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Effective Use of Line Charts

- Purpose** This tool provides guidelines and tips on how to effectively use line charts to communicate research findings.
- Format** This tool provides guidance on line charts and their purposes, shows examples of preferred practices and practical tips for line charts, and provides cautions and examples of misuse and poor use of line charts and how to make corrections.
- Audience** This tool is designed primarily for researchers from the Model Systems that are funded by the National Institute on Disability and Rehabilitation Research (NIDILRR). The tool can be adapted by other NIDILRR-funded grantees and the general public.

The contents of this tool were developed under a grant from the National Institute on Disability, Independent Living, and Rehabilitation Research (NIDILRR grant number 90DP0012-01-00). The contents of this fact sheet do not necessarily represent the policy of Department of Health and Human Services, and you should not assume endorsement by the Federal Government.

Overview and Organization

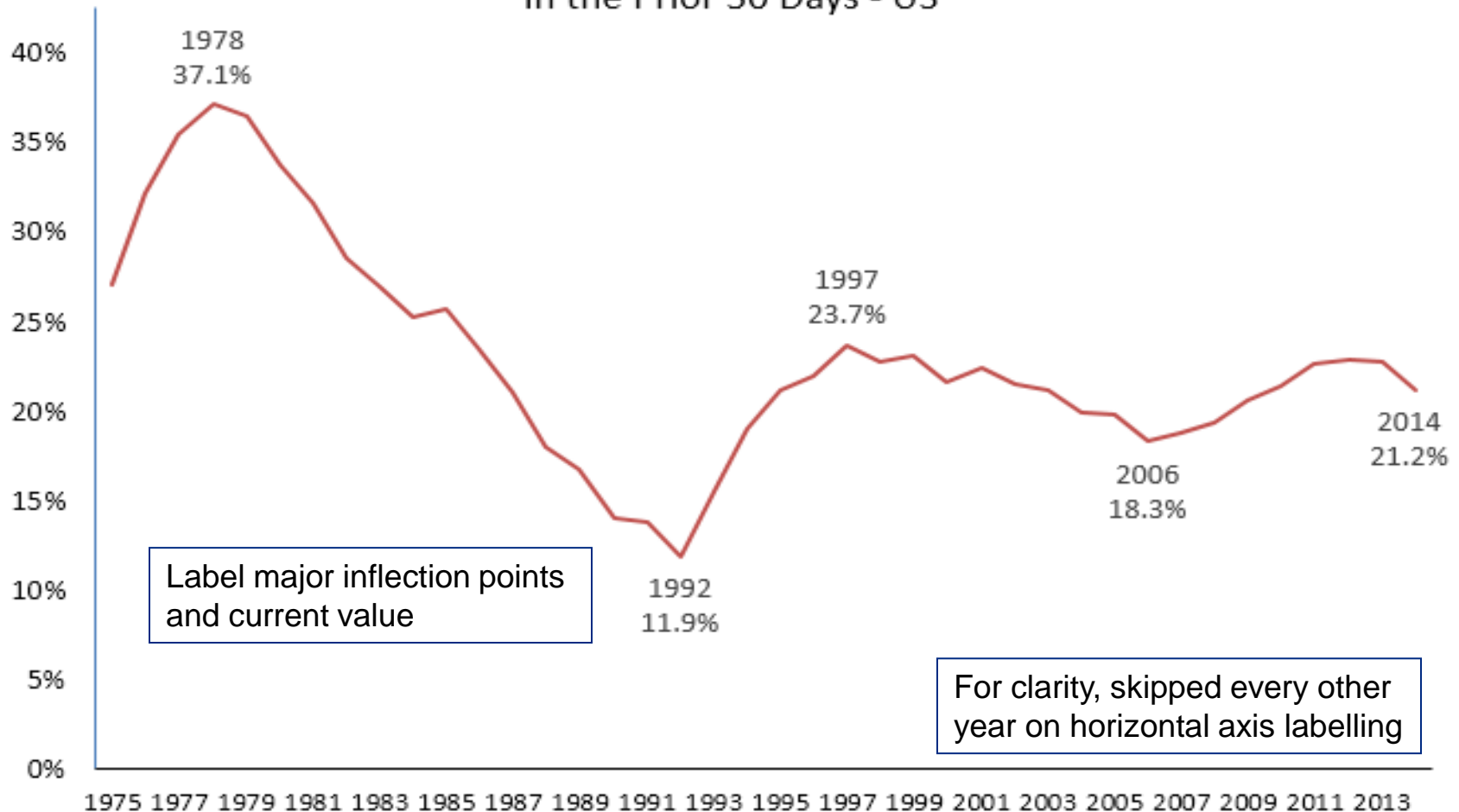
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Simple Line Chart

- ▶ The primary use of Line Charts is to display trends over a period of time (marijuana use by youth by year, trends in clients served at a food pantry by quarter, website page hits by hour).
- ▶ The Time unit (years, quarter, months, hours of the day etc) is distributed evenly along the horizontal axis.
- ▶ The magnitude of each data element in the series is represented by its position on the vertical axis.
- ▶ The line in the Line Chart connects the individual data points across the time period.

Simple Line Chart – Trends

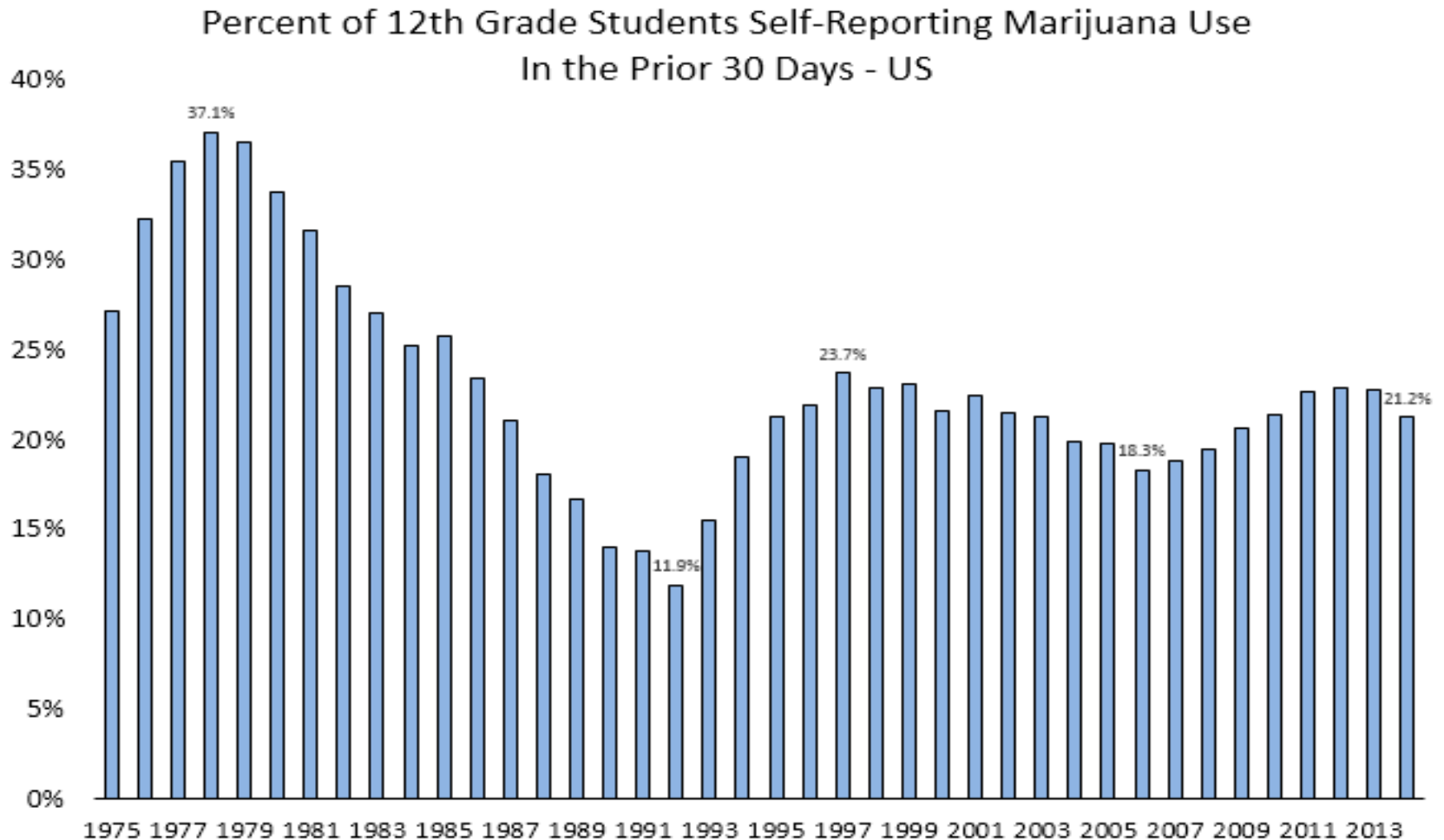
Percent of 12th Grade Students Self-Reporting Marijuana Use
In the Prior 30 Days - US



Useful for general impression of trends, especially trends with a large number of data points.

