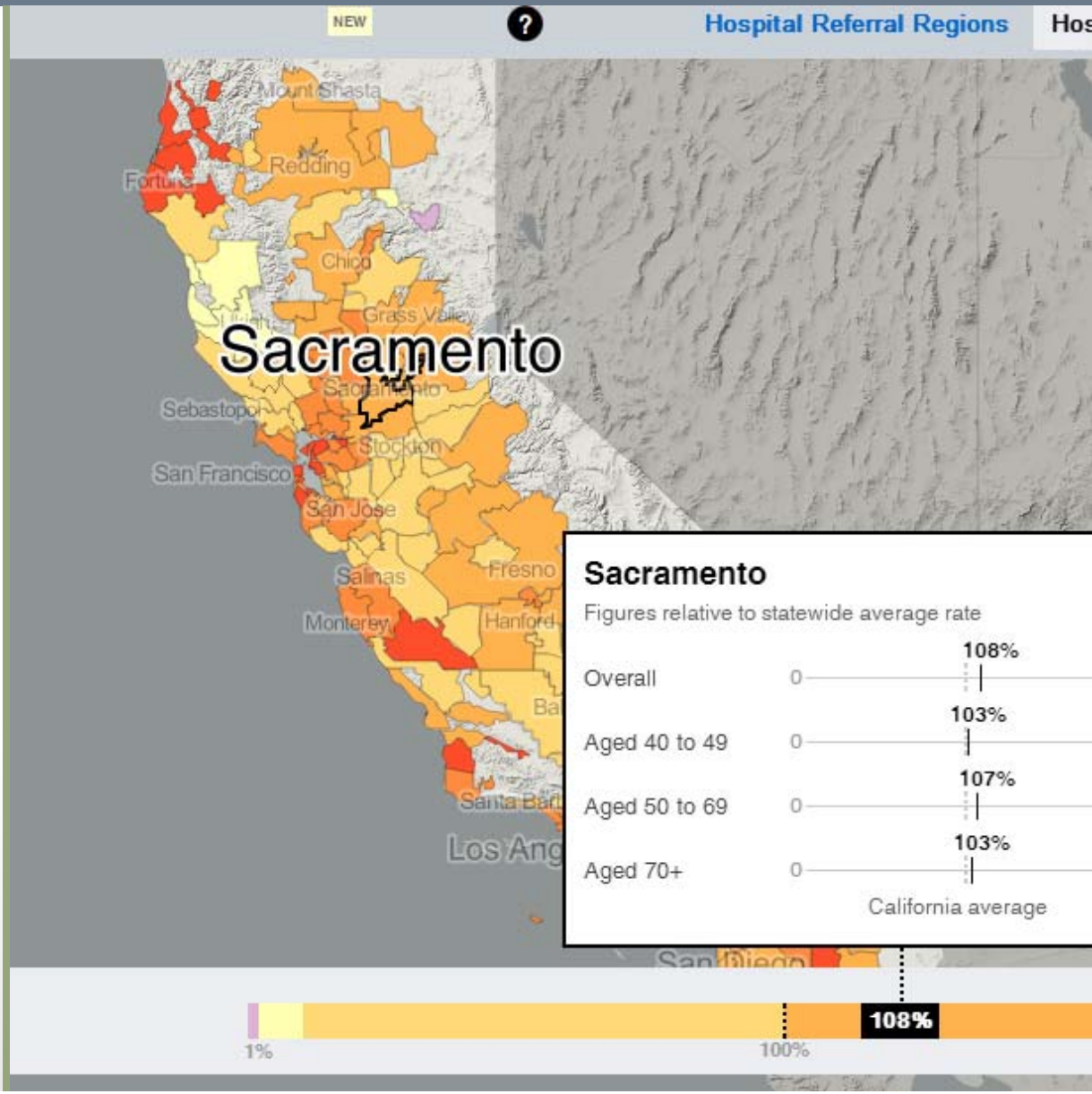
CALIFORNIA HEALTHCARE FOUNDATION

Worth a Thousand Words: How to Display Health Data

February 2014



Introduction

Organizations with access to health data face difficult decisions about how best to visualize these data for clarity, storytelling, and impact. This presentation serves as a guide to select the best visualization options for your data, and explains how to get started on the path to better data presentation.

The presentation will explore:

1. Case Study: Columbus County, NC
2. How to Present Data Visually: Toolkit
3. How to Get Started Visualizing Data
4. Strategies for Sharing Your Data
5. Resources & Inspiration

Note: Throughout this presentation, web links are embedded for more information on the examples given when available.

Spreadsheets Aren't the Answer

To better communicate findings and implications, take data out of its native spreadsheet or database to conduct analysis in a way not possible through simply reviewing a spreadsheet. The visual representation of the data must help you communicate it better.

Keep in mind that others may have good ideas for how to communicate the data, so it is also very valuable offer a data download or, even better, an API into the data.

1. Case Study: Columbus County, NC

Columbus County, North Carolina

"Eat smart. Move more."

This simple message is now shared in schools, churches, and county offices.

Even a call to the health department is greeted with a recording of Director Kimberly Smith reminding residents to take a brisk 30-minute walk every day and to eat more fruits and vegetables.

But it wasn't always this way… So, why the change?

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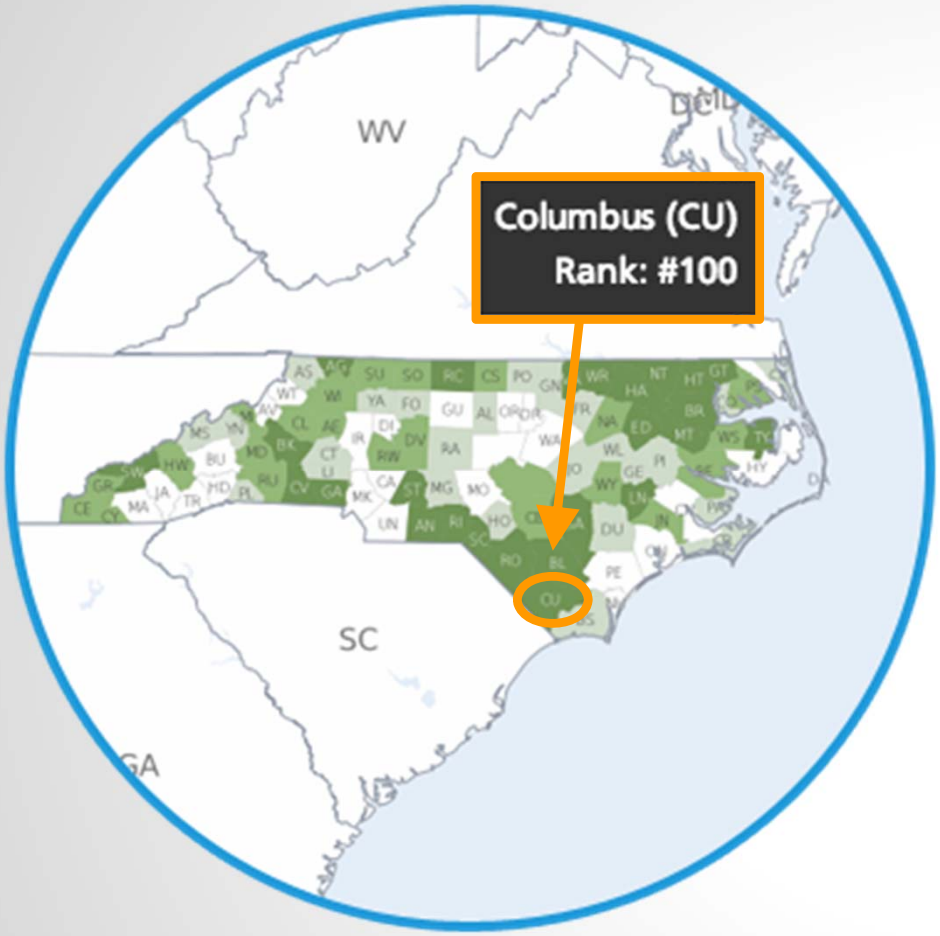
Columbus County Ranked Last in NC Health



Columbus County Ranks Last in North Carolina Health. Source: County Health Rankings, March 2010, University of Wisconsin Population Health Institute and the Robert Wood Johnson Foundation.

The *County Health Rankings* look at multiple factors that affect health, including:

- Access to care
- Smoking and other unhealthy behaviors
- Air quality
- Socio-economic factors such as poverty

The results prompted the health department to initiate a public education campaign to call attention to the issue and improve community health by focusing on the basics.

