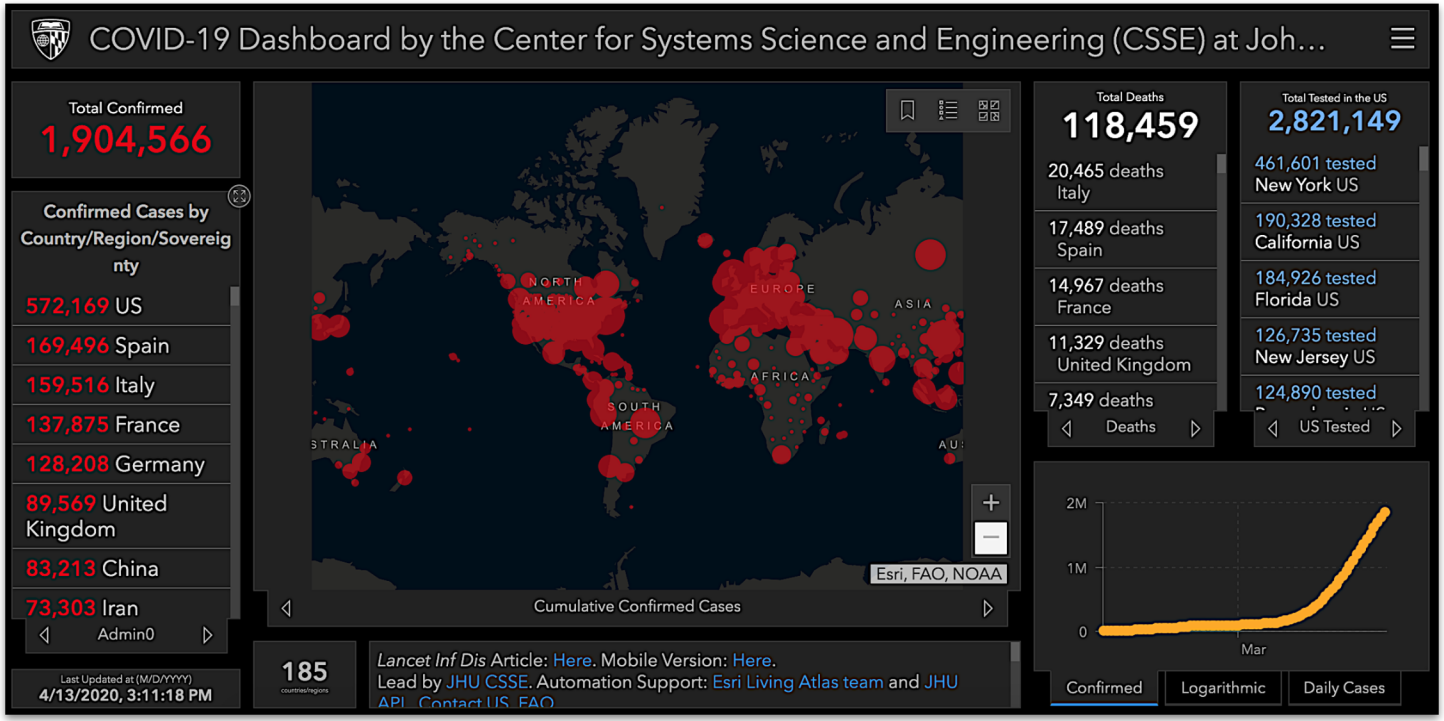
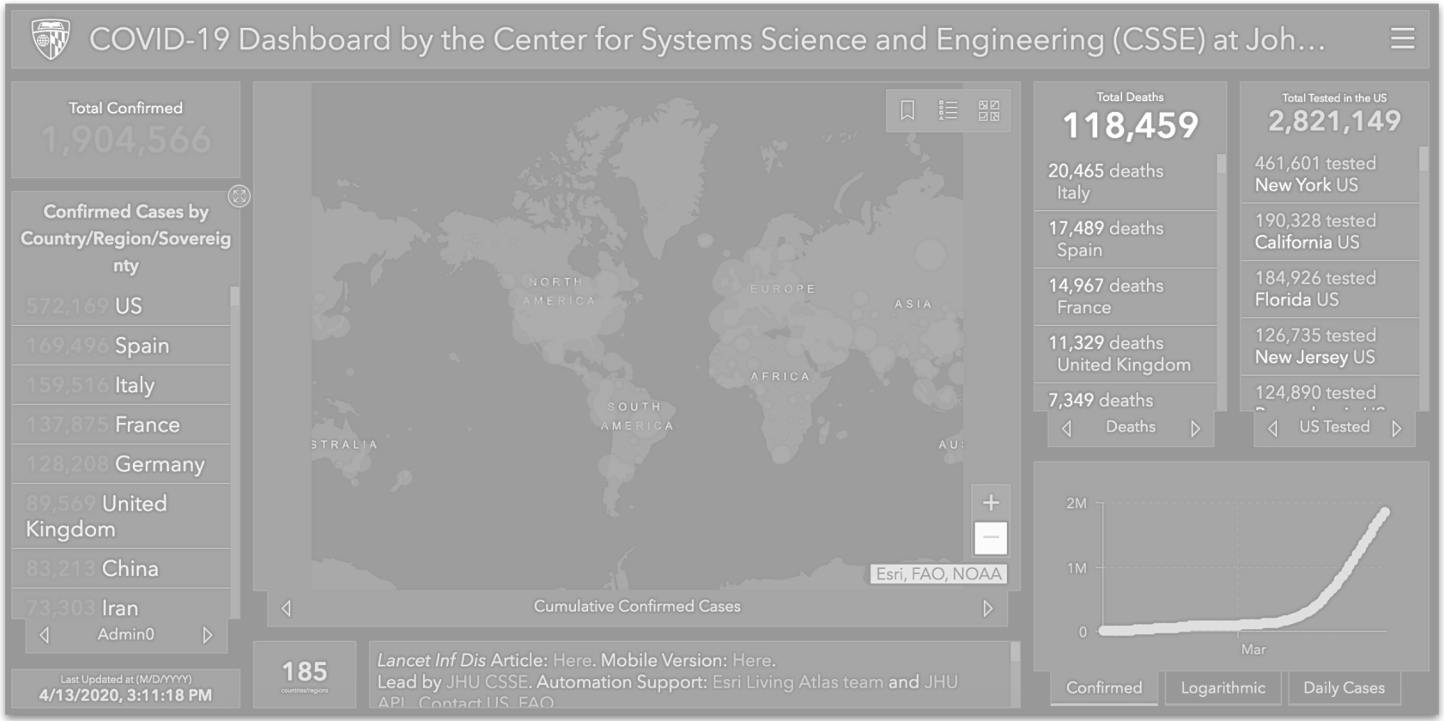
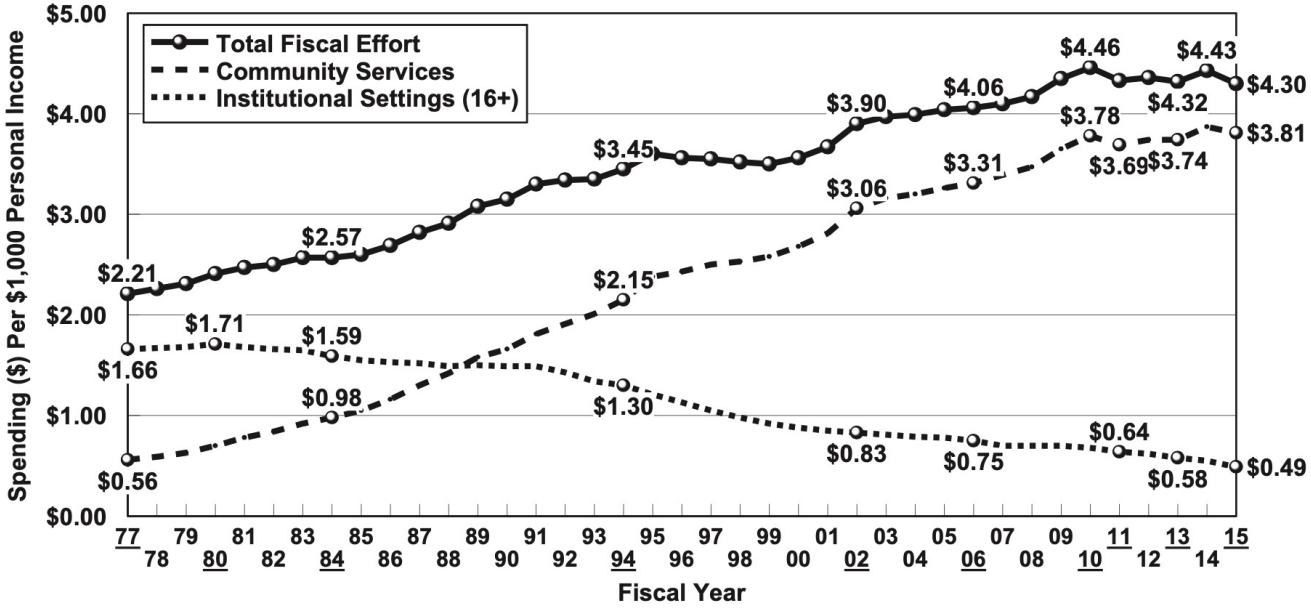