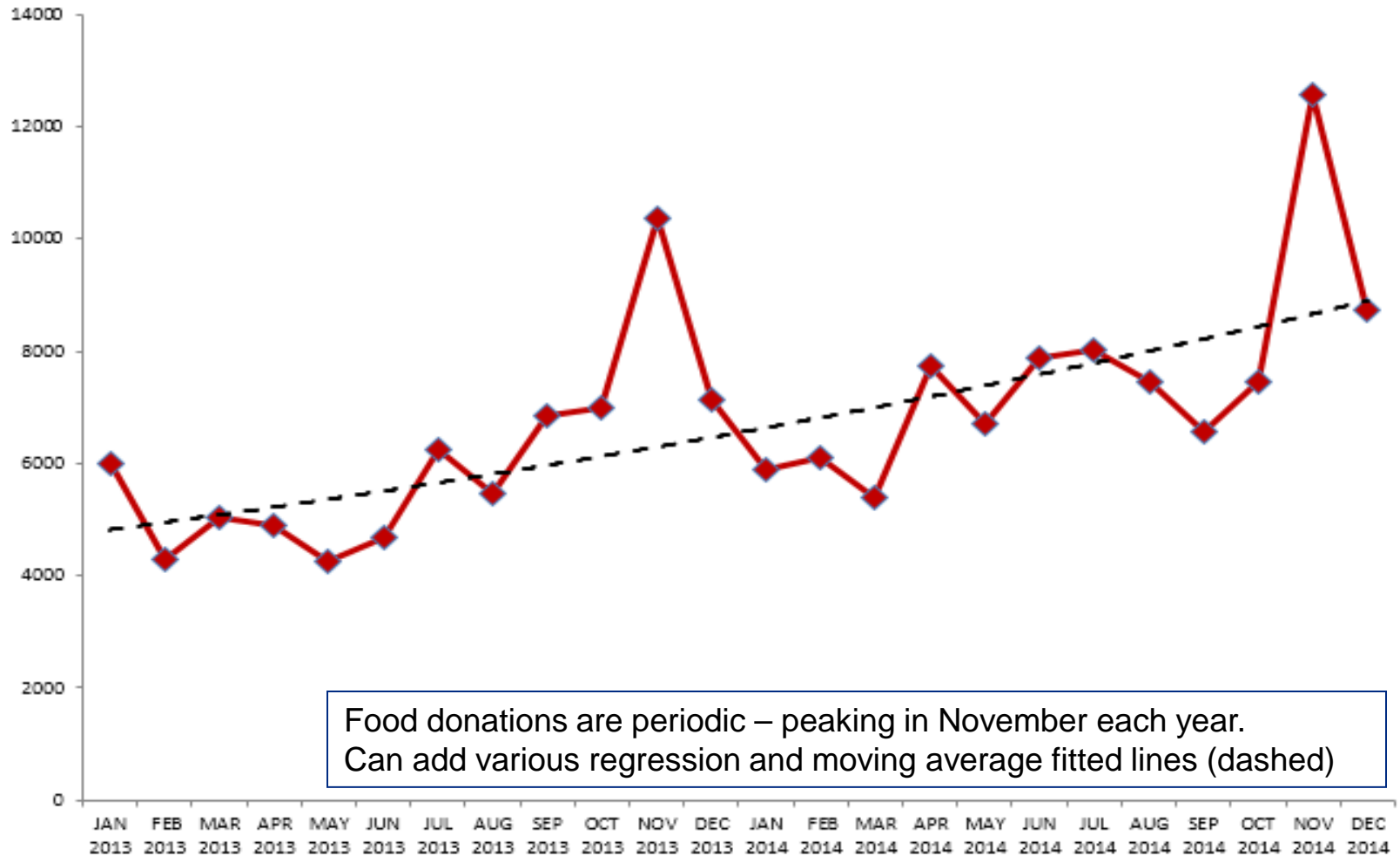
Simple Line Chart – Trends – Presentation Options

If a trend chart is used in a large-room presentation, a thin trend chart line is often only marginally visible at the back of the room. Consider column trend instead.



Simple Line Chart – Trends

Food Donations [Pounds] Chatham Outreach Food Pantry

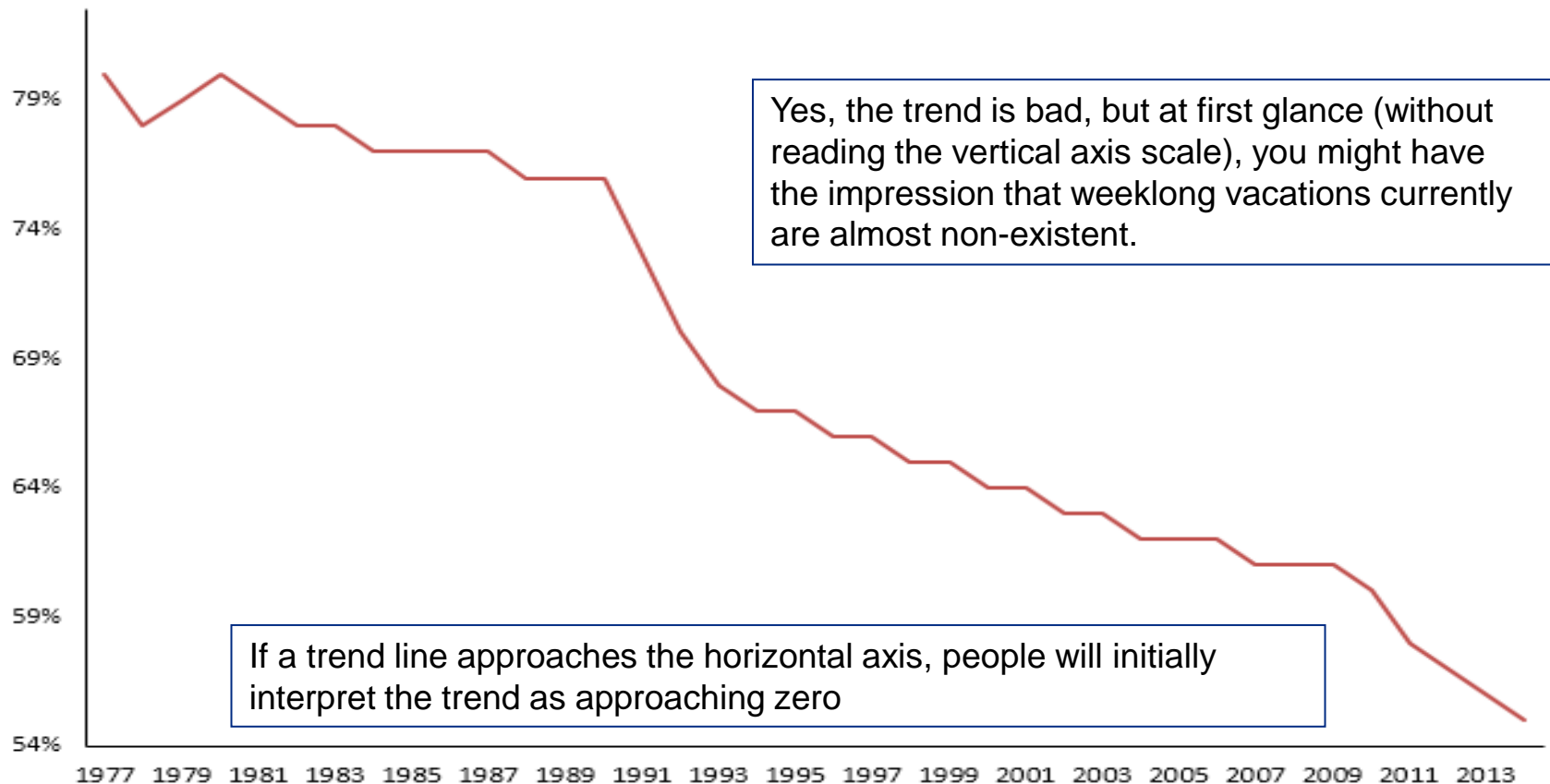


Food donations are periodic – peaking in November each year.
Can add various regression and moving average fitted lines (dashed)