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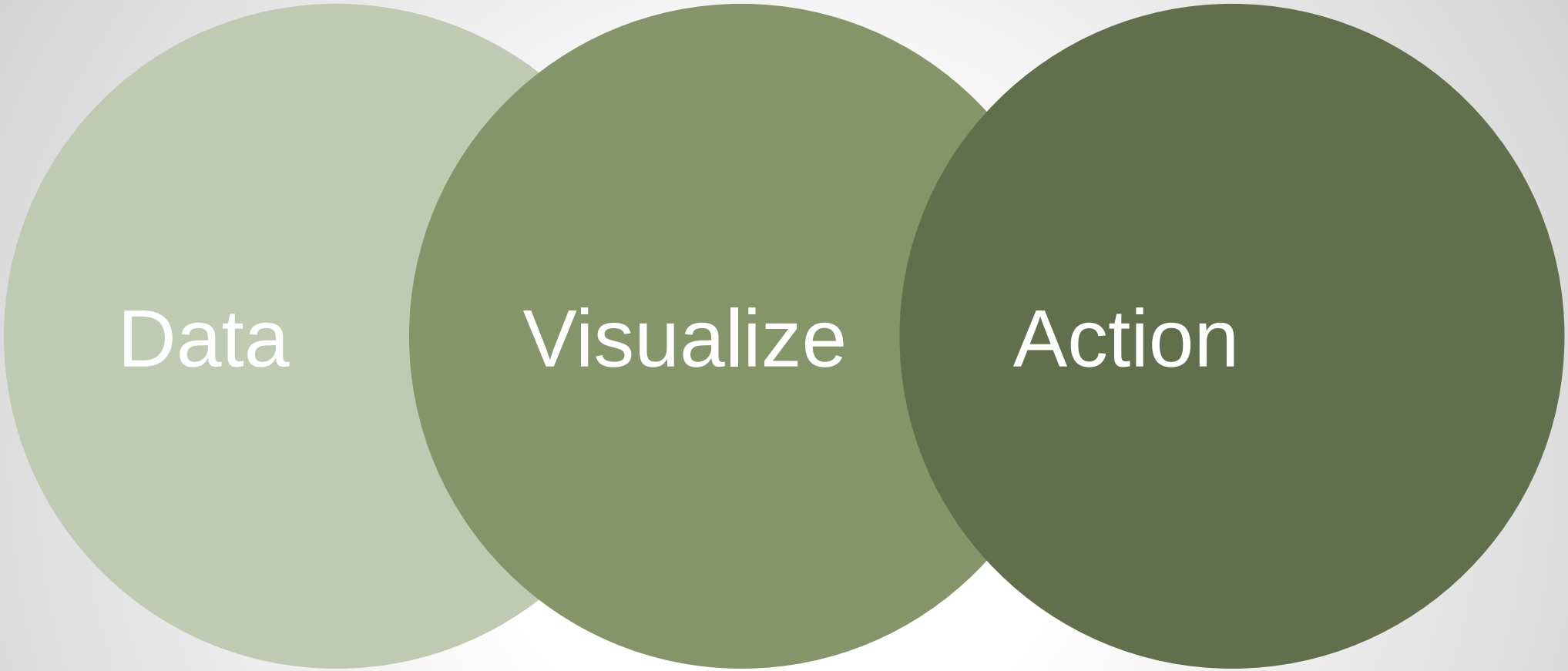
We're seeing more activity now... People are making an effort."

– Kimberly Smith, Columbus County Health Director

- Smoking was banned in county buildings.
- A van began bringing fruits and vegetables to residents in rural areas.
- About 20 county employees joined a local version of "The Biggest Loser" weight-loss competition for eight weeks. County commissioners showed their support by weighing-in at each meeting.
- Smith and her colleagues have relentlessly promoted the "Eat smart; Move more" message to schools, churches, hospital groups, civic clubs, and other county offices.



Columbus County Uses Visually Engaging Data in New Campaign

It's all part of the county's plan to turn its ranking around by getting more people engaged in physical activity and healthier eating habits.

2. How to Present Data Visually: Toolkit

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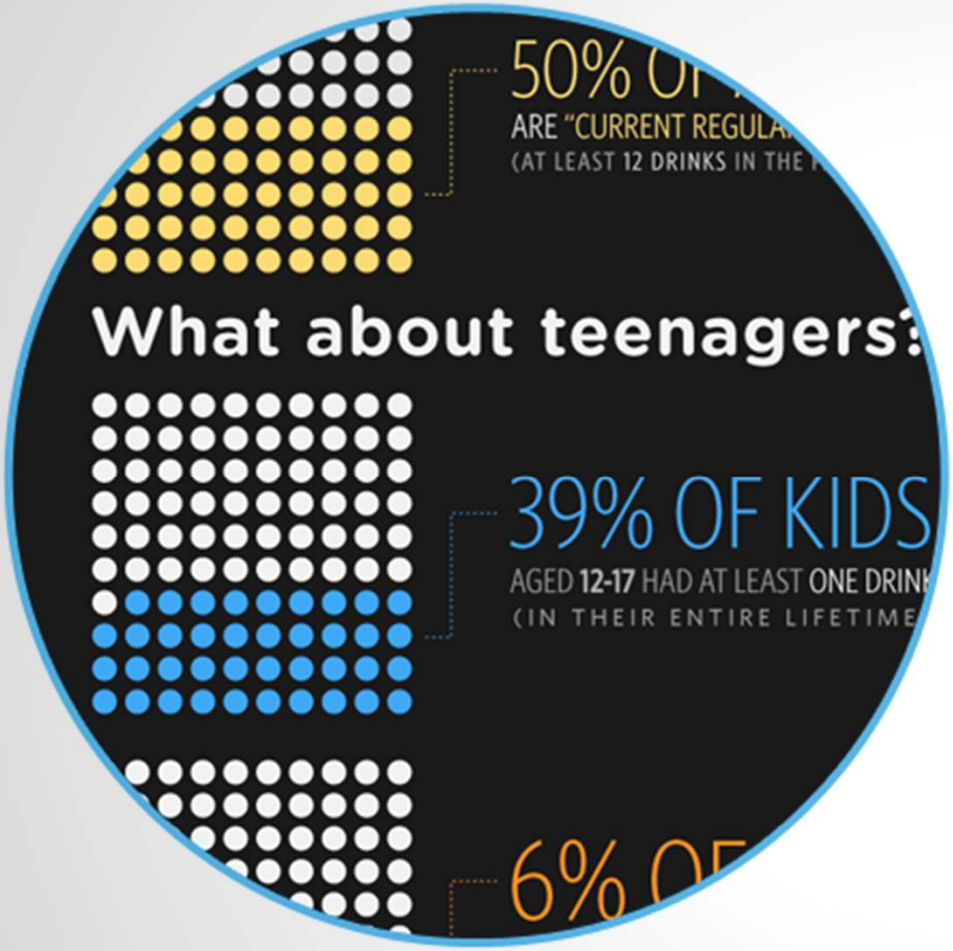
Speak with Numbers

Highlight key facts and figures with style and brevity



Source: "Visualizing Alcohol Use" by Phlebotomist.net.

"Keep it simple."

Your role is to translate often incredibly complex data into simple messages. By selecting the right numbers that best tell your story, and using appropriate typography techniques to highlight these figures, you'll join the ranks of simple data presentation leaders.

CLICK TO VIEW

Tables & Rankings

Present multiple data points in digestible way

Source: Compare Counties in California, County Health Rankings, Robert Wood Johnson Foundation.

Tables are useful when presenting data sliced by multiple variables (such as diabetes screenings by race and gender)

Tips:

- Leave plenty of white space between figures and highlight major numbers and sections, as in this County Health Rankings example
- Clearly label columns. Make sure they are "frozen" when users scroll vertically
- Avoid using too many columns, which will force users to scroll horizontally
- Provide links or tooltips to additional information about the measures

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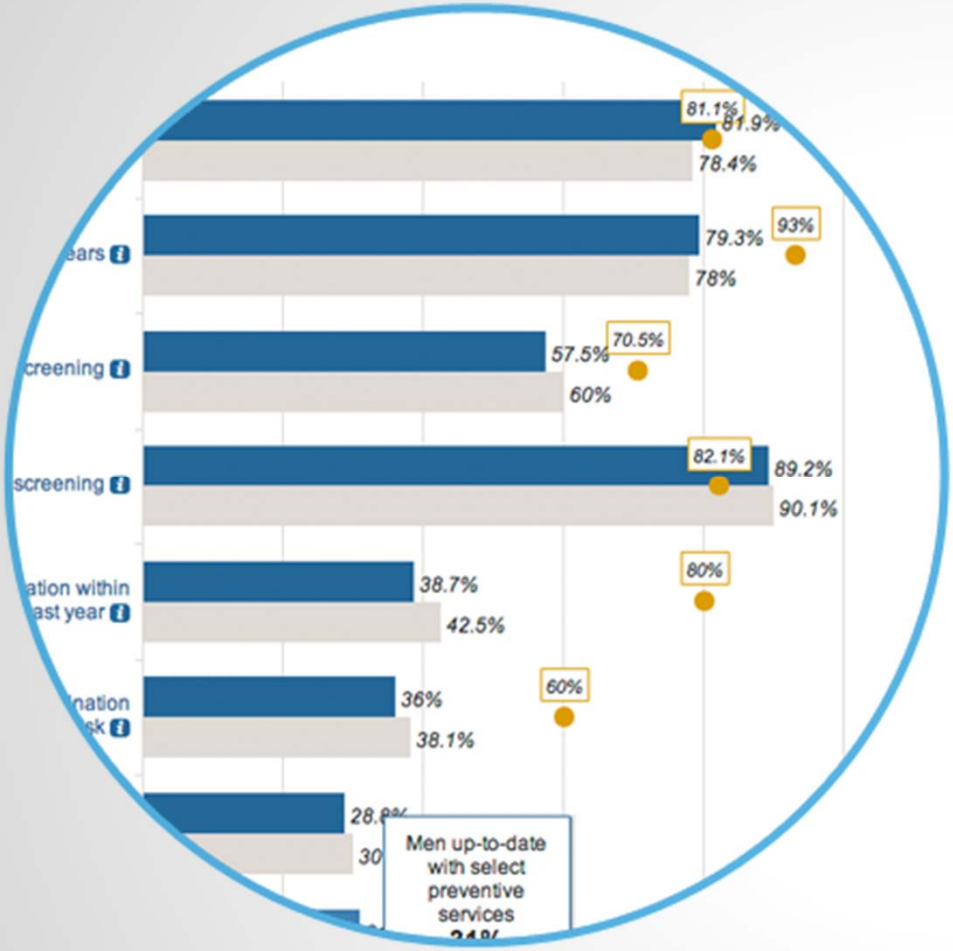
Bar Charts

Highlight independent elements and compare values



Source: Use of Preventive Services Among People 50-64 years of age, California vs. US national average, AARP.

- An excellent choice for highlighting disparities
- Horizontal bars allow for the inclusion of more metrics
- Bar charts play on humans' inherent ability to draw quicker conclusions based on side-by-side lengths

AARP Chart: Why It Works

This stacked chart allows the eyes to easily compare state and national averages.

Bright orange dots showing federal targets offer another access point, clearly indicating the differences in usage rates and target goals.