No Access to Public Information



No Access to Public Information

Figure 4
FISCAL EFFORT FOR INTELLECTUAL AND DEVELOPMENTAL DISABILITIES SERVICES IN THE UNITED STATES: FY 1977-2015



Source: Braddock et al., Coleman Institute and Department of Psychiatry, University of Colorado, 2017.

No Access to Personal Important Data

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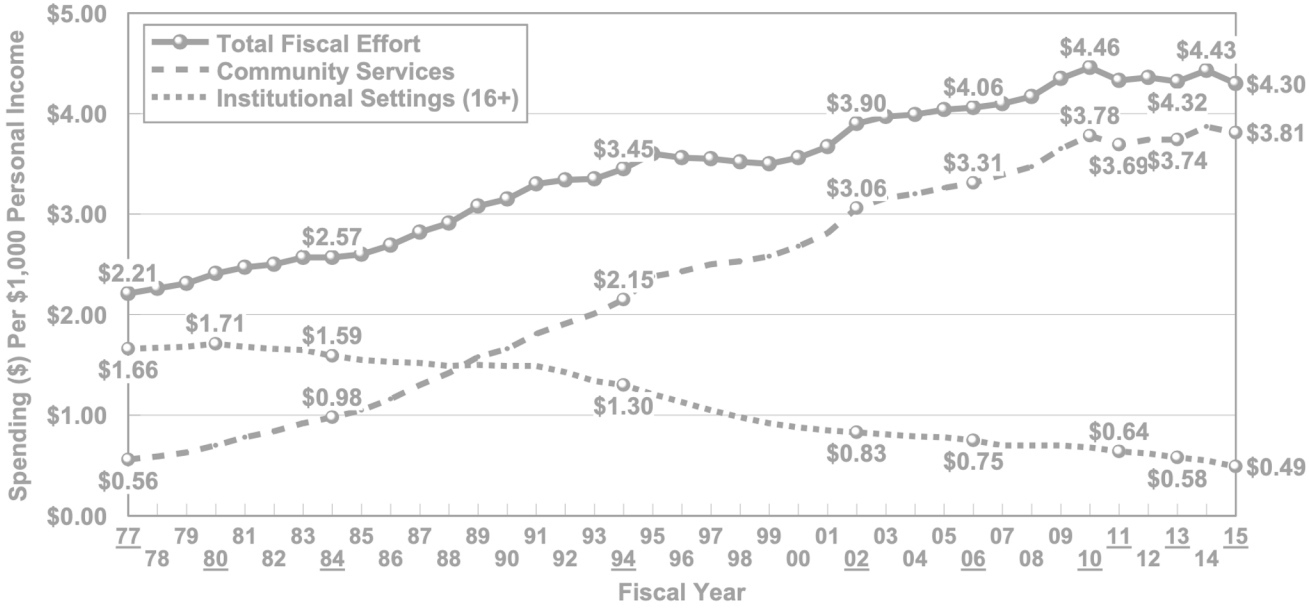

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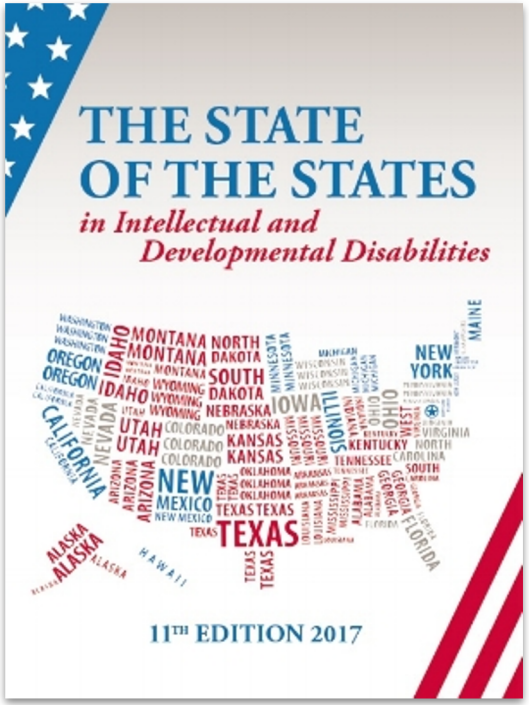
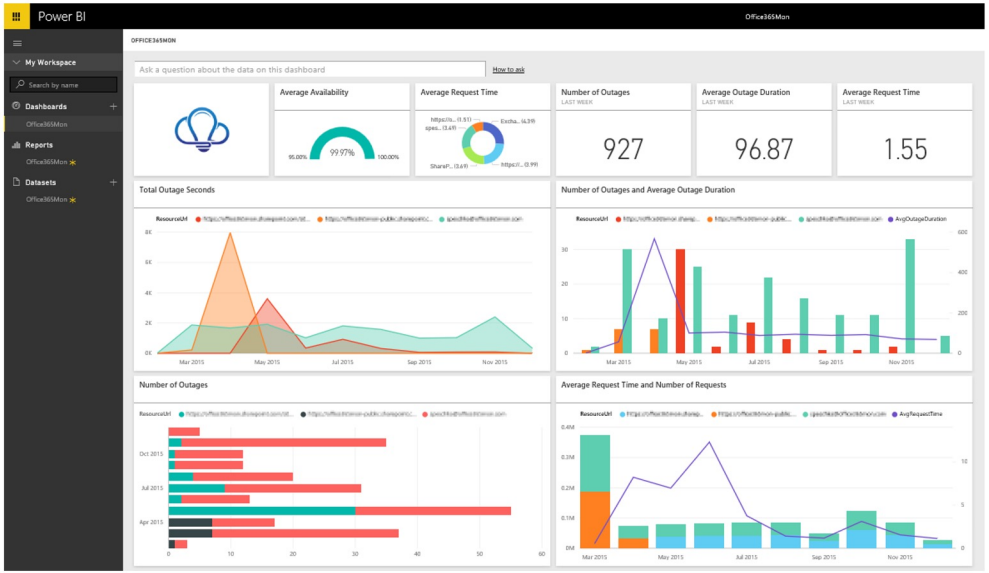