Also added data markers to emphasize the data points

Simple Line Chart – Vertical Axis Cautions, Misuse, and Poor Use

Percent of Workers Taking a Weeklong Vacation - US

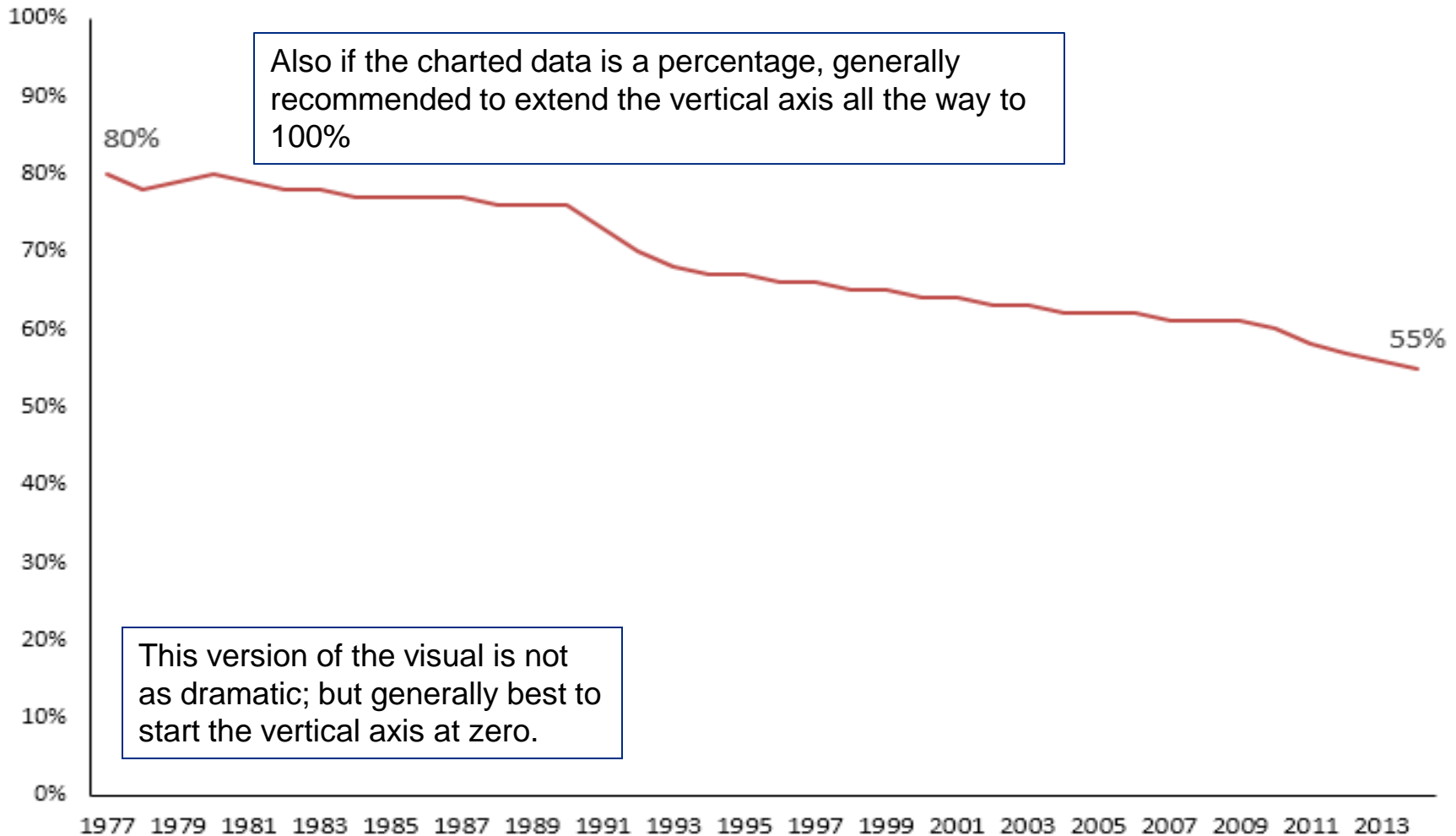


Use caution when setting the vertical axis ranges. Here this vertical axis is truncated at the bottom (and somewhat at the top as well).

Simple Line Chart – Vertical Axis

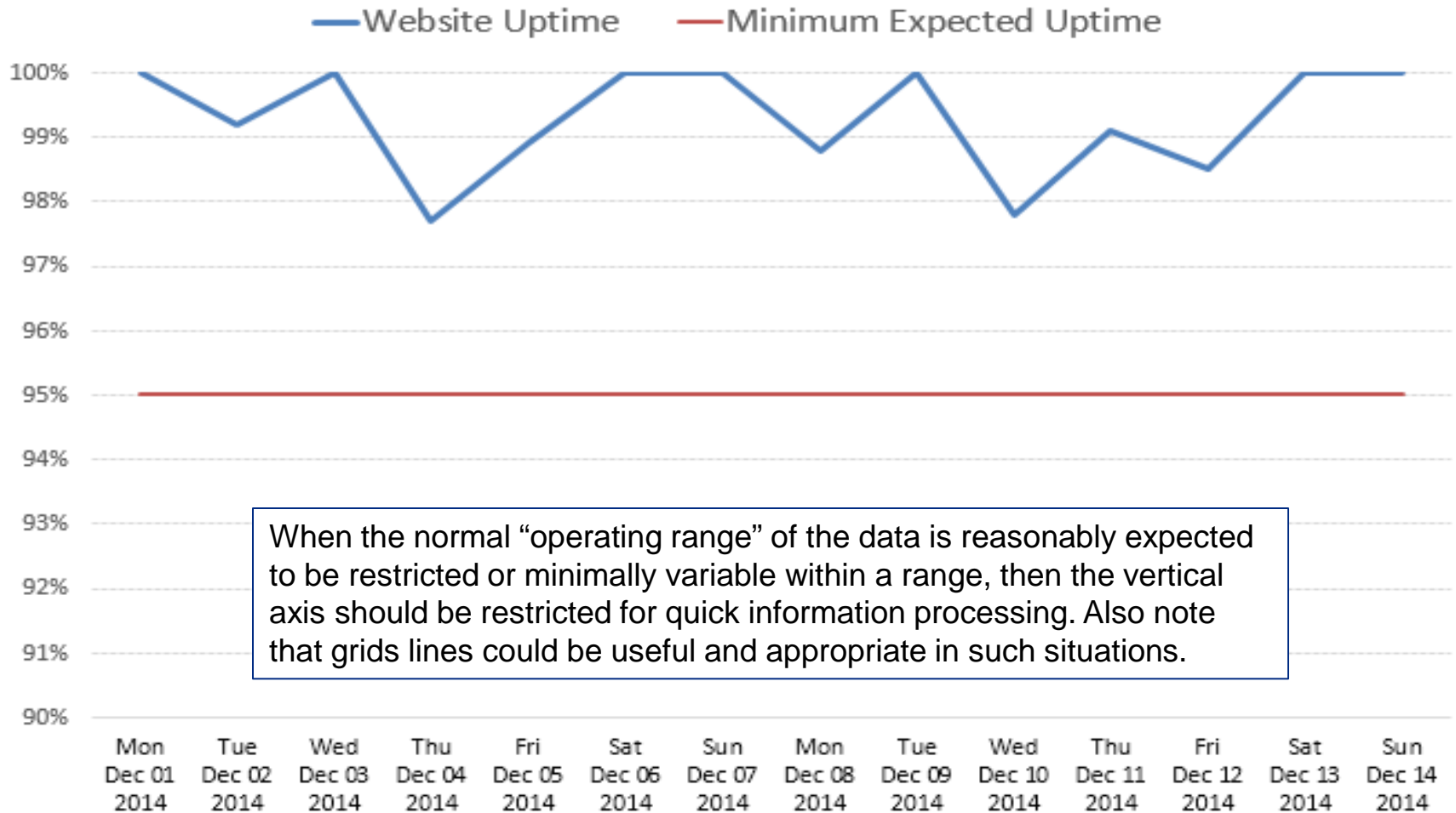
Principles, Tips, Preferred Practices

Percent of Workers Taking a Weeklong Vacation - US



Simple Line Chart – Vertical Axis Exception

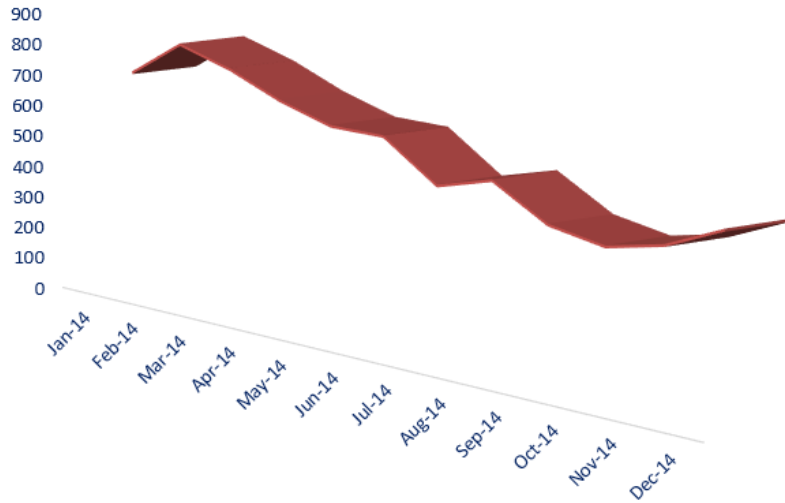
Percent of Each 24-Hour Period in Which the Project Website Was Online and Operating With No Errors



When the normal “operating range” of the data is reasonably expected to be restricted or minimally variable within a range, then the vertical axis should be restricted for quick information processing. Also note that grids lines could be useful and appropriate in such situations.

