

CT Open Data

Data Visualization Guidelines

Introduction

This document outlines guidelines for data visualization (viz) and provides information about some tools that have been used to create data visualizations by Connecticut state agencies. Use the guidelines below when developing a data visualization or dashboard.

1. Define your goal.

Before you start visualizing your data or making a dashboard, make sure you can clearly explain what your goal is. In most cases, you probably don't want to make a data visualization just for the sake of it. Some questions to consider before you start designing your viz include:

- What questions do you want to answer?
- Why do you want to make a data visualization or dashboard?
- What purpose will your viz or dashboard serve?
- What is your goal?

2. Know your audience.

Another essential step before starting to create data visualizations is considering who your audience will be. A solid understanding of your audience and their needs should guide the development of your data visualizations.

- Is your audience technical or non-technical?
- What does your audience want to learn?
- What questions do they want answered?
- What format of data visualization would work best for your audience (e.g. interactive dashboard, data story, written report, slideshows, etc.)?

3. Identify and prioritize the data points or trends you want to highlight.

Review your data with your goal and audience in mind to determine what data points or trends you want to prioritize in your data visualization or dashboard. Once you have identified the story you want to tell with your data, you can start thinking about how your data visualizations can contribute to that story. Make sure you have a clear purpose for each chart you make.

- How can you use your data to answer your audience's questions?
- What points or trends from your data do you want to highlight for your audience?
- What story can you tell with your data?

4. Match your story with a chart type.

Once you have identified the points and trends you want to highlight with your data, it's time to choose your chart type. To learn more about chart types, visit Depict Data Studio's [Interactive Chart Chooser](#). Another resource for chart types is the [R Graph Gallery](#). Some charts to consider are listed below, grouped by chart type.

- **Points in time:** Line, bar, stacked area, small multiples, sparklines
- **Part-to-whole:** Pie/donut, stacked bar, waffle chart
- **Comparisons:** Bar, stacked bar, lollipop, small multiples
- **Correlation:** Scatterplot, bubble, heat tables/heat maps
- **Distribution:** Histogram, scatterplot, pyramid
- **Maps:** Choropleth

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5. Choose a software program.

There are many data visualization tools to choose from, including some great free options. Your agency or organization may license a tool like Microsoft Power BI or Tableau, which you could consider. Some data visualization tools to consider include:

Program	Description	Links
Excel	Excel is a common spreadsheet and graphing program that can be used to make effective data visualizations.	Depict Data Studio is a helpful resource for data visualization in Excel.
Datawrapper	Datawrapper is a web-based data visualization tool that lets users create charts, maps, and tables through a point-and-click interface and embed the visualizations in their own websites. Free and paid versions are available.	Datawrapper can be accessed online here. Example: DPH Daily COVID-19 Report
Tableau	Tableau is a popular dashboard tool with free and paid versions. Tableau lets users create interactive dashboards with no code required.	Tableau Public (the free version) can be downloaded here. Examples: DSS Dashboard , GreenerGov CT FY2021 Dashboard
R	R is a programming language for data management, analysis, visualization and dashboards, often used in the open-source software RStudio . R is a versatile and powerful tool for data visualization but has a steeper learning curve than no-code data visualization options.	Download R here. Download R Studio here. Example: Connecticut Annual Nursing Facility Census
Socrata	Tyler Technologies Data & Insights (also known as Socrata) provides the software that powers the Connecticut Open Data Portal. Users of the Open Data Portal can use the data visualization tools built into the platform to create charts and maps based on datasets hosted on the Portal.	Access Socrata support articles about data visualizations here. Example: 2020 U.S. Census Block Adjustments
ArcGIS Online	ArcGIS Online is a cloud-based mapping and analysis tool that can be used to create interactive maps and data visualizations.	Esri Map Gallery Example: CT DOT Crash Emphasis Area Dashboard
Power BI	Power BI is a business analytics tool provided by Microsoft that can be used to develop interactive dashboards.	Access trainings on Power BI here.

6. Design for clarity.

Help your audience understand your data visualization by keeping it simple. Less is more. Simplify your data visualization so that it clearly illustrates the point you are trying to make and does not distract your audience with unnecessary information.