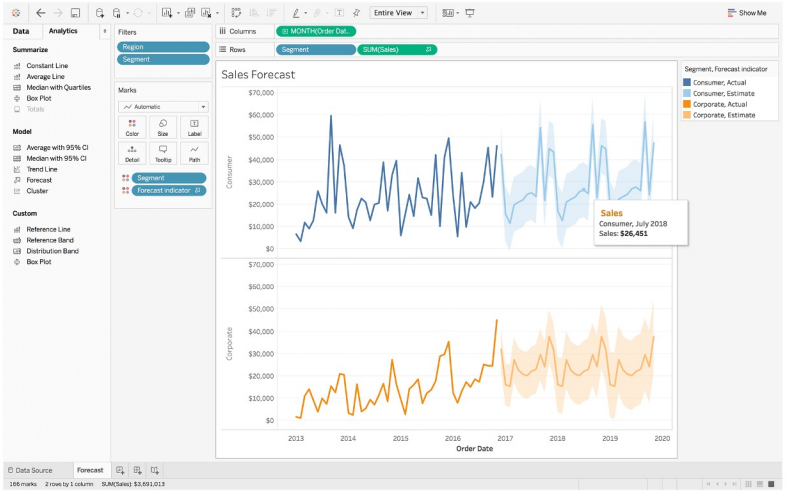
1977 - 2015

Nationwide Fiscal & Programmatic Trends

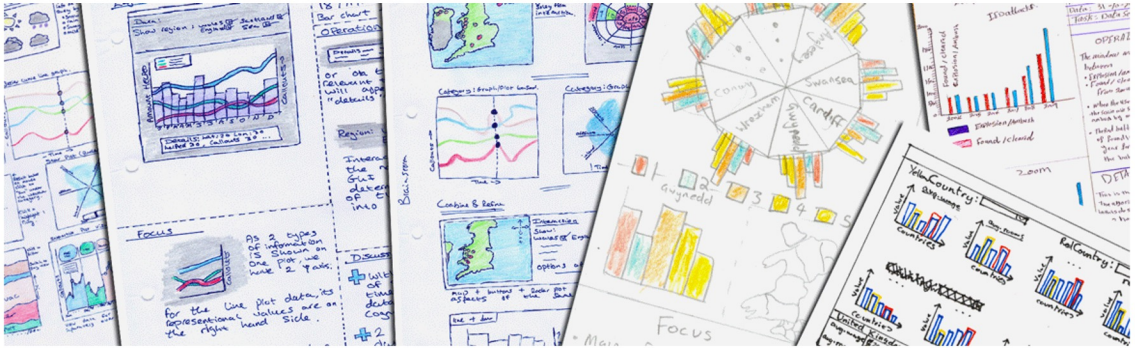
Financial Self-Advocacy & Determination

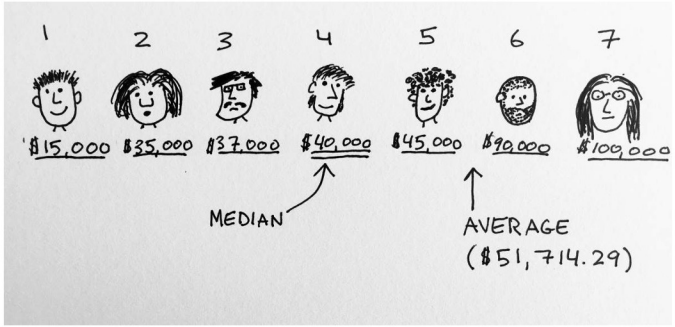
Tableau / Power BI



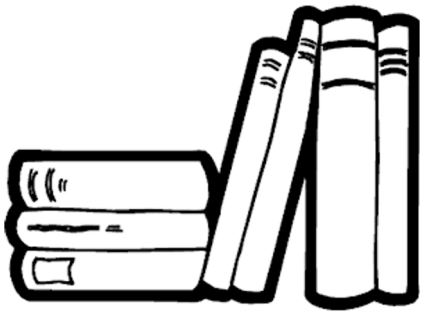


Paper-based Sketch

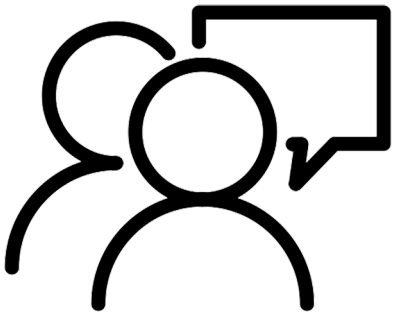




How do People with Intellectual and Developmental Disabilities Interpret Data Differently?



Literature Review



Informal Interview

Three Hypotheses

Three Hypotheses

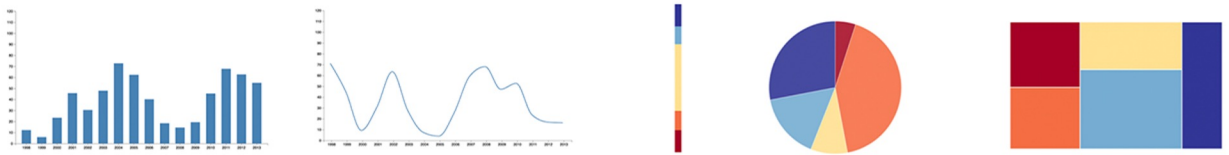
H1: The best chart type for a given task will differ between people with and without IDDs.

H2: Discrete data representations will lead to more accurate performance for people with IDDs

H3: Semantically meaningful chart embellishments will enhance data interpretation for people with IDDs