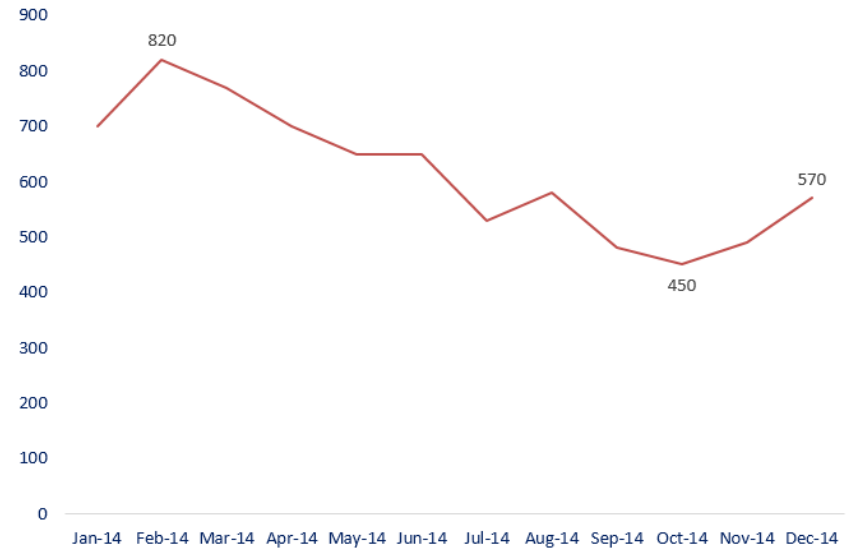
Simple Line Chart – 3-D

Client Intakes Statewide

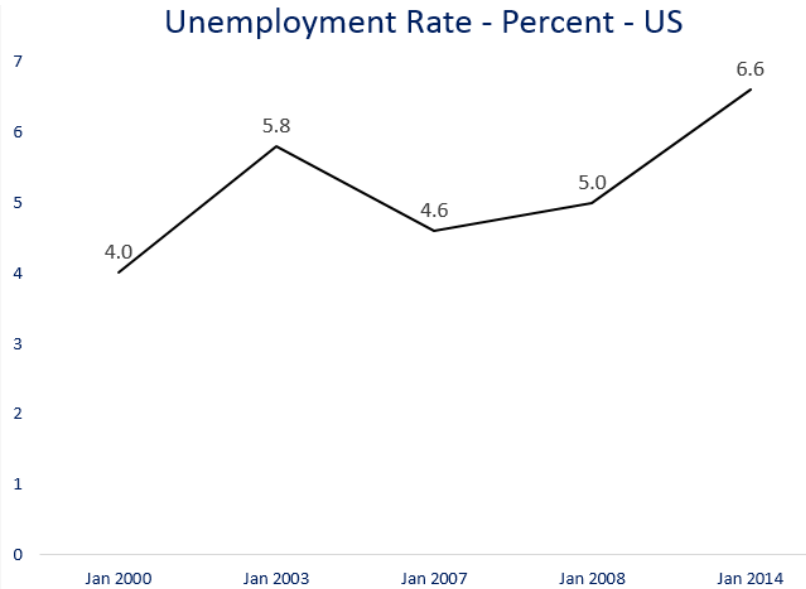


3-D generally not helpful.
In the 3-D ribbon to the left it is not immediately apparent that the Oct client intakes were down by almost half (45%) compared to the Feb peak.

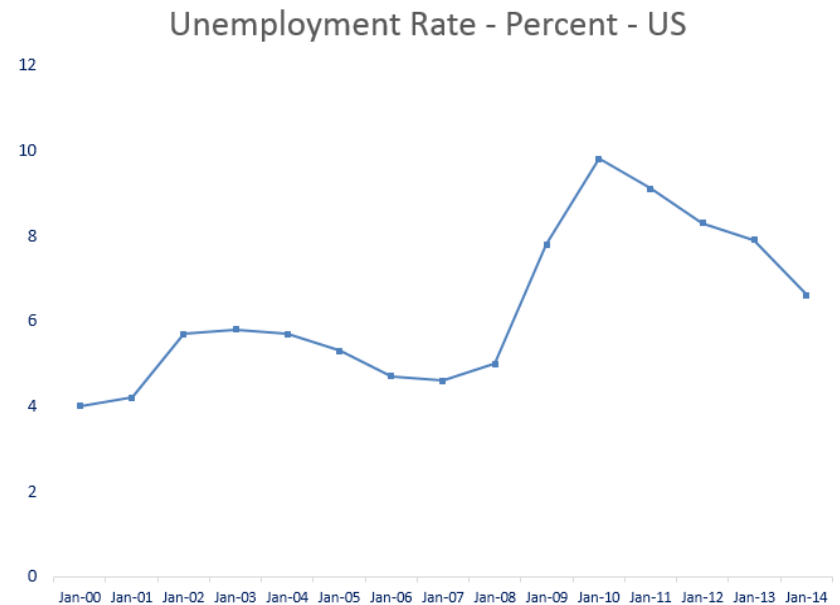
Client Intakes Statewide



Simple Line Chart – Unequal Horizontal Axis Increments



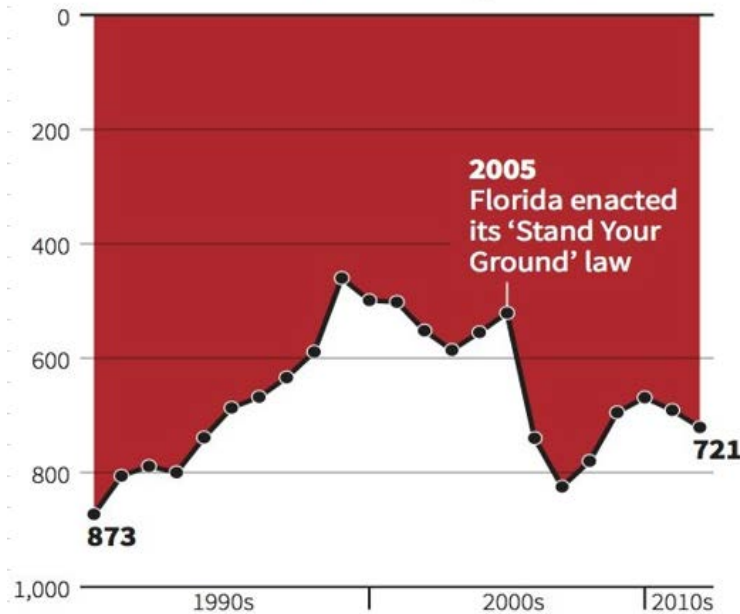
The unemployment trend to the left does not include all potential years in the series. And the gaps between the years are not equal. The resultant “line” creates an impression at odds with the full equidistant series below.



Simple Line Chart – Vertical Axis Zero Starts at Bottom

Gun deaths in Florida

Number of murders committed using firearms



Source: Florida Department of Law Enforcement

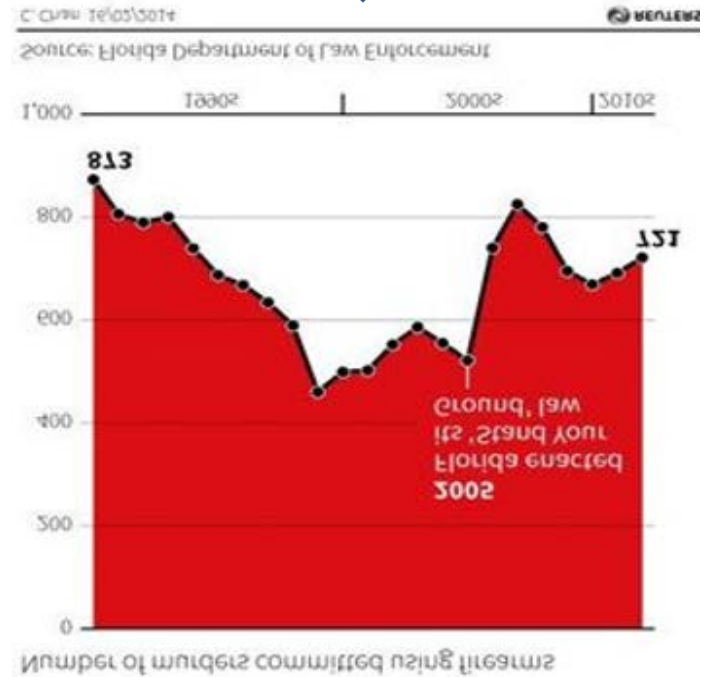
C. Chan 16/02/2014

REUTERS



Firearm murders seem to be down since FL enacted “Stand Your Ground”. But, FL/Reuters set the zero on the vertical axis at the top of the range.