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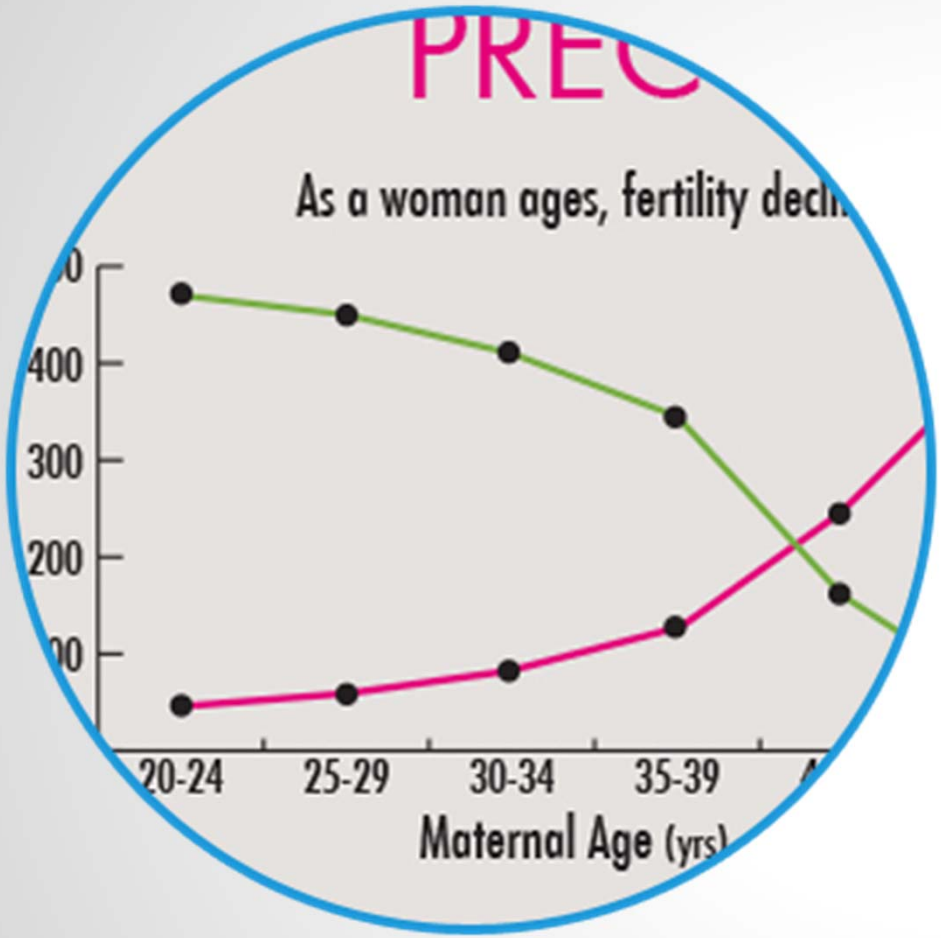
Line Graphs

Connect time and trends



- A simple line graph cleanly plots specific values
- Demonstrates trends over time
- This line graph expertly uses dots and colored lines to show that as women age, fertility rates decrease
- Avoid confusion by using less than five lines

Source: Fertility Rates Decline With Age, Shady Grove Fertility.

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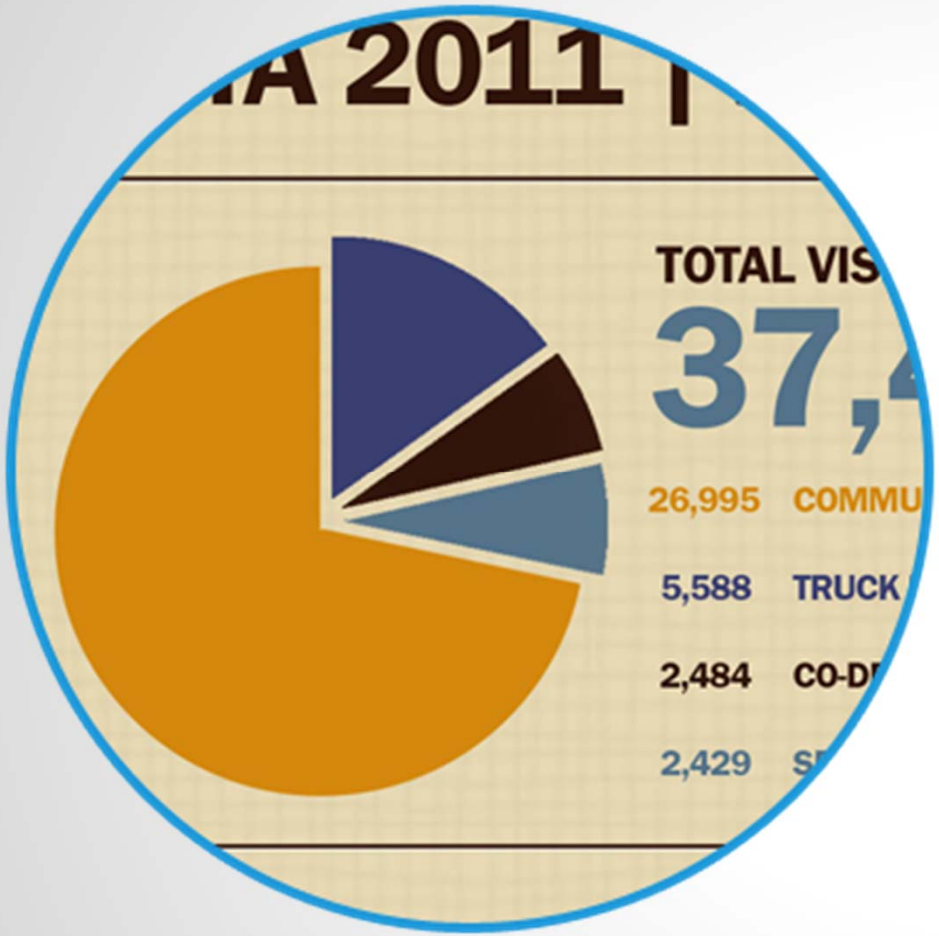
Pie Charts

Display proportional segments of a whole



Source: East African Health Clinic Visits by Traveling Worker, “East Africa Health Care That Moves,” North Star Alliance.

This pie chart uses four slices and contrasting colors to highlight the percentage of visits various traveling workers made to clinics.

It can be difficult for readers to differentiate among similarly sized slices. So consider alternatives to pie charts, such as a stacked bar chart (see next page). If you use a pie chart, consider:

Tips:

- Use five or fewer slices (segments of data)
- Pie charts work well when presenting large differences among data
- Smaller slices are difficult to read and slight differences are difficult to discern
- Don’t compare data sets with side-by-side pie charts

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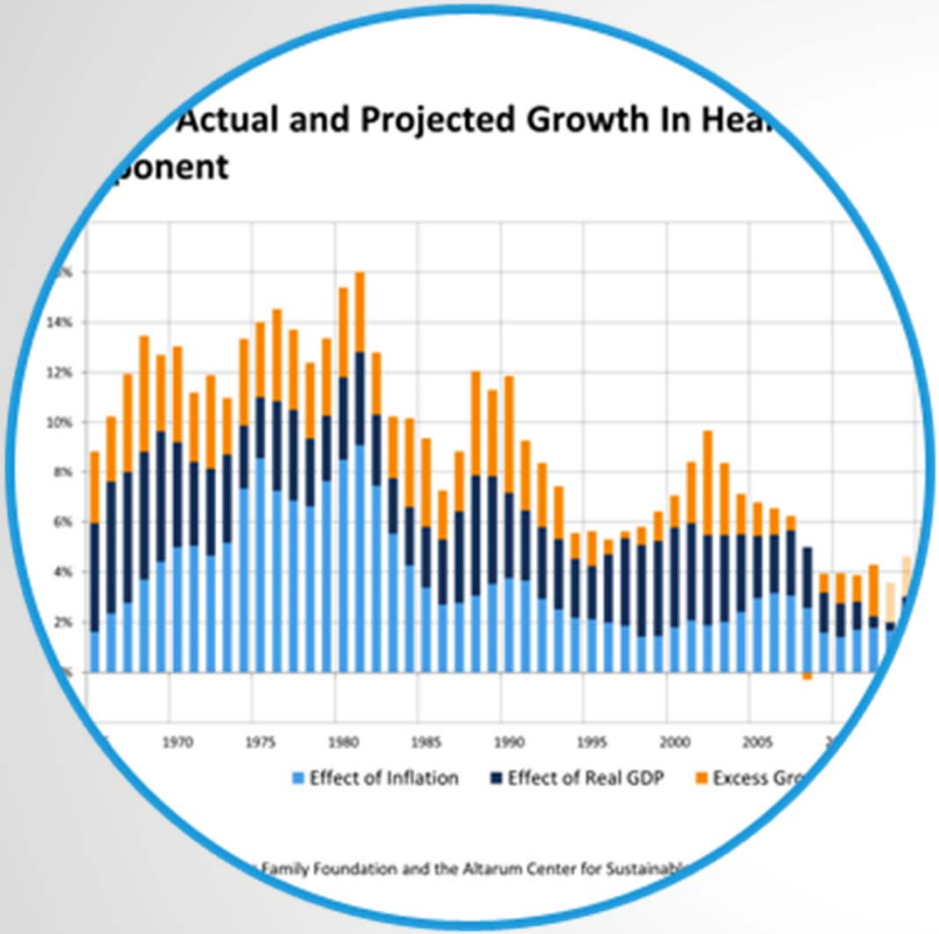
Stacked Bar Charts

Highlight variation;
Another way to show
parts of a whole



- Stacked charts are optimal for comparing multiple instances and/or variations of the same part of the whole (e.g. over time)
- For example, this stacked bar chart from the Kaiser Family Foundation displays multiple components of health spending
- Three sets of colored bars show historical growth in health spending by year, that are then broken down further by GDP, inflation, and “excess” health spending growth

Source: Historical Growth in Health Spending, Kaiser Family Foundation.