Three Hypotheses

Chart Type



Data Continuity

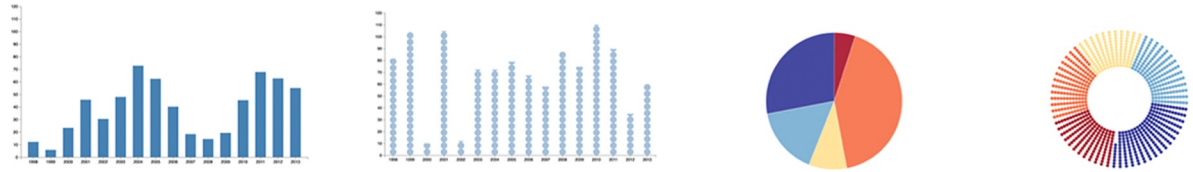
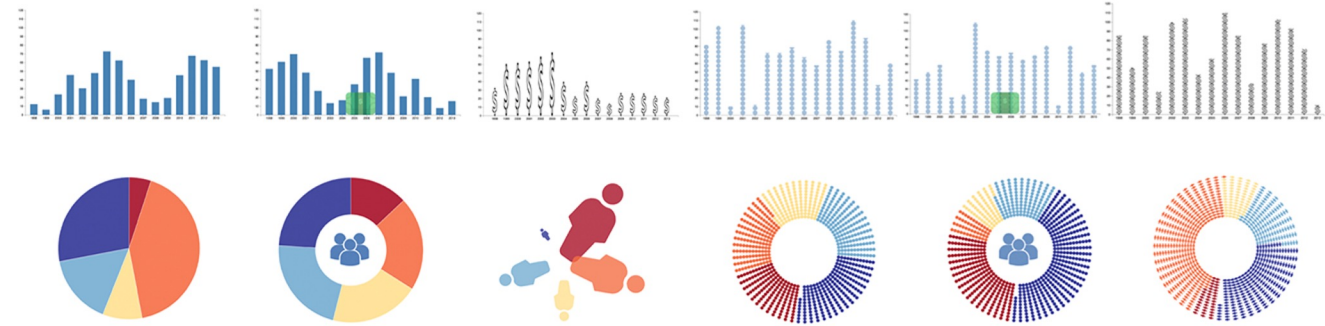
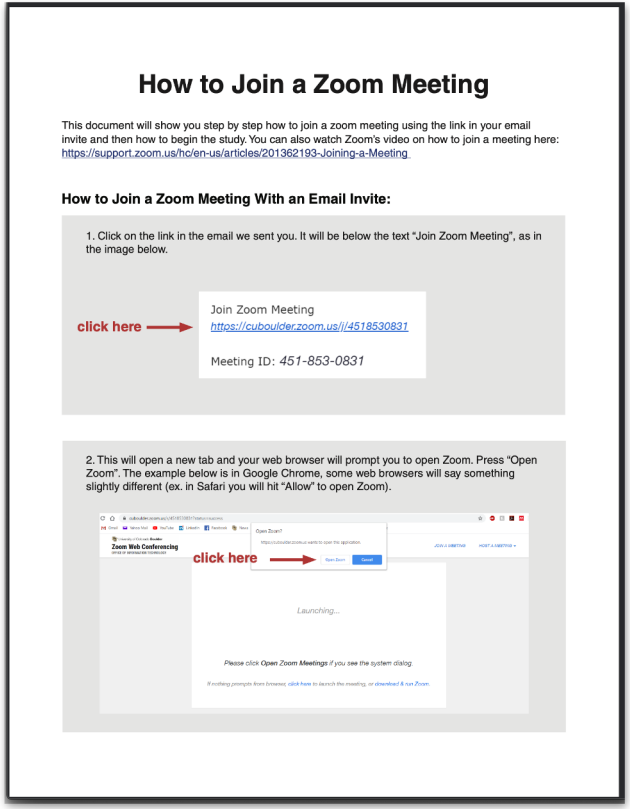


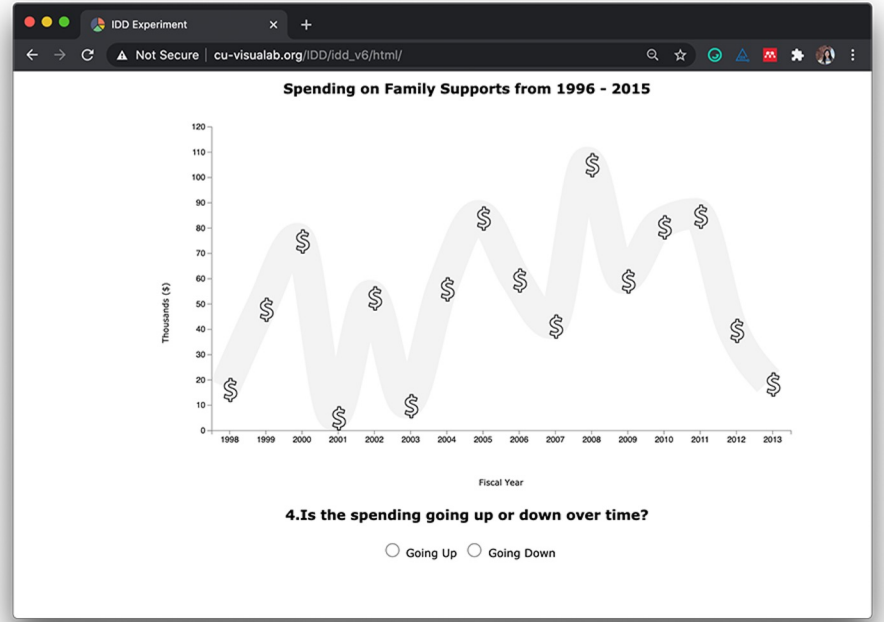
Chart Embellishment



Recruitment

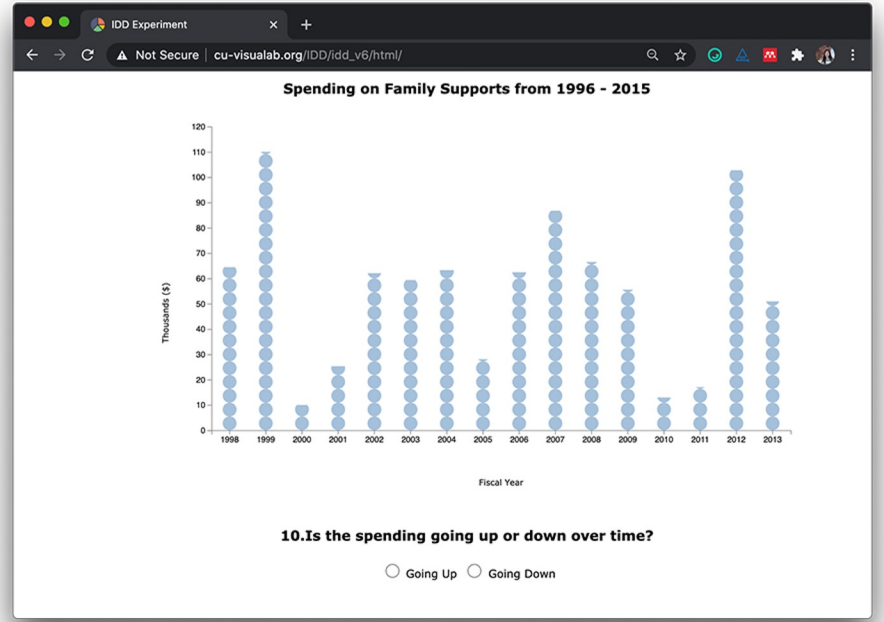


Mixed-Methods Experiment



34 Participants
with and without IDD

Mixed-Methods Experiment



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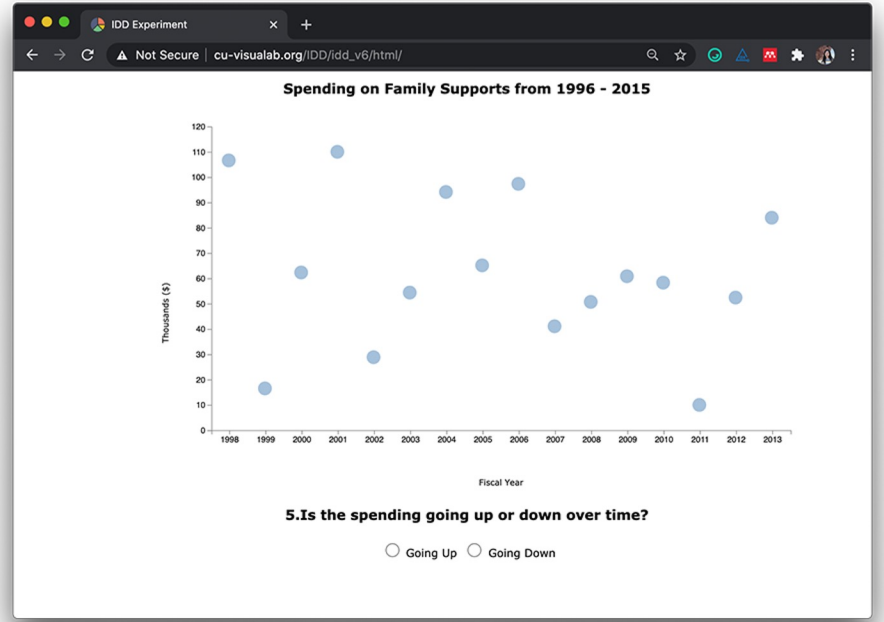