When you flip the vertical axis zero back to the bottom of the scale, the graphical impression is quite different.



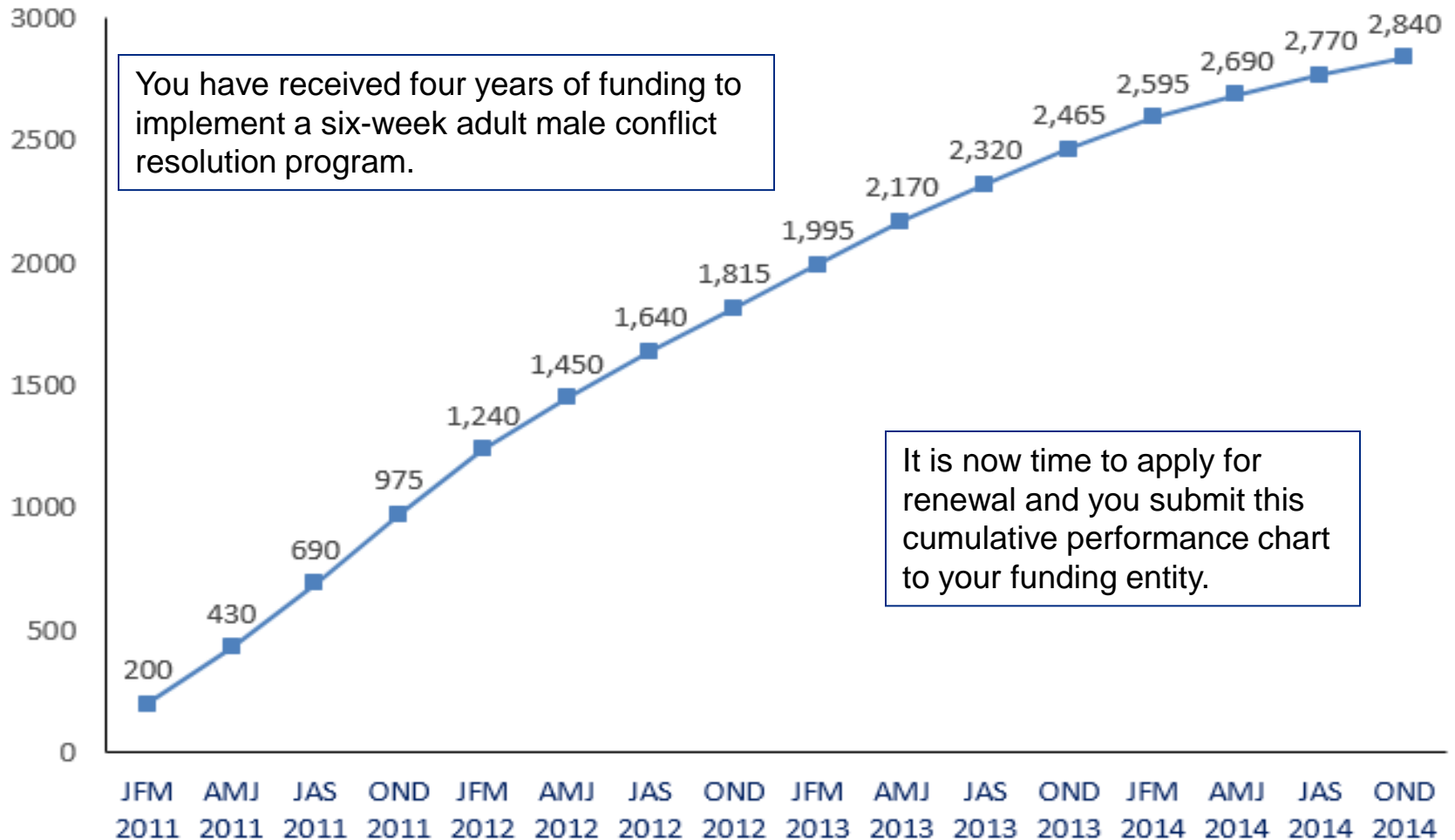
Gun deaths in Florida



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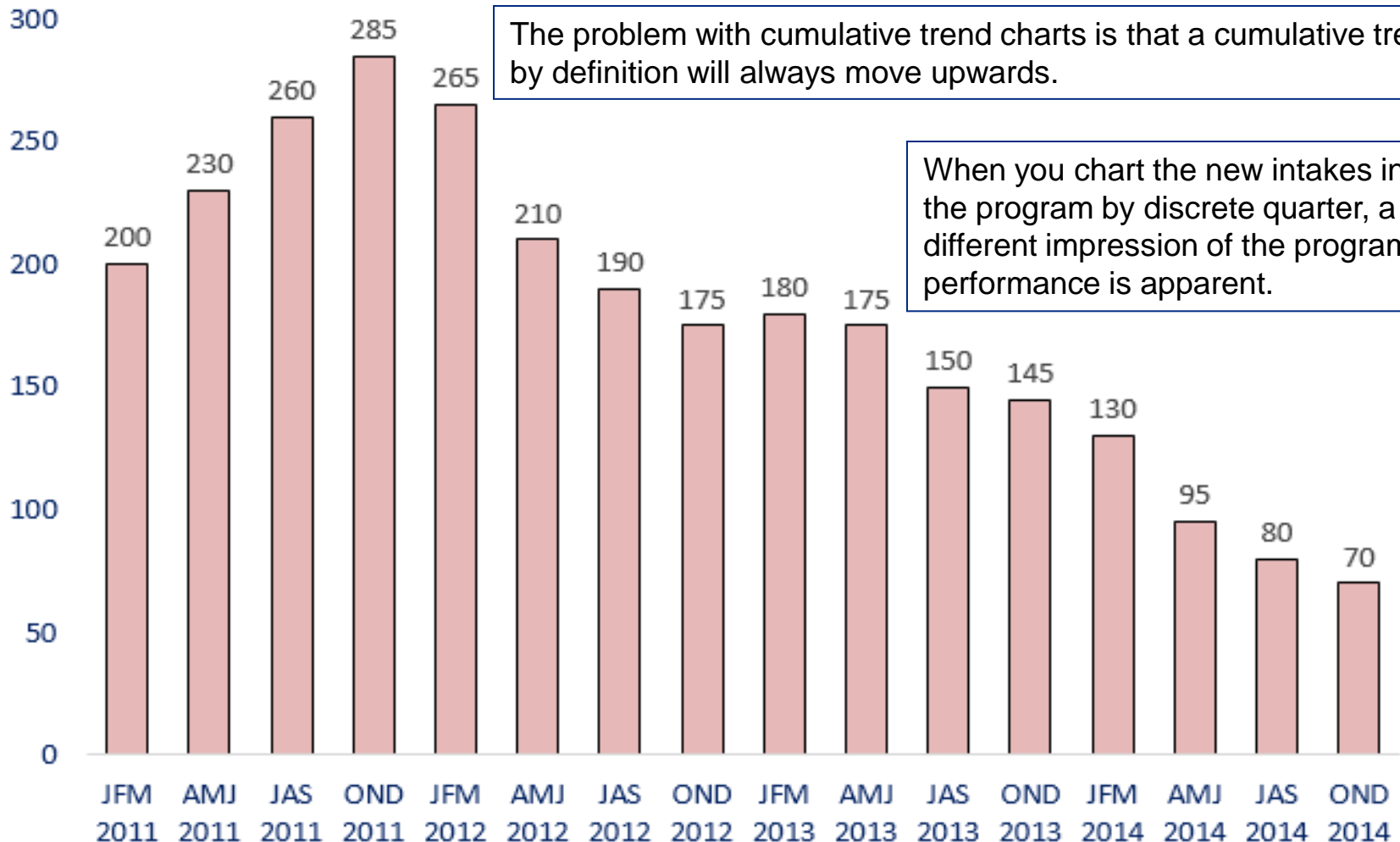
Simple Line Chart – Cumulative Trends