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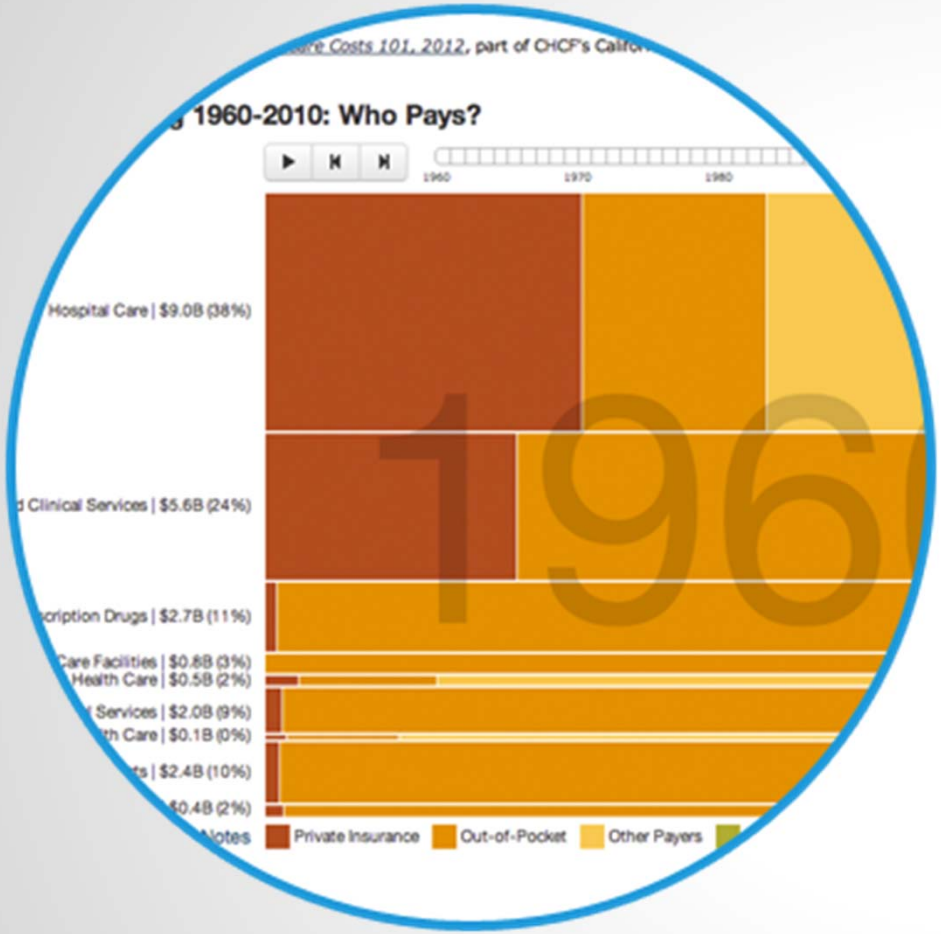
Tree Maps

Demonstrate relativity



Source: US Health Care Spending 1960-2011: Who Pays? California HealthCare Foundation.

- Use for abstract or hard to grasp concepts, including budgets/spending by category
- Good for presenting the relative importance or size of two or more items organized hierarchically
- This tree map from the California HealthCare Foundation shows who has paid for what share of medical services over time and how much these services cost

"We often read or hear reports of 'billions spent on this, billions spent on that,' but we don't have the innate ability to process numbers that large..."

-- Data journalist David McCandless

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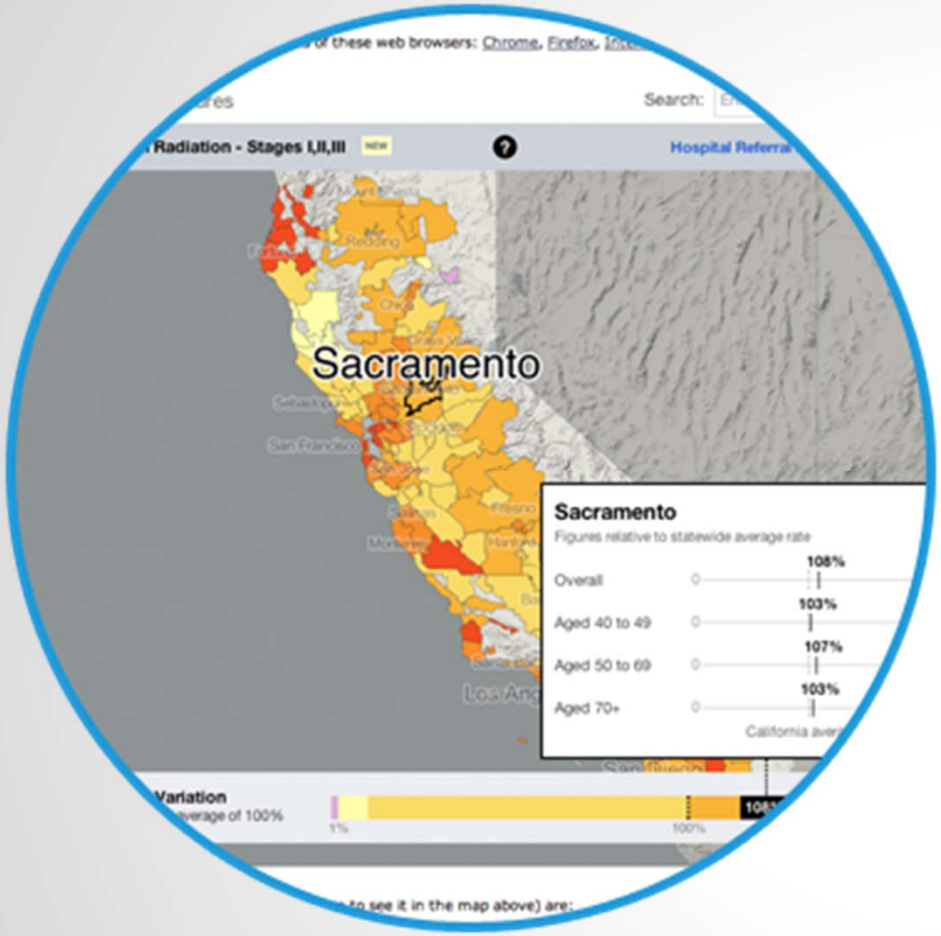
Chloropleth Maps

Define and compare geographic areas



- Also known as “heat maps,” these allow quick comparison of data geographically to show relative performance
- Color can divide areas into two or more categories
- Instead of using different colors, more subtle gradients of the same color also can show key differences, as shown by this density map on varying rates of elective procedures in California

Source: All Over the Map: Elective Procedure Rates in California Vary Widely, California HealthCare Foundation.

CLICK TO VIEW

Cartograms

Statistics displayed on maps

- Cartograms distort the area of a map based on data (in most cases, population data)
- Redefine land mass as alternate data point
- Data are all equally represented on the screen or page, but due to its unique design, the cartogram can make regions unrecognizable
- This world map distorts the size of the countries to demonstrate total health care spending

Source: Total Spending on Health Care, Images of the Social and Economic World by M.E.J. Newman, University of Michigan.

CLICK TO VIEW

Pinpoint Maps

Identify clusters or trends within a geographic region

Source: Mapping Fast Food Clusters in San Francisco, FastFoodMaps.com.

- **Pinpoint maps have become popular as more data sources include exact coordinates**. Google maps and GPS devices commonly use this type of map to pinpoint exact locations. Geo-coded social content, such as tweets and Instagram photos, are also commonly mapped this way.
- **In health care, pinpoint maps work well to show clusters of disease**, uncover food deserts, and find health service delivery locations
- Consider layering a heat map with a pinpoint map to see where and how a health issue (such as obesity) relates to service locations (such as fast food outlets)

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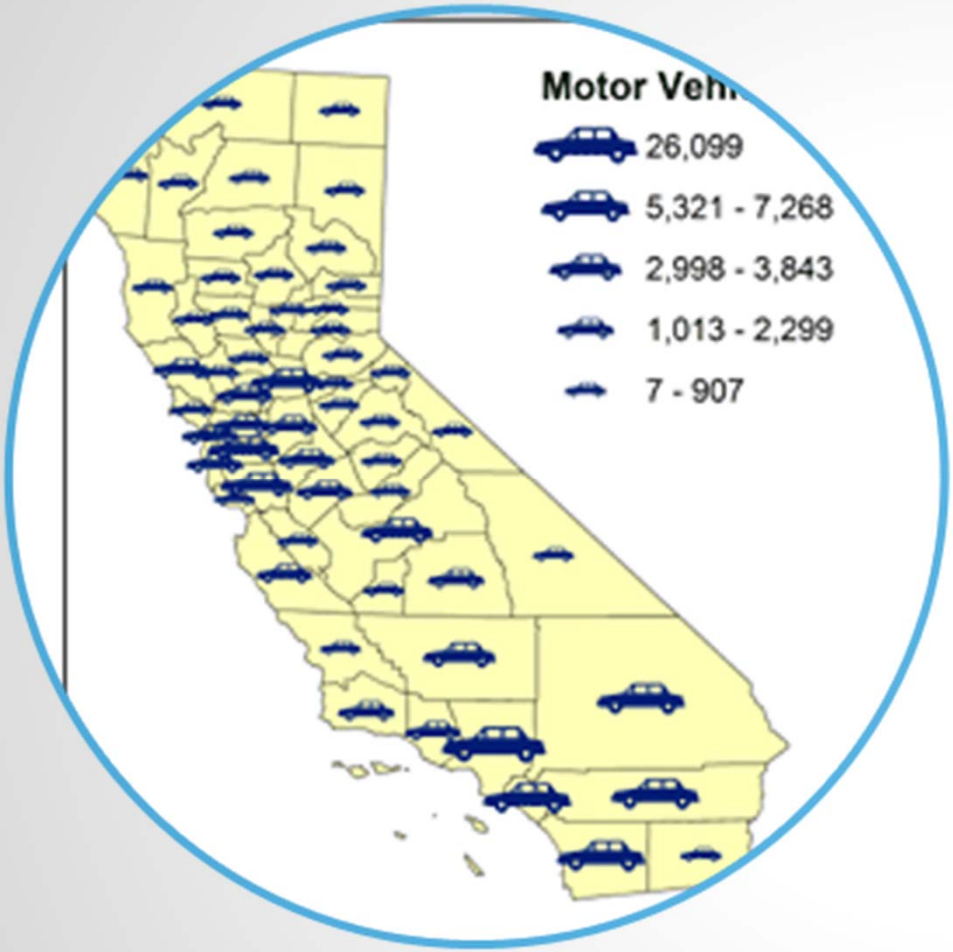
Proportional Symbol Maps

Compare statistics through symbols on maps



Source: Motor Vehicle Deaths by California County, Pennsylvania State University Geography Department.