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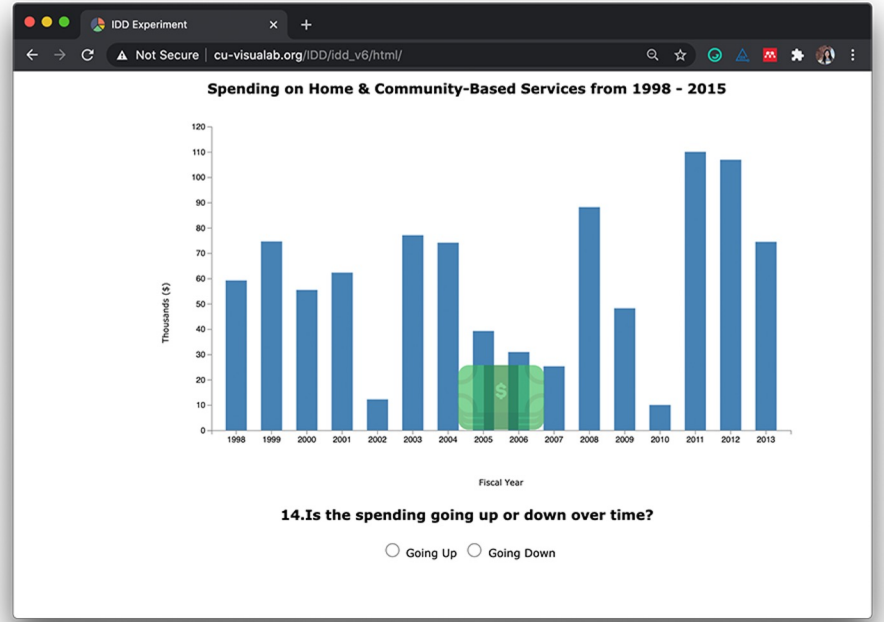

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Time Series &
Proportion Data

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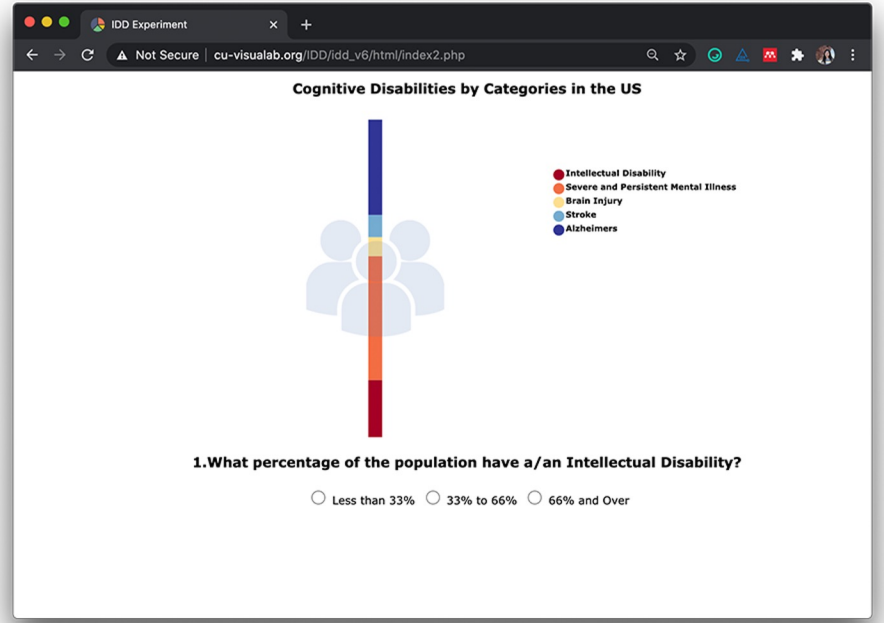

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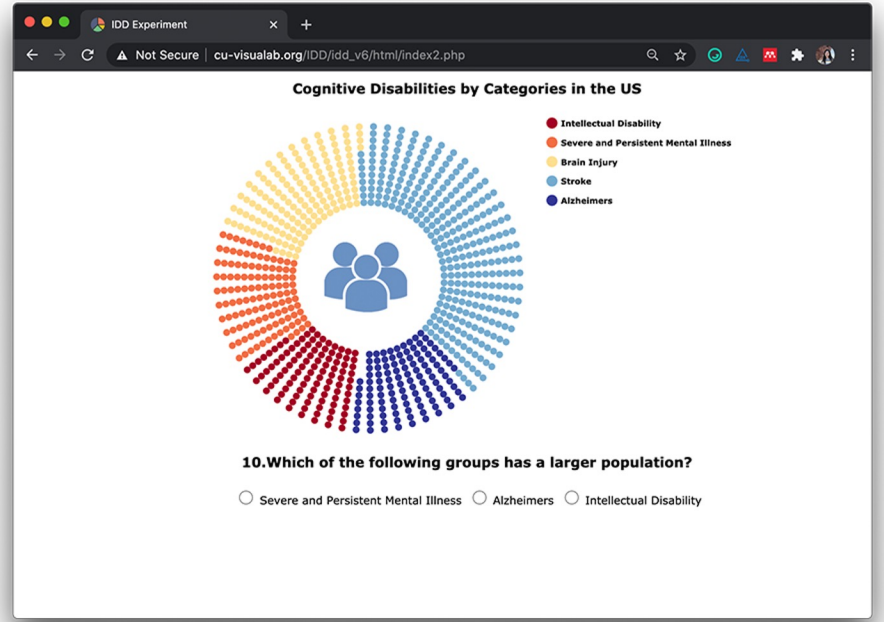