Cumulative Intakes - Adult Male Conflict Resolution Six-Week Program



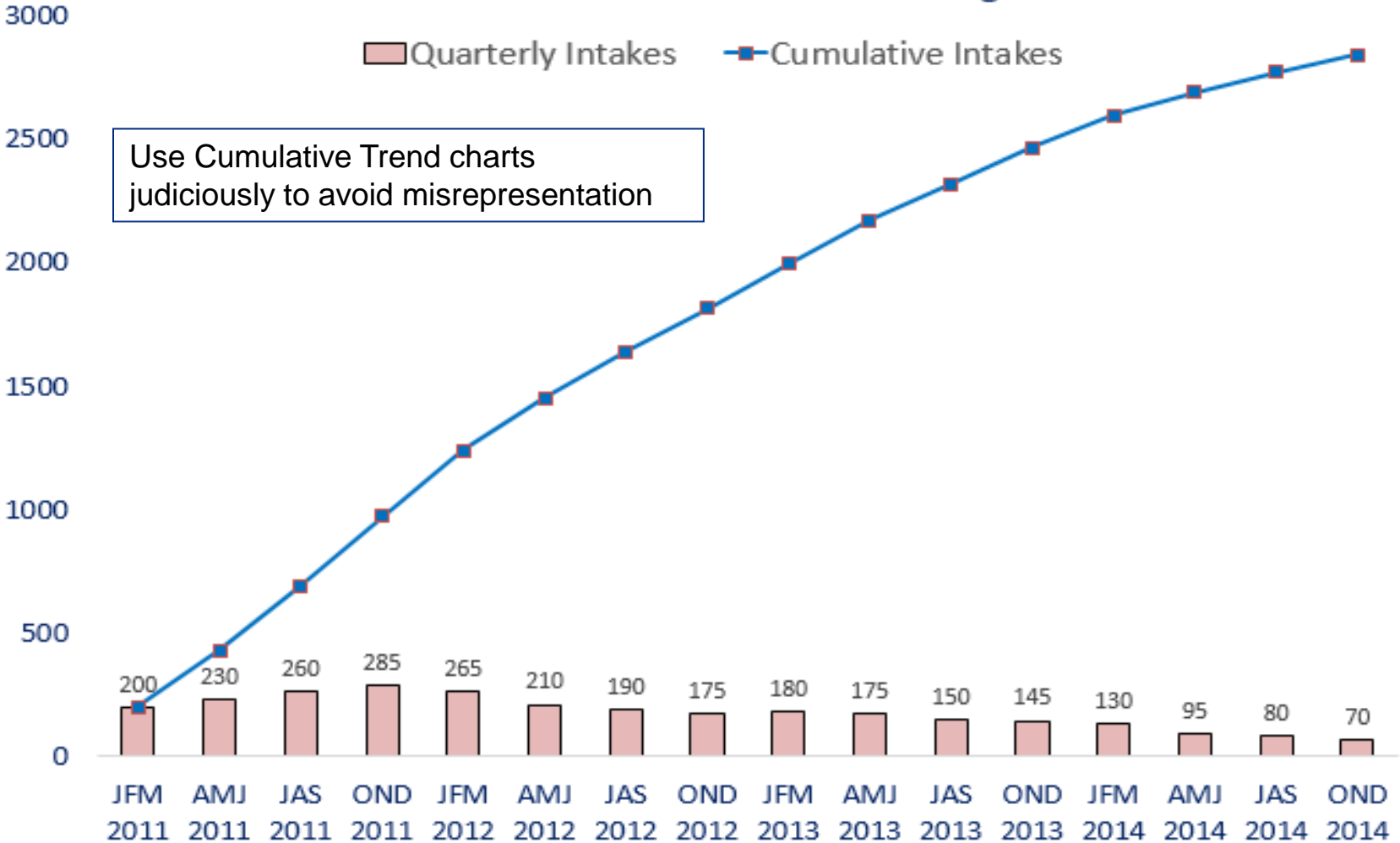
Simple Line Chart – Cumulative Trends

Client Intakes Per Quarter into the Six-Week Adult Male Conflict Resolution Program



Simple Line Chart – Cumulative Trends

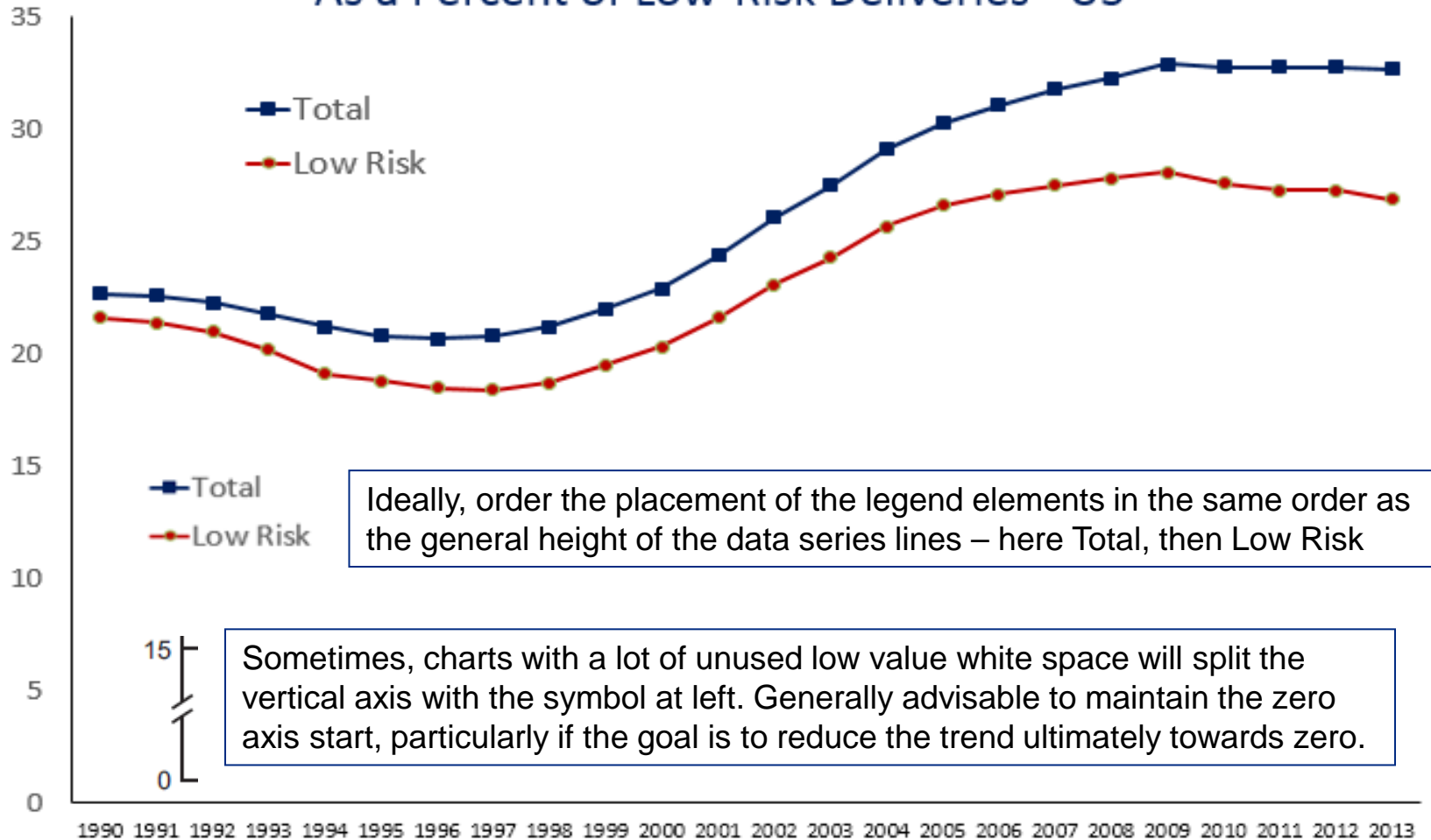
Quarterly Intakes vs Cumulative Intakes Adult Male Conflict Resolution Program



Use Cumulative Trend charts judiciously to avoid misrepresentation

Multiple Line Series Chart

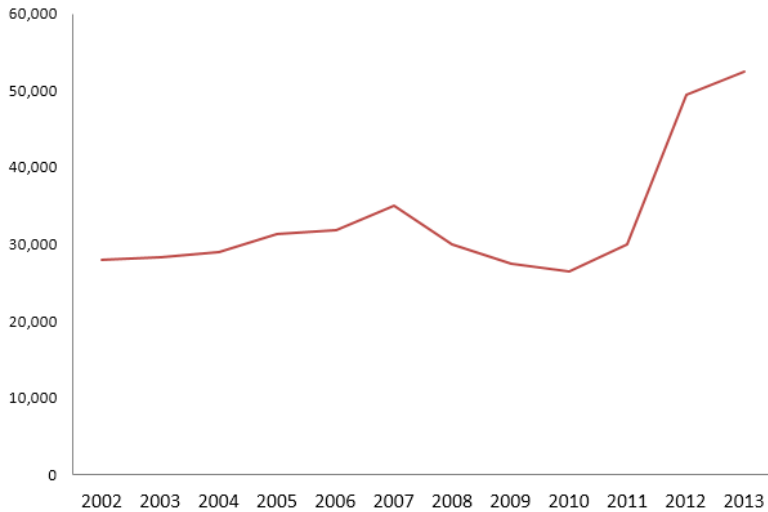
Cesarean as a Percent of Total Deliveries and As a Percent of Low-Risk Deliveries - US



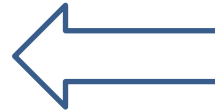
National effort to reduce medically unnecessary C-Sections – particularly for low-risk deliveries.