- Similar to chloropleth maps, proportional symbol maps typically use bubbles or other iconography (such as the cars in this map) plotted in the middle of each geographic region
- Proportional symbols: The size of each shape is determined by the data, allowing users to compare quantitative differences in geographic areas
- Sometimes these maps are difficult to interpret because of overlapping symbols in smaller geographic regions. This can be addressed by ensuring scale and appropriate size and translucence

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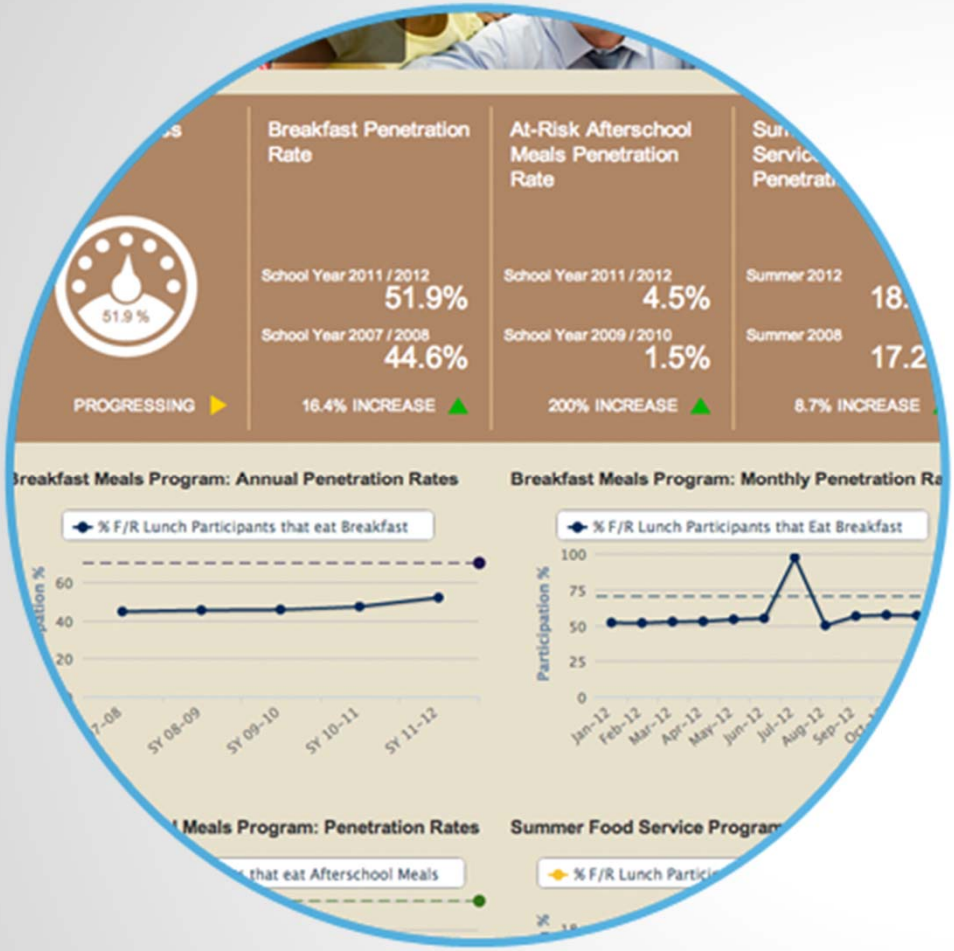
Dashboards

Summarize key data points on one page



Source: Maryland StateStat, Goals for Ending Childhood Hunger.

- Valuable in communicating quick snapshots of key figures on a single page
- Contain tables, charts, graphs, and other data visualizations
- Odometers are a popular dashboard style. For example, this dashboard uses an odometer with clear percentages to detail progress in ending childhood hunger in Maryland
- Less is more: Create clean designs with limited data points
- Use minimal visualizations to avoid confusion and force focus

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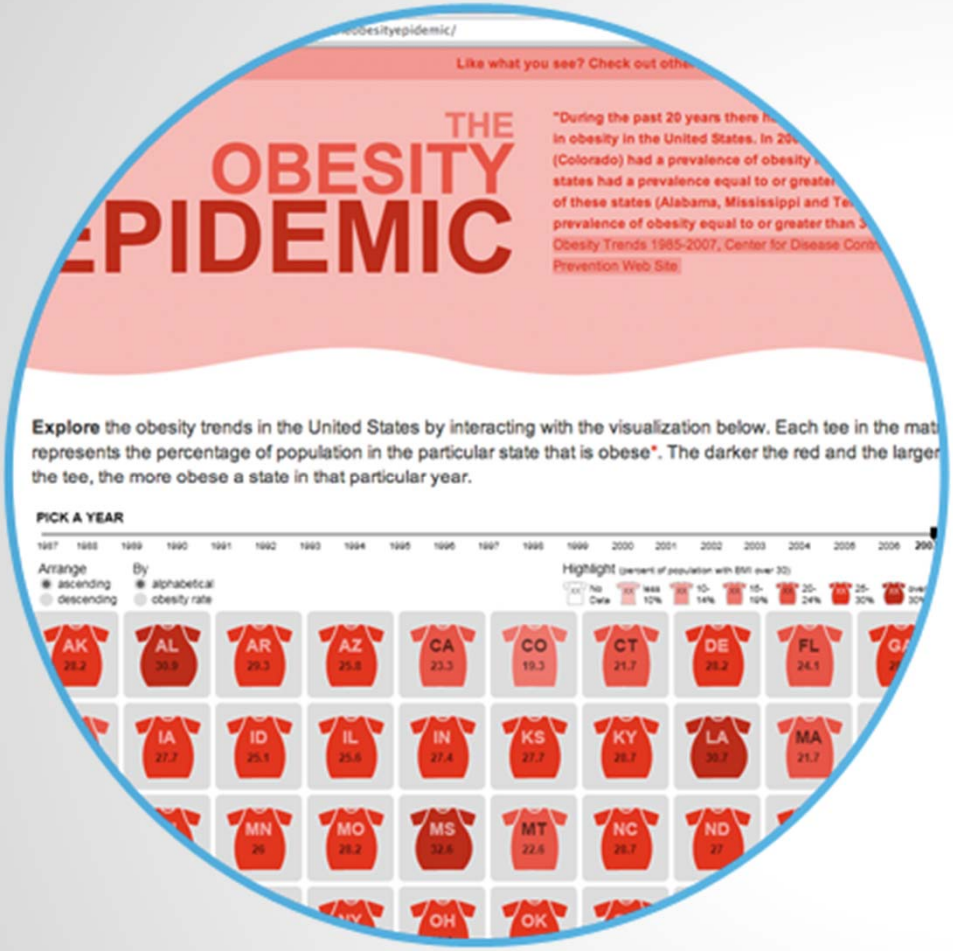
Infographics

Tell compelling stories with data using unique design elements



Source: Infographic on the Obesity Epidemic, based on data from CDC's Behavioral Risk Factor Surveillance System, by MIX Online.

Infographics come in many forms:

- Static or interactive
- Long form
- Digital postcards
- Illustrations, photos or icons

Interactive example: Red t-shirts are used to highlight the growth of the obesity epidemic over several decades

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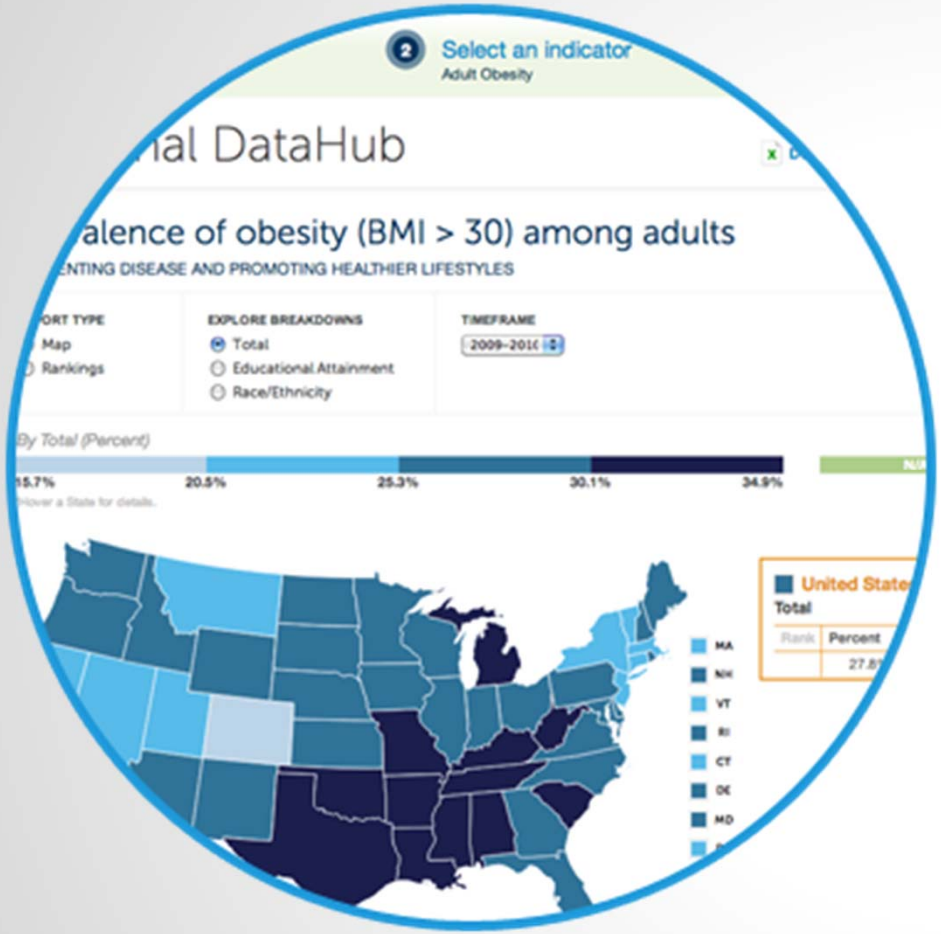
Animated Visualizations

Demonstrate changes over time



- Can incorporate icons and other visualization options
- This example shows obesity rates in a chloropleth map
- The movement in animated graphics is more engaging to viewers
- Users can roll the data back to 2000 and play the animation to view changes in the map and data through 2010

Source: Obesity Prevalence Among Adults, DataHub, Robert Wood Johnson Foundation.