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Time Series &
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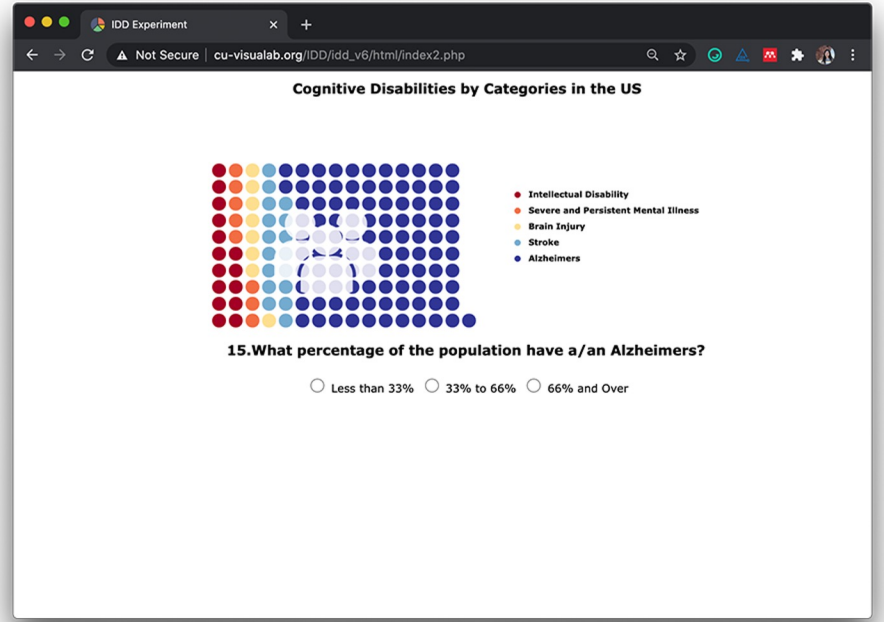
**Task Performance &
Chart Preference**

Mixed-Methods Experiment



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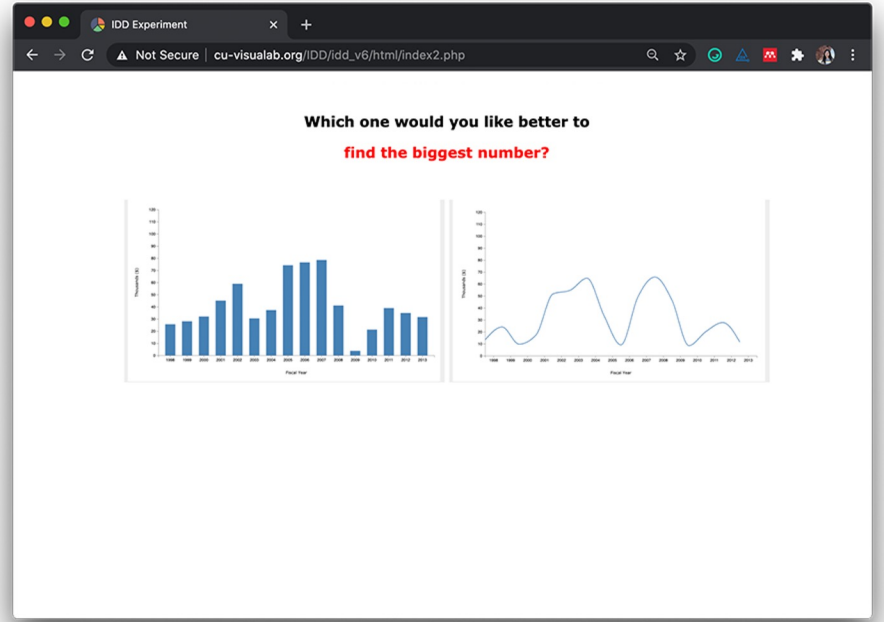

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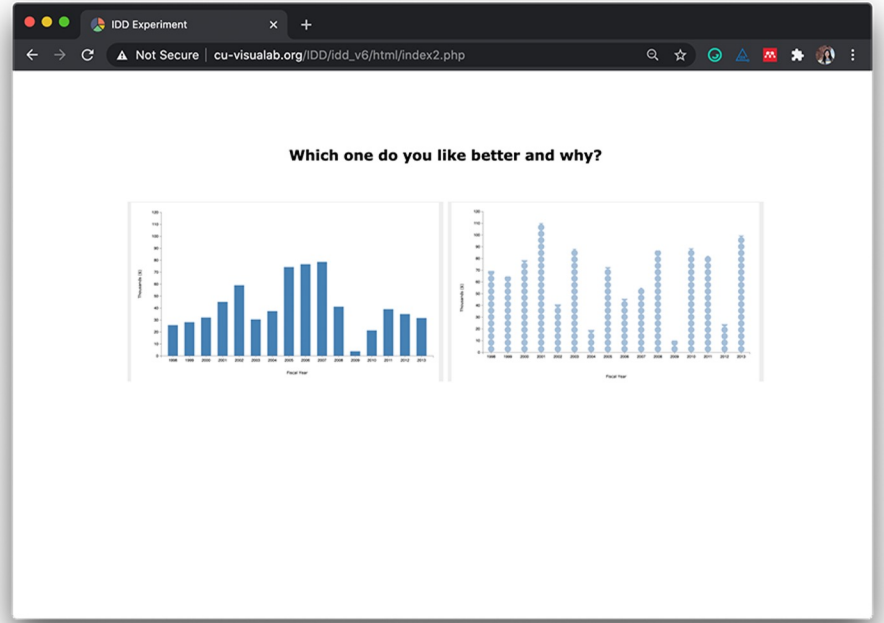

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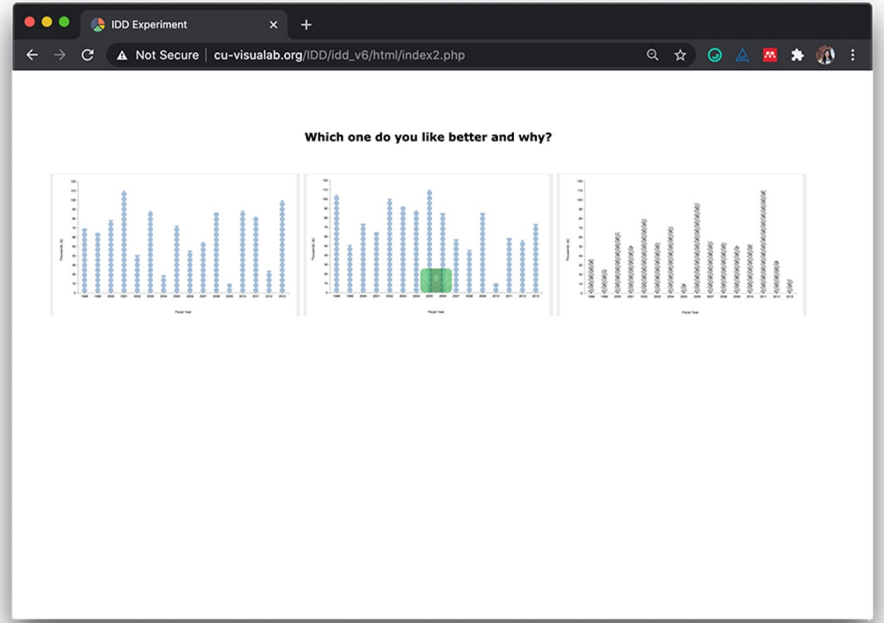