Multiple Line Series Chart – Data Investigation

Total Industrial Sand Production - Metric Tons - US



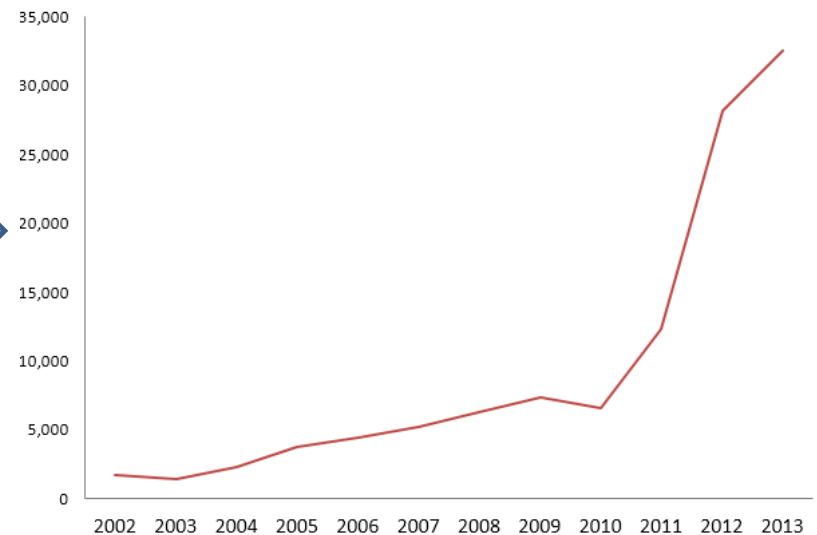
Why is Industrial Sand Production Up So Sharply Recently?



Dig deeper into the data.
Hydraulic Fracturing – “Fracking”

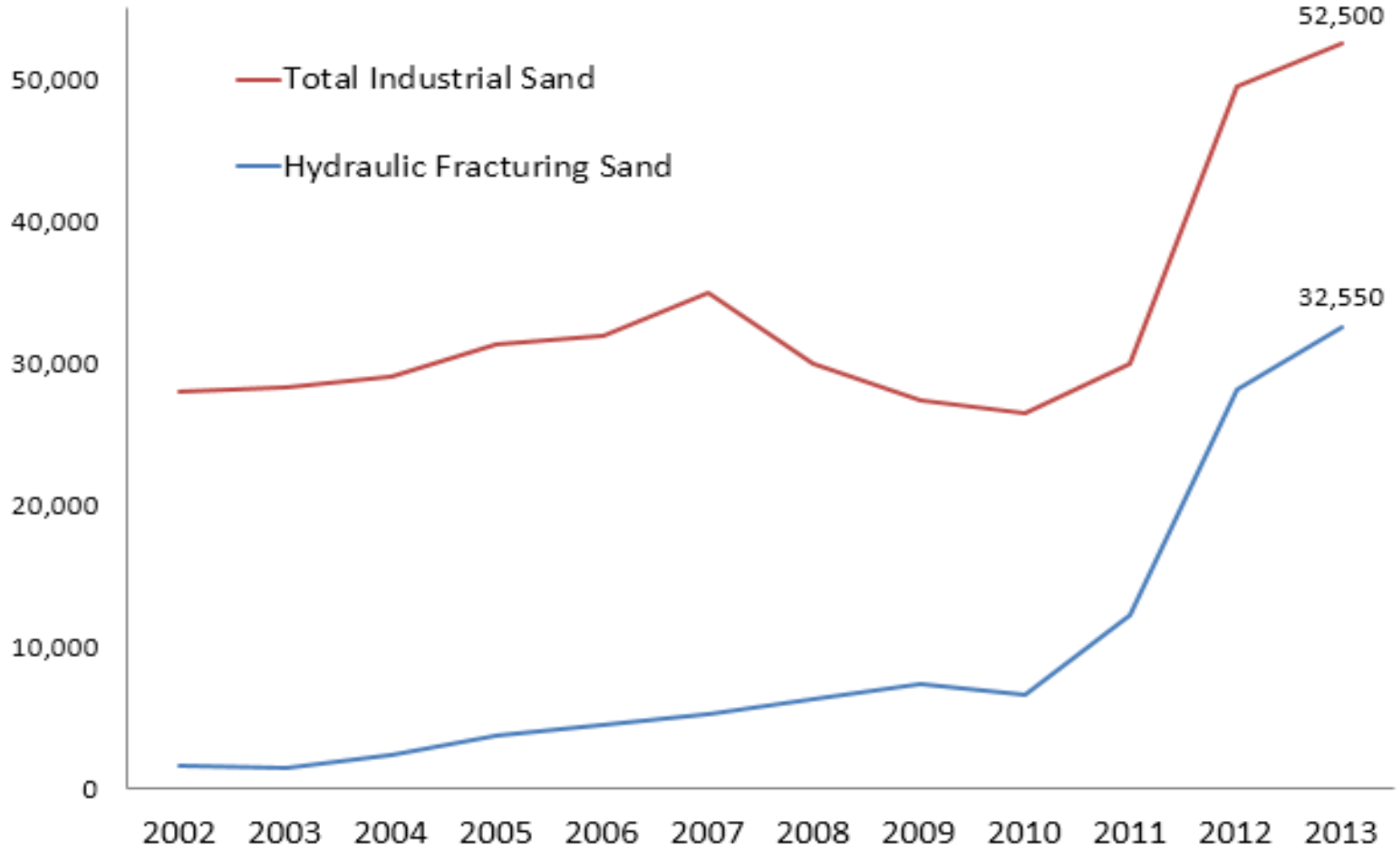


Hydraulic Fracturing Sand Production - Metric Tons - US



Multiple Line Series Chart – Data Investigation

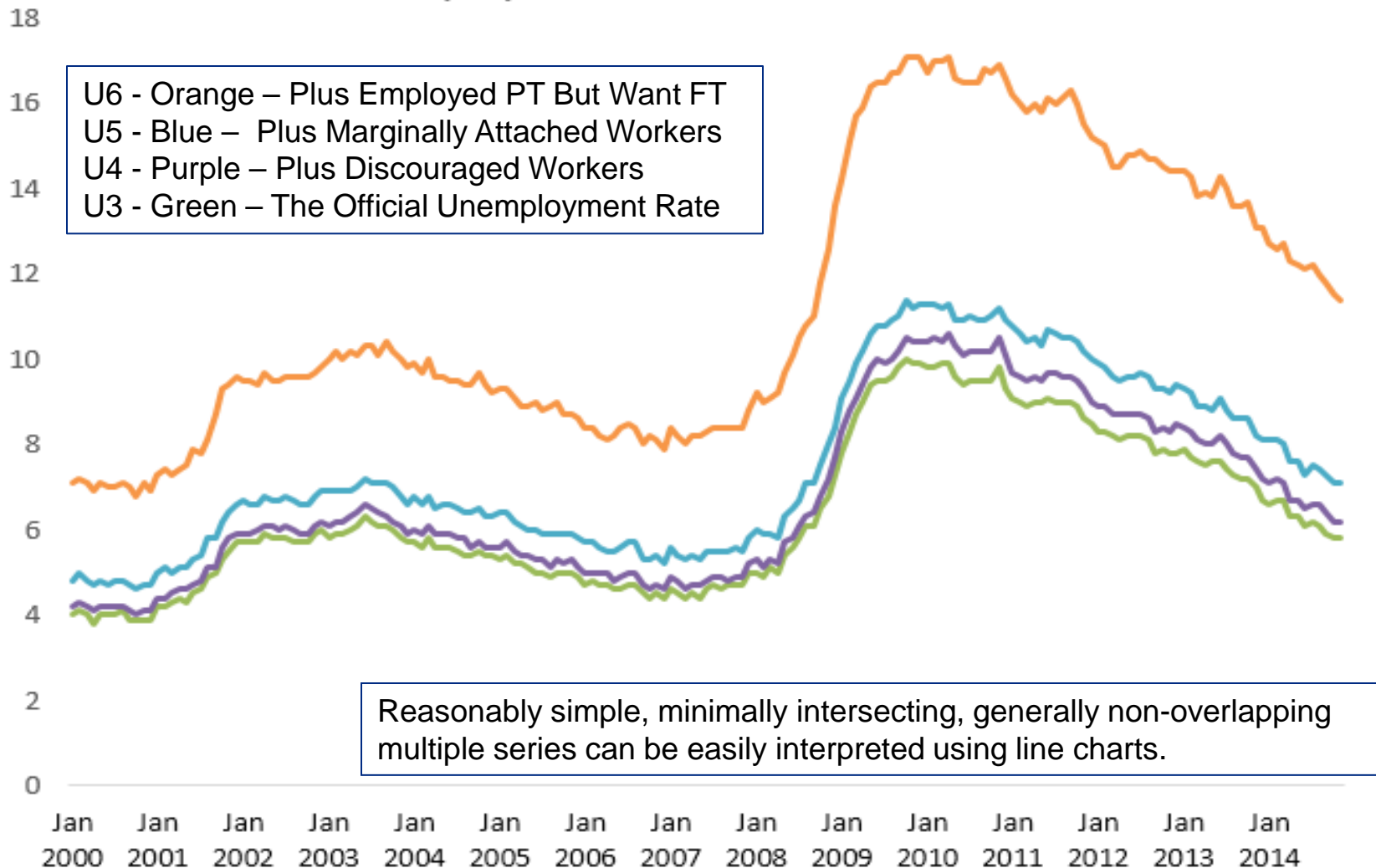
Industrial Sand Production - Metric Tons - US