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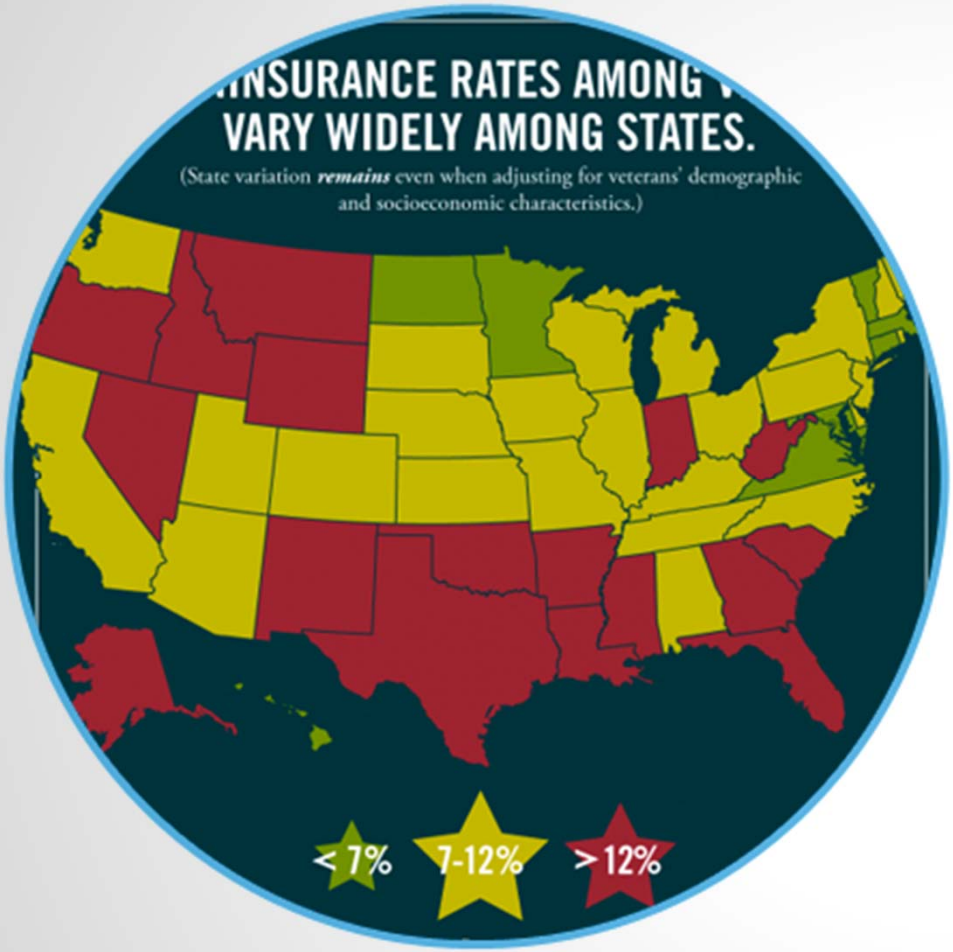

Source: Uninsurance Rates Vary Widely Among US Veterans, Robert Wood Johnson Foundation.

Static Visualizations

Require the least effort and expertise to create

Static presentations of bar, line, and trend graphs, as well as maps, summarize and display data as interesting visuals in ways that are easy to share. Static visualizations can include numbers, charts, maps, and iconography.

Benefits:

Ease of use. With no moving parts or user interactions, static visualizations represent the least amount of effort and technical expertise.

Simple tools, including pencil and paper, Excel, Photoshop, and Google charts.

Here, the RWJF visualization uses numbers, iconography, a chloropleth map, and text to tell the story of uninsured veterans

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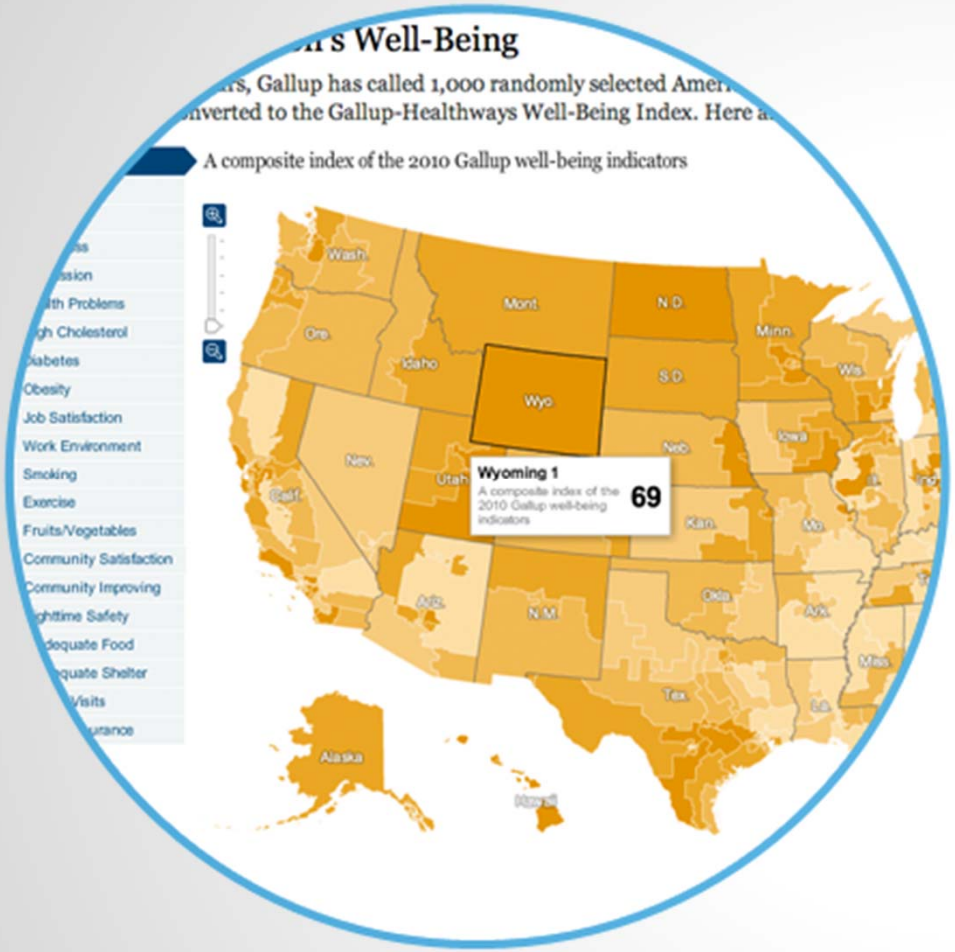

Source: Gallup-Healthways Well-Being Index Scores by state and congressional district, *The New York Times*.

Interactive Visualizations

Require a higher level of effort and expertise

Interactive visualizations are attractive because they capture users' attention. This chloropleth map, for example, allows users to hover over states for detailed data on various quality of life indicators.

Here are some software tools to produce interactive visualizations:

- Without advanced programming knowledge: Google Charts & Maps (Google Fusion Tables), Tableau Public, Mapbox, Datawrapper, Infogram, Many Eyes, iCharts
- With advanced programming (coding frameworks, map tile producers, and Javascript libraries): High Charts, TileMill, D3.js, FLOT, Fusion Charts, OpenLayers, and JSMap