- **Remove chart clutter.** Remove unnecessary elements from charts, including borders, gridlines, distortions, backgrounds, and redundant labels.
- **Clarify with text.** Give your data visualization a clear title that will be understandable to somebody not familiar with the subject matter; you may want to write the takeaway finding in the title of your chart. Use direct labels where applicable to help your audience quickly understand what they are looking at.
- **Use plain language.** Use language that is familiar to your audience and avoid jargon. Be succinct—using short sentences and paragraphs. For more information on plain language visit [plainlanguage.gov](https://www.plainlanguage.gov).
- **Test your viz with somebody with less knowledge of the data source.** Share a draft of your visualization with somebody less familiar with the data to make sure they can understand what you're trying to show with your data.

7. Provide context.

It is difficult for people to interpret data without context. Help your audience understand the data you are presenting by providing context, such as including trend data or comparison groups as a point of reference. Including meaningful chart titles, subtitles, and other text can also help your audience more easily interpret your data visualizations.

- **Provide access to the underlying data.** Consider publishing the data used to create your data visualizations as open data to provide greater transparency and to allow users to conduct their own analysis. Connecticut state agencies can publish data on the [CT Open Data Portal](#), which also provides APIs for each dataset that can be used to bring data into some data visualization programs.
- **Provide a text summary of the visualization.** Describe the trends or patterns in the visualization in text that accompanies the visualization. This will help users understand what they are seeing in the data visualization and will also make the information more accessible to users navigating with screen readers.

8. Apply equity awareness in your design.

When creating data visualizations, think intentionally about the people and groups represented in your data. Remember that the data represents real people and communities. For more guidance on applying an equity lens in data visualization, see [the Urban Lab's "Do No Harm Guide: Applying Equity Awareness in Data Visualization."](#)

- Avoid the use of colors and icons that may reinforce gender or racial stereotypes.
- **Use people-centered language.** When referring to a person or group of people, start with the person, not the characteristic. For instance, "person who is incarcerated" rather than "inmate."
- When creating data visualizations and writing about groups of people, do some research about the preferred terms of those who you are writing about. [Read a comparison of people-first and people-centered language here.](#)
- Consider missing data and consider alternatives to an "other" category that can contribute to othering underrepresented groups.

9. Ensure your design is accessible.

Data visualizations are not always accessible for all users. Common accessibility barriers include color schemes that are not accessible to people who are color blind or not considering the experiences of people who are navigating via screen readers. The University of Wisconsin-Madison provides the following guidelines for developing accessible data visualizations. [Read the full article here.](#)

- Include a text title and description of the visualization so users understand the purpose of the visualization and what the data is conveying.
- Include alternative text so that people navigating via screen reader will know what the visualization is when they encounter it.
- Include accessible data tables and link to the raw data in your description or alternative text.
- Use direct labels on charts to ensure users don't have to rely on color or the legend to understand the data.
- Use colors with sufficient contrast and use a palette that is accessible to people who are colorblind. Use a [color contrast checker](#) to ensure high enough contrast ratios. Tools like [Colorsafe](#) can help create an accessible color palette. Simulators like [Coblis](#) can show what your color scheme might look like to somebody who is colorblind.
- Don't try to communicate a point exclusively through the use of color.

Resources

1. [Data Visualization 101](#), CT Office of Early Childhood
2. [Data Visualizations](#), U.S. Web Design Systems
3. [Data Visualization Checklist](#), Stephanie Evergreen
4. [Do No Harm Guide: Applying Equity Awareness in Data Visualization](#), Urban Institute
5. [Data Viz Style Guide](#), Amy Cesal, Maxene Graze, Jonathan Schwabish, Alan Wilson
6. [Interactive Chart Chooser](#), Depict Data Studio
7. 3 C's for Better Charts: [Context](#), [Clutter-free](#), [Contrast](#), Nielsen Norman Group
8. [Accessible data visualizations](#), UW-Madison
9. [Plainlanguage.gov](#), Plain Language Action and Information Network
10. [My pre-publication checklist for an effective graph](#), Storytelling with Data, Lucia Stefanuto
11. [Equity in Data Visualization](#), Negeen Aghassibake, Going Public, 2020