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**Task Performance &
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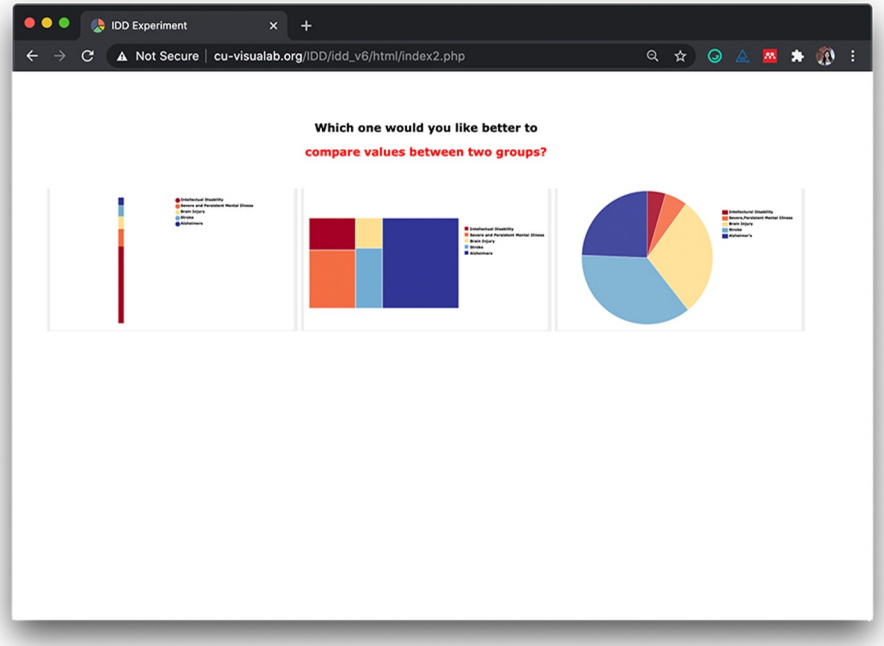

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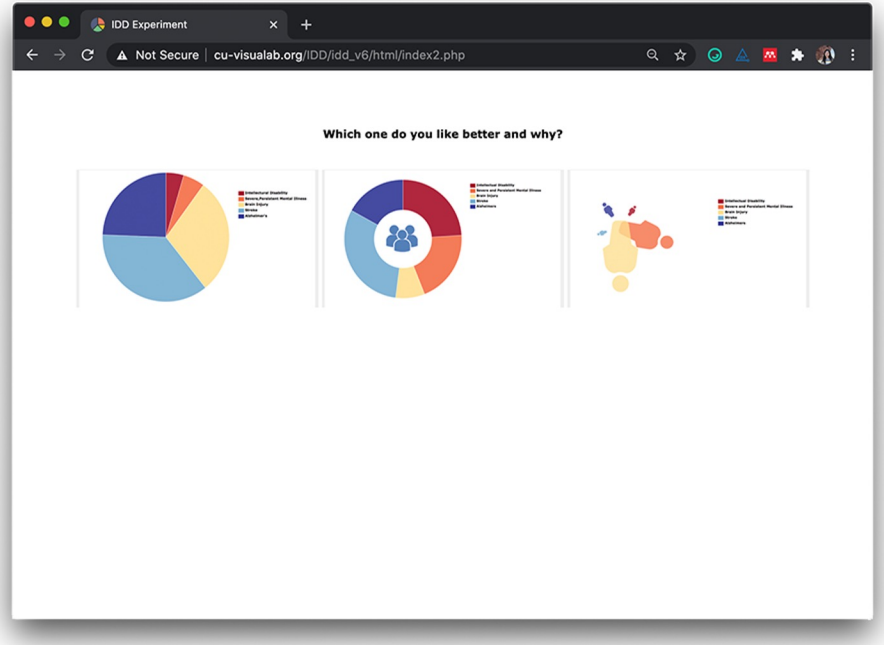

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**Task Performance &
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Four Design Guidelines

Design Guidelines

Avoid pie charts

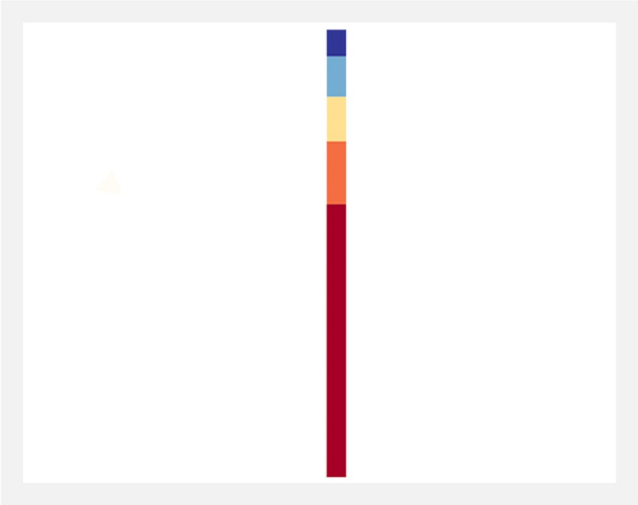
Use familiar metaphors

Manage visual complexity

Use discrete encodings for axis-aligned representations

Design Guidelines

Avoid Pie Chart



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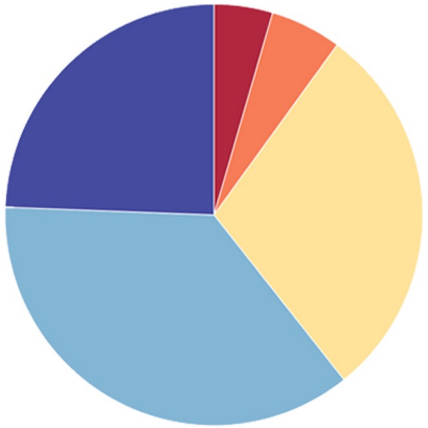

Not Accessible

Design Guidelines

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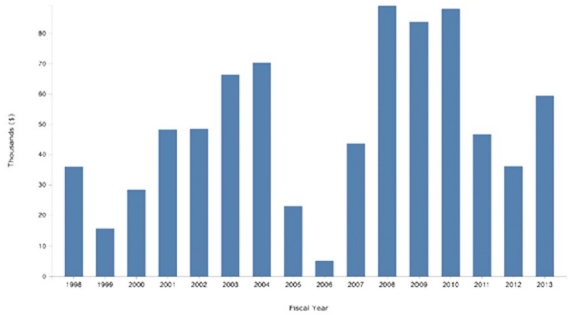
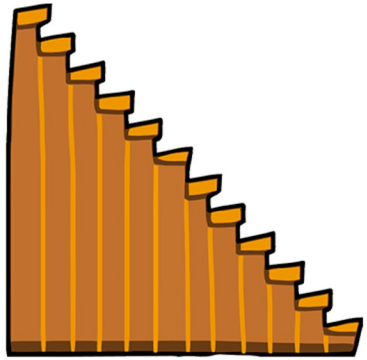
Design Guidelines

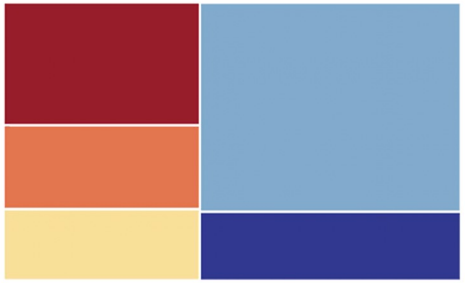
Use Familiar Metaphors





Design Guidelines

Use Familiar Metaphors



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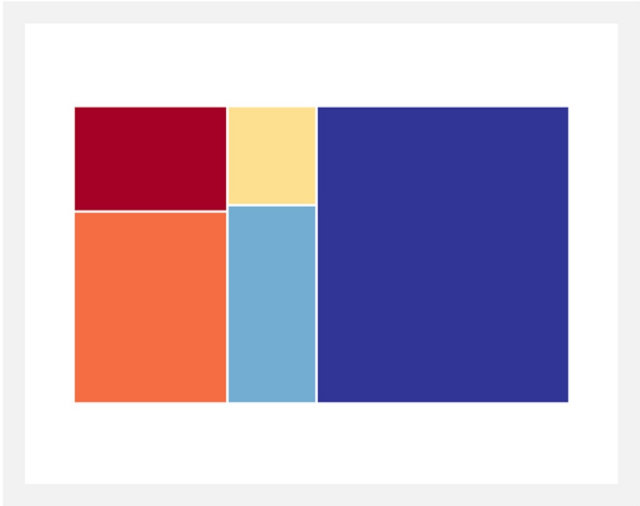