3. How to Get Started Visualizing Data

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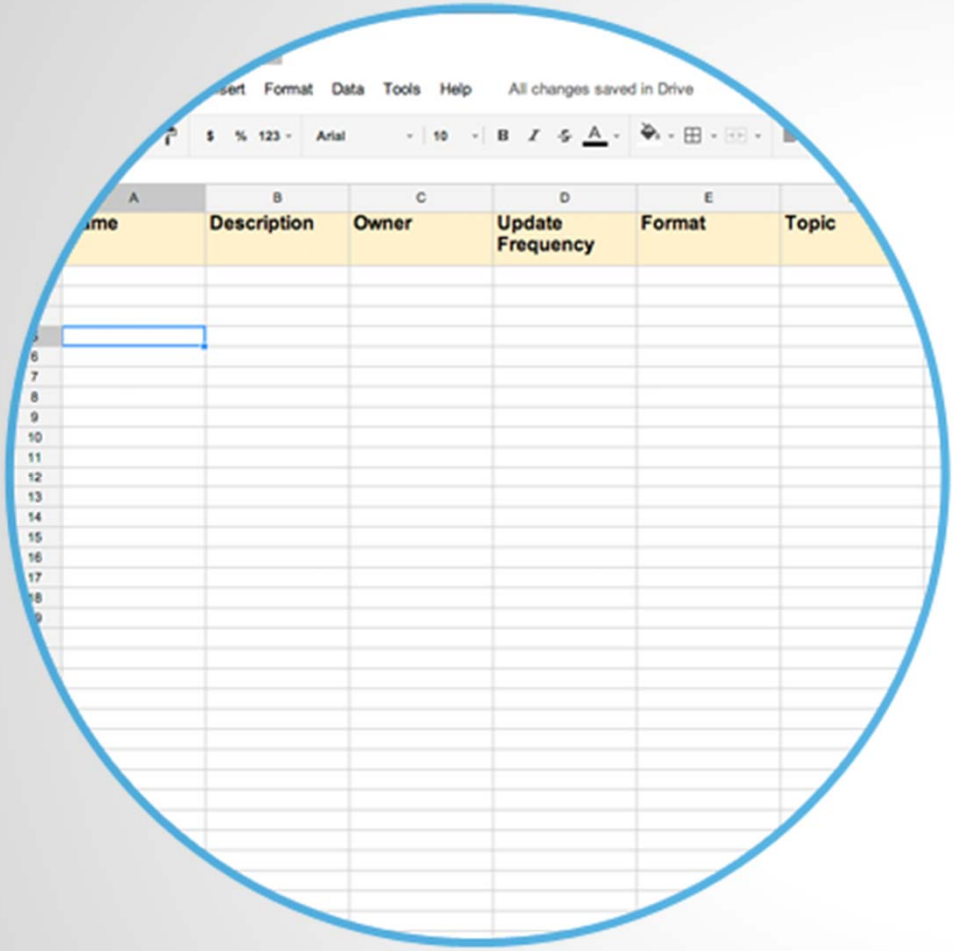
Take Inventory

What data are available?
What is missing?



Create an inventory spreadsheet with the data source's:

Name, description, owner, frequency of updates, topics covered, geographic depth(city, county, country specific), format (API, CSV, XLS, PDF, widget, query tool)

Key questions to consider:

- What data do we have and where?
- What is the scope?
- What is the quality?
- What are constraints and limitations?
- Are the data statistically significant?
- Are the data private in any way?
- Does the dataset include test data?

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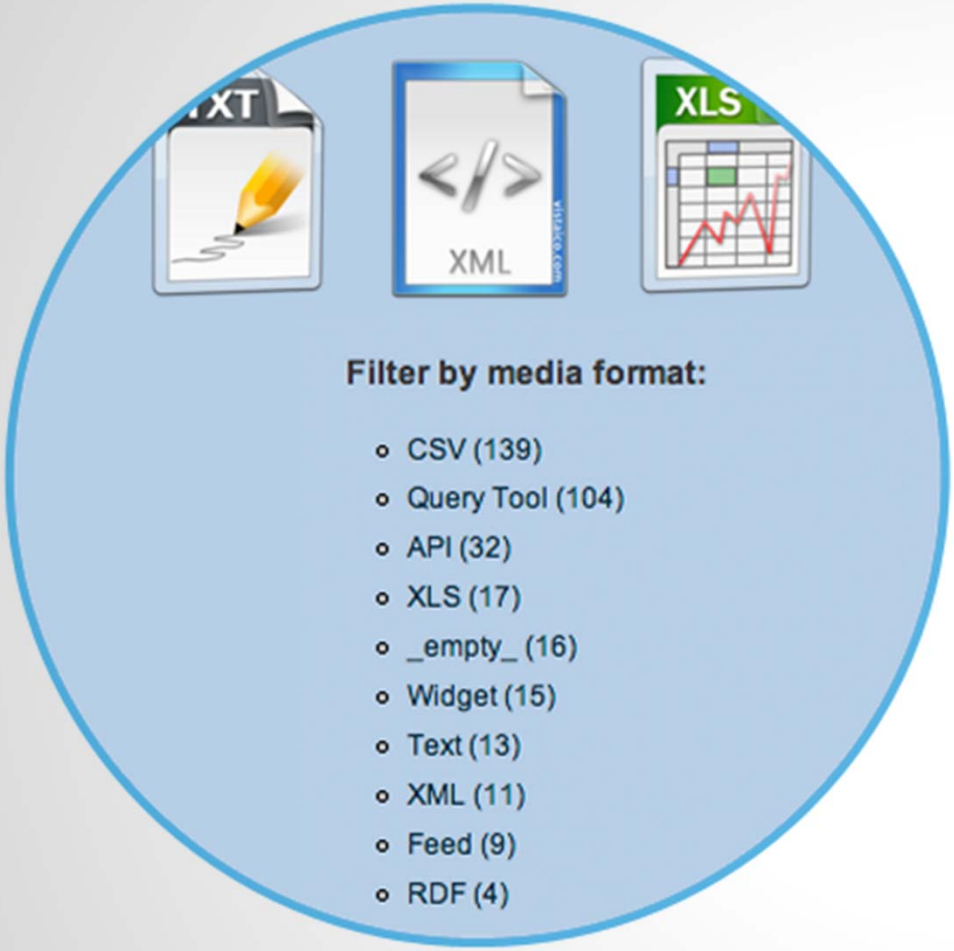

Consider Data Format

What format is your data in?

Some formats lend themselves to interactive tools better than others. For example, data in a PDF or a report is hard to extract, repurpose, and segment**. Tip: Go back to the original source (like an Excel sheet if available) for easier extraction**.

- Data that are packaged in an API or spreadsheet are often easier to dynamically update and incorporate into tools and displays
- Look for ways to store data in flexible formats, such as Excel. Data should not “live” in the report only

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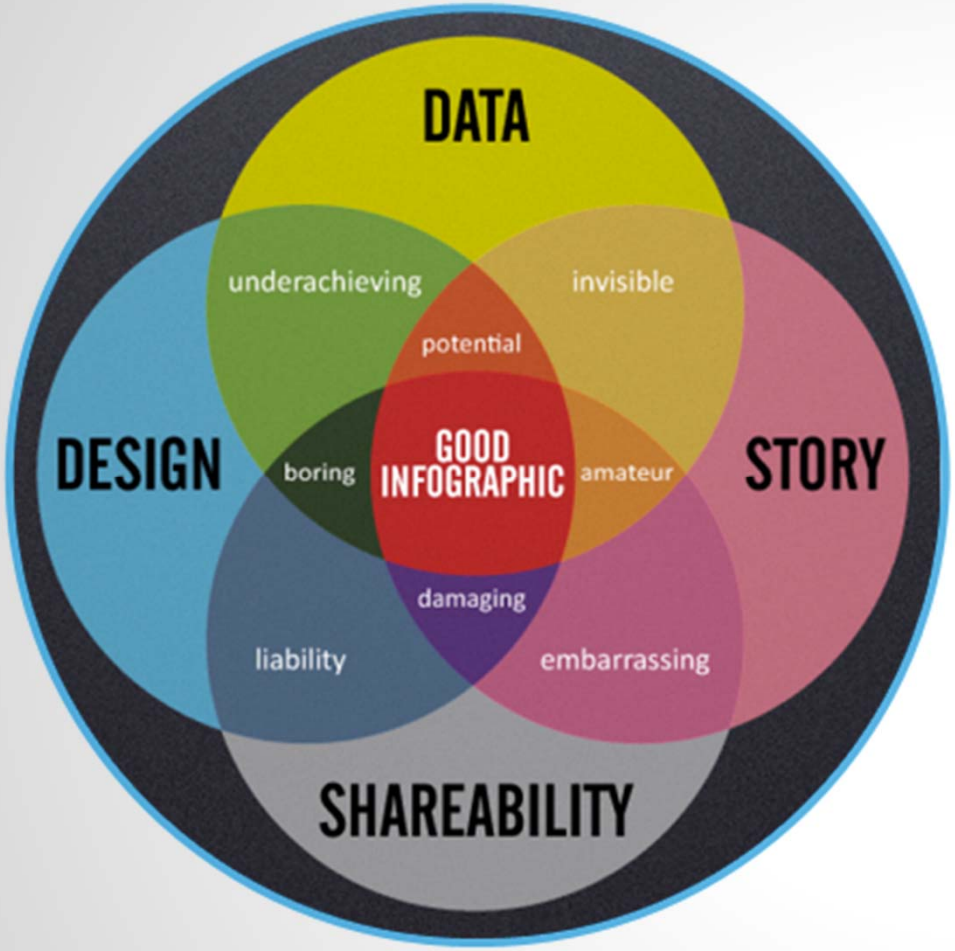
Analyze the Data

What message are you trying to convey?



Source: DashBurst.

Determine which data are the most useful information and central to this message

Determine conclusions users will make when they view the data visualization

Consider these characteristics of strong data visualizations:

- Personalization and storytelling
- Relevance and timeliness
- Connections and comparisons

Have a Maintenance Strategy

How will you update and maintain the data and the visualization?

When data are updated regularly, people are much more likely to use the information.

Questions to consider:

- How often will the data be updated?
- Who will update it?
- How long will it take to update?
- Do you need to gather new data?
- How regularly?
- Where will you store your data?
- Is it easy to access?
- Do you have resources to do this?

Be sure to record your process for analyzing, creating a visualization, releasing, marketing, and updating your data.

Determine a Presentation Approach

Key elements of getting started:

1. Know your level of expertise and resources at your disposal in crafting a visualization, as well as the level of effort needed to create a display
2. Determine what visualization methods best achieve your goals
3. Review the various types of presentations in section 2 of this publication
4. Consider whether you can and should make the visualization either static or interactive

4. Strategies for Sharing Your Data

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Create Customized Views

Increase user interaction

Source: The federal government site HealthCare.gov gives clear information and offers helpful ways to interact and personalize data views.

Custom views call for more planning and strategy.

Give users an opportunity to personalize their view into the data by providing:

- Query tools that lead a user through a series of questions or selections before presenting the results
- Comparison tools that allow users to select multiple criteria and compare results side-by-side
- Widgets that allow users to select criteria and to embed them on other sites, making them very portable

It is vital to understand the target audience's needs. Have a clear vision of the goals, and create a design that is intuitive and useful.

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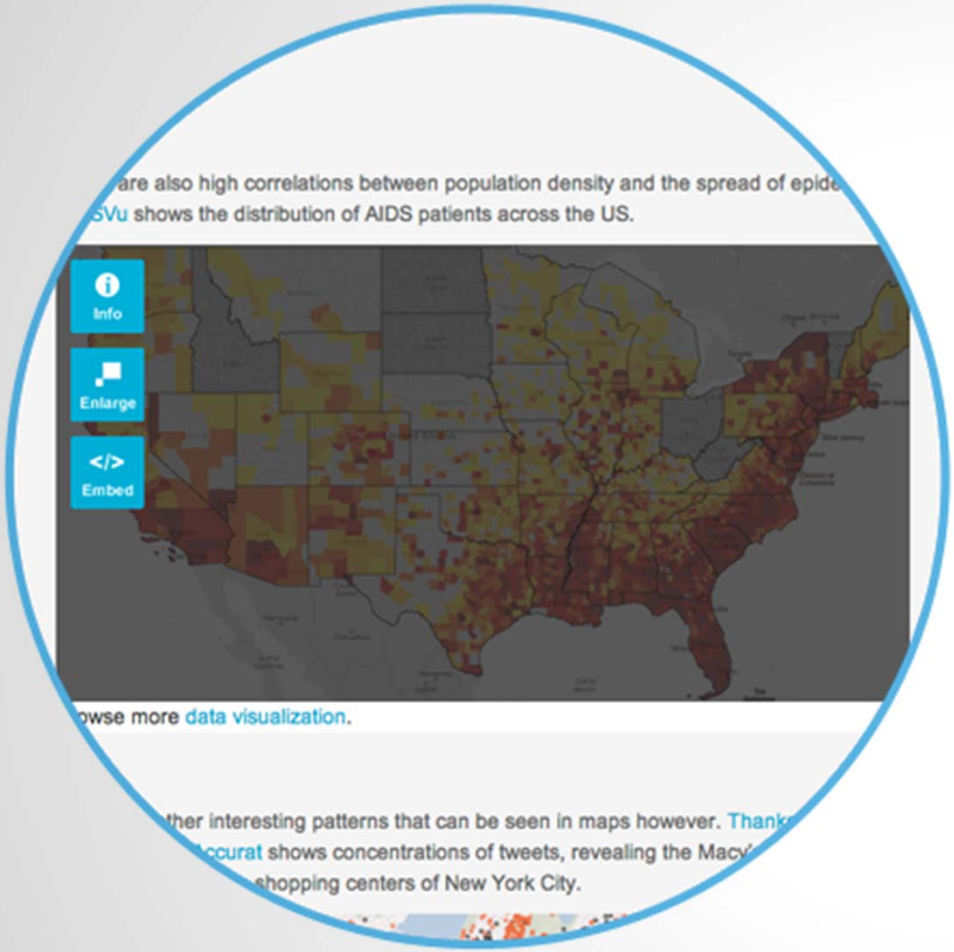
Give the Raw Data

Creating a stunning data query tool or visualization isn't enough…



Source: US Geographic Distribution of AIDS by New Diagnoses and Prevalence Rates, AIDSVu.

Sharing raw data will advance user interaction by making valuable data available to others to create their own data visualizations.

- Provide a machine readable download option (such as an Excel spreadsheet)
- If possible, provide an API for web developers

This chloropleth map shows geographic clusters of AIDS patients. It allows users to embed the map on another website.

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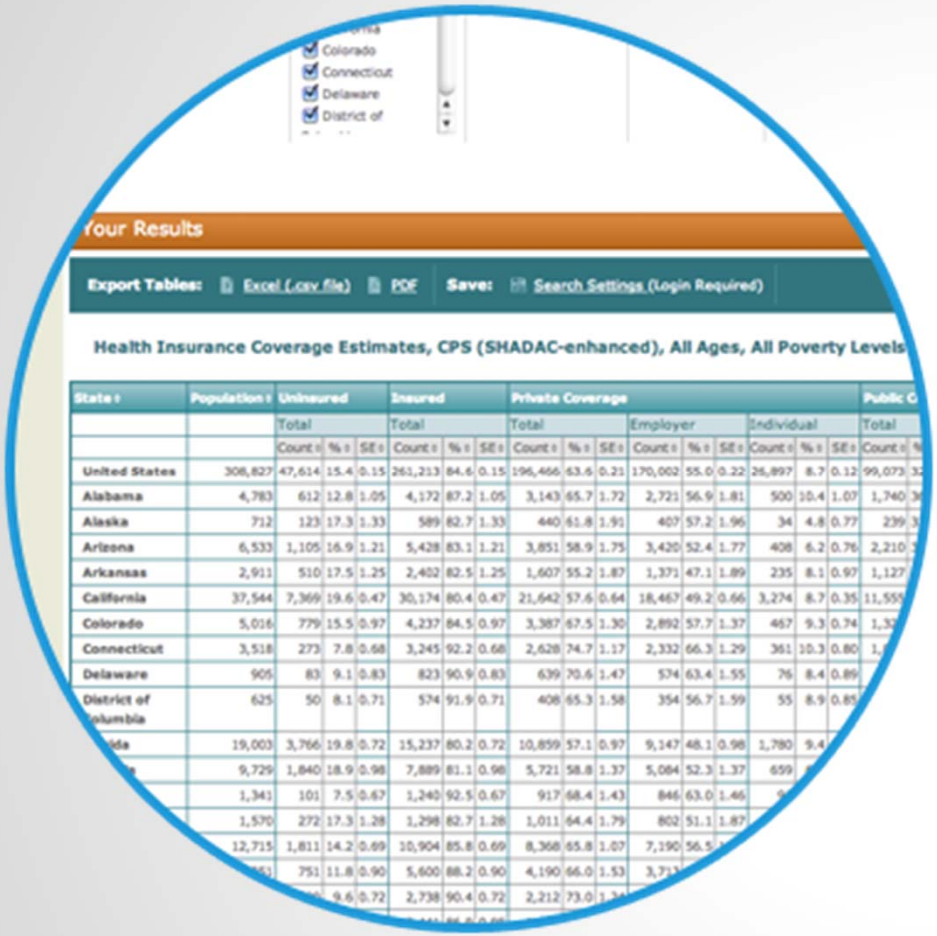
Download Approaches

Offer machine-readable formats



- Researchers like Excel or CSV files, which **allow them to grab the data for their own analysis**
- **Break down large data sets into smaller files** to enable people to select distinct data pieces, achieve a quicker download and avoid network disruptions

This chart on health insurance coverage estimates allows users to export tables into Excel and PDF formats.

Source: Health Insurance Coverage Estimates, Shadac.org.

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Provide Public APIs

Source: Programmableweb.com.

Valuable Developer Tool
APIs – application programming interfaces - enable developers to easily and automatically "tap into" the data and create their own visualizations, mashups, or apps that integrate data.

Publish Data More Easily
APIs allow data published in one location to be dynamically updated and posted in multiple applications around the web.

The federal government site HealthData.gov offers a number of APIs and adds more regularly.

Create a Marketing Plan

Consider how will you drive traffic

Before publishing the data, consider how you will alert critical stakeholders. This is a "must do" for reaching a wide audience.

How will you promote your new visualization, drive traffic to your site and encourage people to download and use the data?

- Post it on your home page and blog
- Send an email blast
- Share via social media
- Post it on popular industry blogs or sites
- If your data visualization is especially beautiful, upload it to sites like Visual.ly.

If your product may be newsworthy, develop a robust marketing and public relations plan, including a written press release, embargoed/coordinated release timing, and placement with new outlets.

5. Resources & Inspiration

Creative IDEAS: Data Visualization Blogs

Daily Infographic

visual.ly

FlowingData
Strength in Numbers

GOOD INFOGRAPHICS
Explorations of the data that surrounds us

CHART PORN
data visualizations you just gotta love

Information is Beautiful
ideas, issues, knowledge, data – visualized!

information aesthetics. *Where form follows data.*

visual complexity

Co.DESIGN

FAST COMPANY
INFOGRAPHIC OF THE DAY

storytelling with data

Data Visualization Tools

Tools for Everyone

- Google Charts & Maps
- Tableau Public
- Mapbox
- Infogram
- Many Eyes
- iCharts
- Datawrapper

Tools for Developers

- High Charts
- TileMill
- D3.js
- FLOT
- Fusion Charts
- OpenLayers
- JSMap

So what will you do?

Conclusion

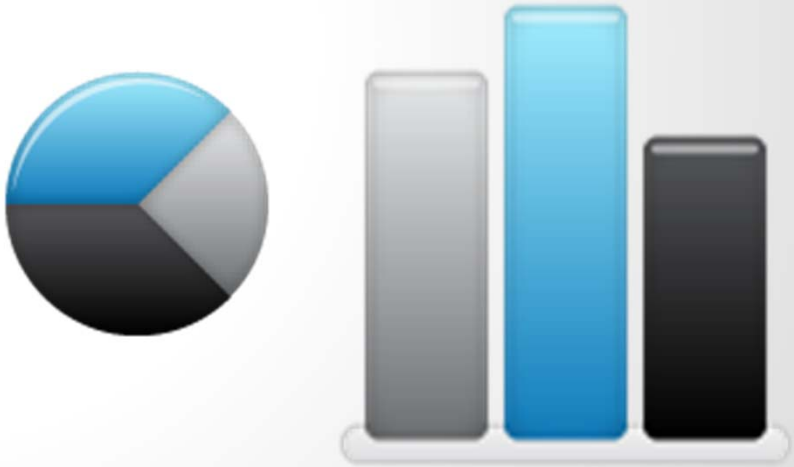
Eat smart.
Move more.

That's what they are doing today in Columbus County, NC

Health data visualization can be quite powerful.

Remember Columbus County's story.

Be data-smart.
Visualize more.
Tell stories.



About

This presentation was developed by Forum One Communications under a grant from the California HealthCare Foundation under its Free the Data initiative.

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