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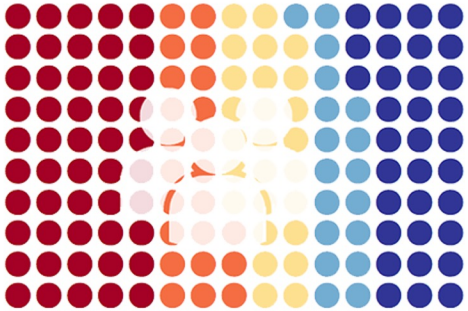

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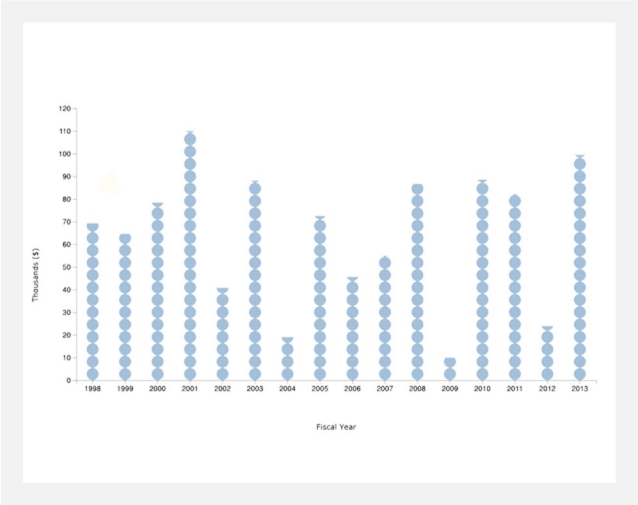

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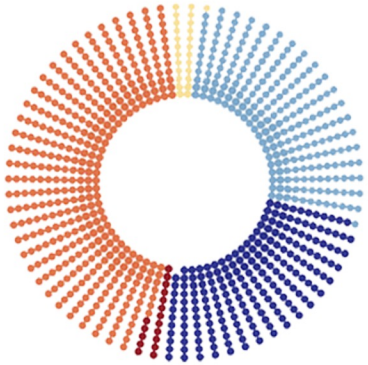


Not Accessible

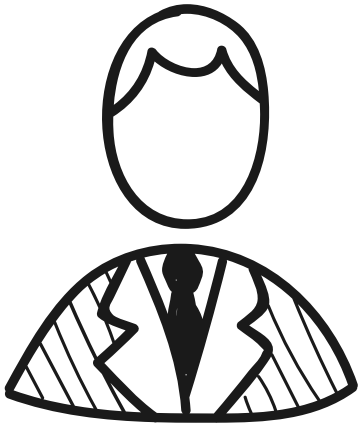
http://cu-visualab.org/IDD/demo/

Variation is the Norm.

Creativity is a Spectrum!

What's Next?

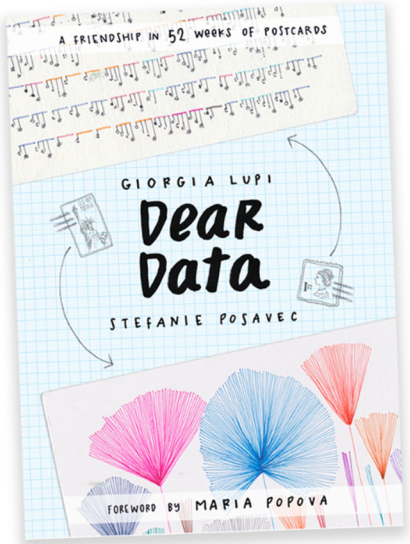
“Nothing About Us Without Us!”



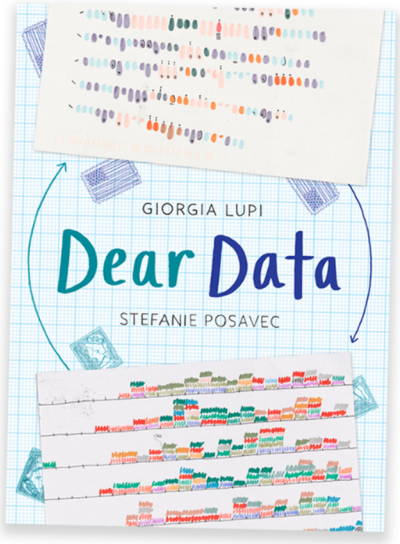
—SOMEONE FAMOUS

Participatory Design Workshop

PUBLISHED IN NORTH AMERICA BY



COVER BY GIORGIA



COVER BY STEFANIE

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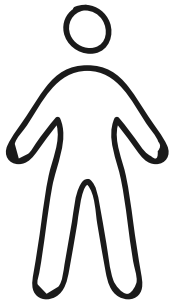
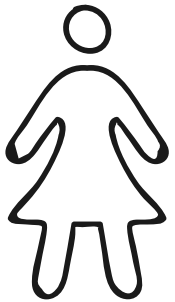
Participatory Design Workshop



Data-Pal

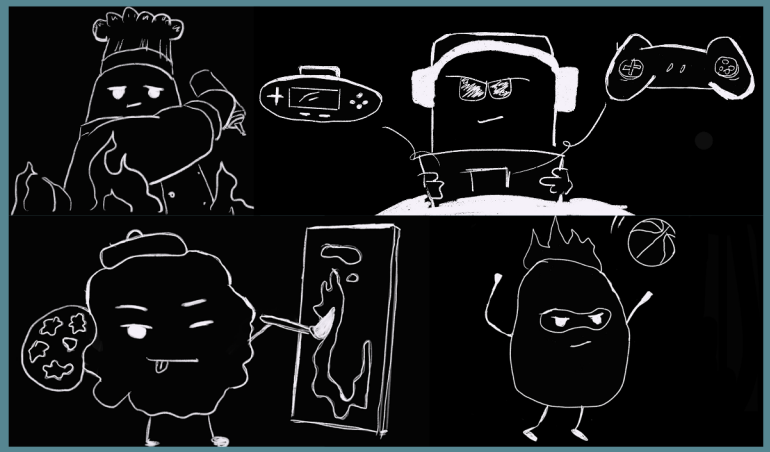


Role-Playing

Participatory Design Workshop

Participatory Design Workshop

Pick Your Favorite!



Who's your favorite alien?

Foodie Alien

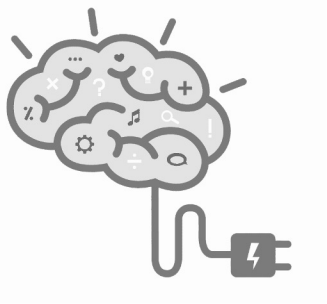
Gamer Alien

Artist Alien

Athlete Alien

Participatory Design Workshop

How do individuals with IDD approach data & build visualizations?



How can we encourage creativity &
self-expression through data visualization?

THANKS!

Project Page: https://cu-visualab.org/IDD/idd/

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