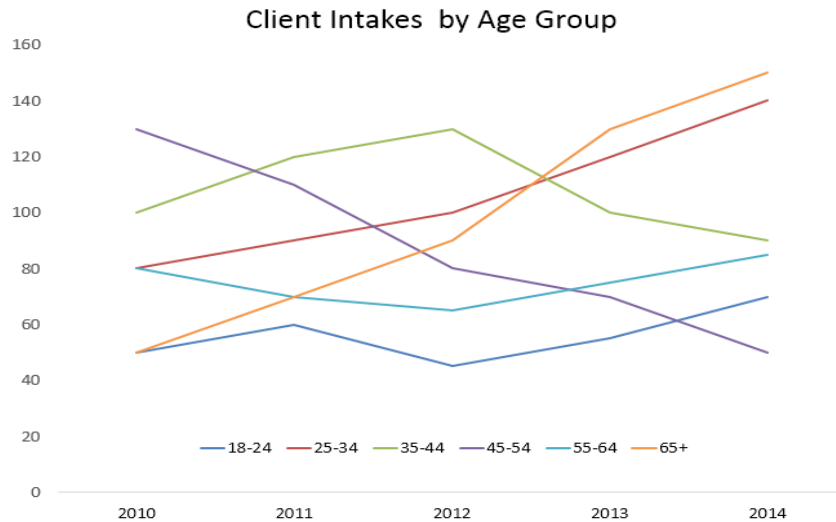
62% of All Industrial Sand Production Is Used for Fracking

Multiple Line Series Chart - Simple

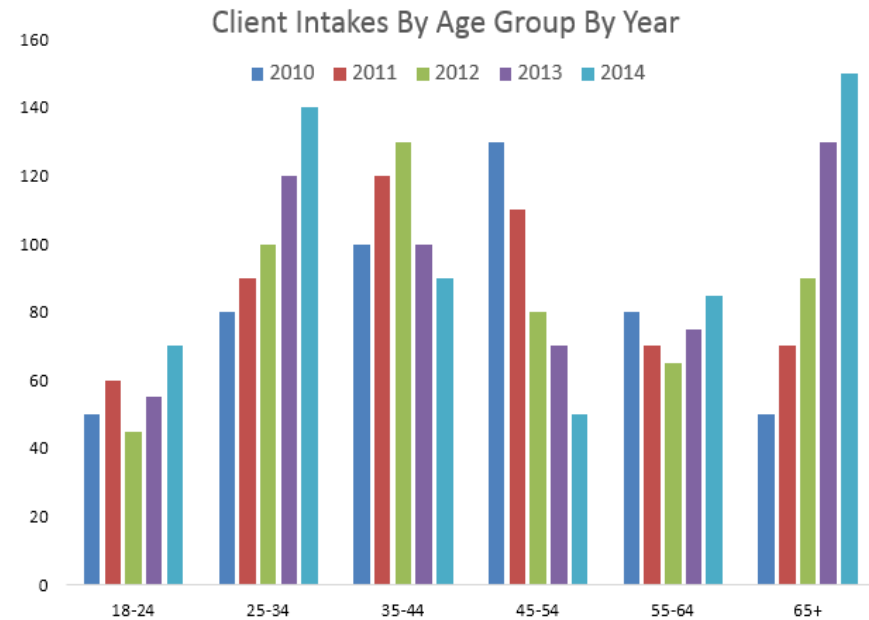
Official Unemployment Rate Plus Alternative Measures



Multiple Line Series Chart – Complex and Intersecting



For complex multiple line series charts where lines intersect at multiple points, consider instead clustered column charts or small multiple charts for clarity



Multiple Line Series Chart – Dual Vertical Axis

Number of Births to Women Age 15-19 and Birth Rate Women Age 15-19 - US

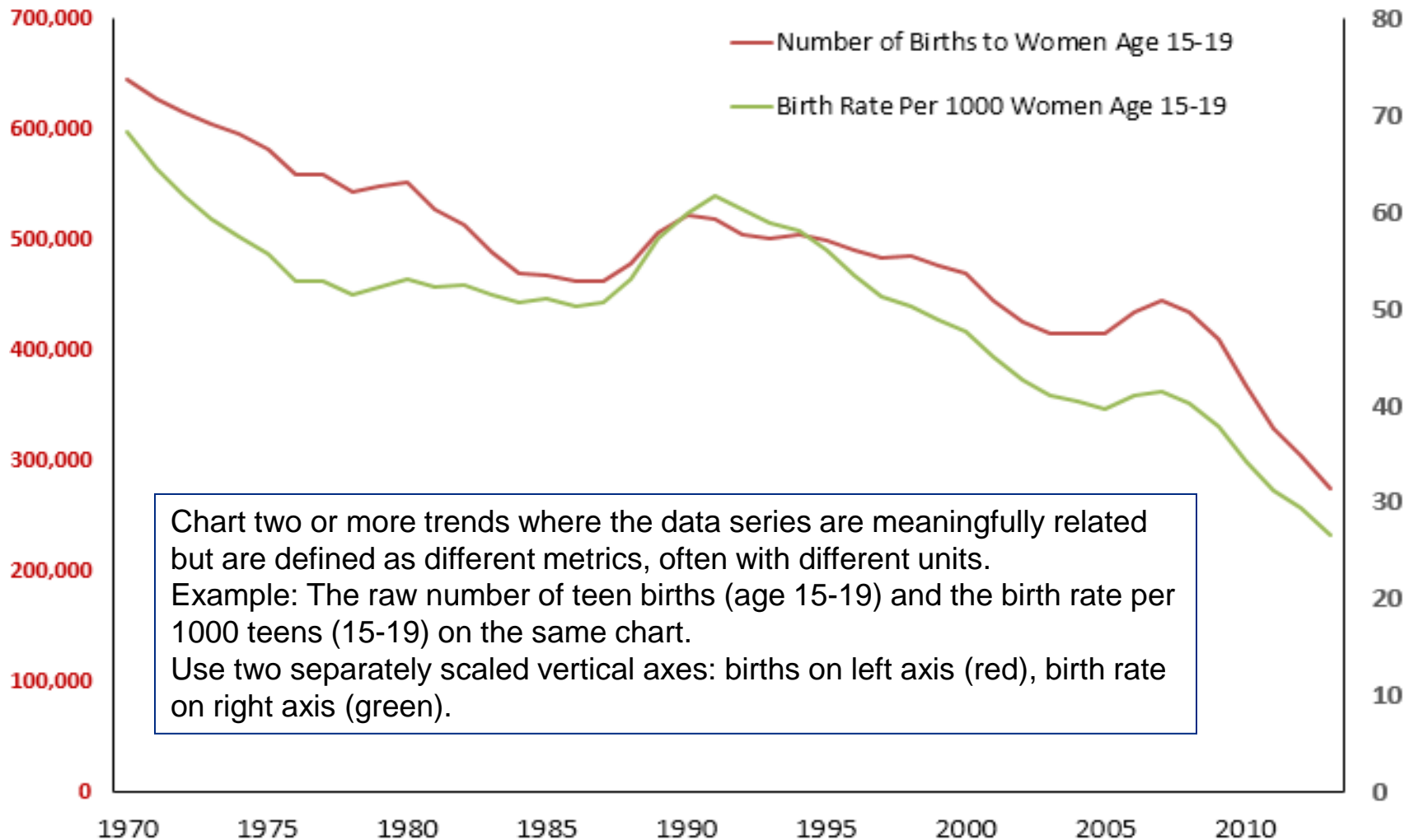


Chart two or more trends where the data series are meaningfully related but are defined as different metrics, often with different units.
Example: The raw number of teen births (age 15-19) and the birth rate per 1000 teens (15-19) on the same chart.
Use two separately scaled vertical axes: births on left axis (red), birth rate on right axis (green).

Multiple Line Series Chart – Dual Vertical Axis

Adult Obesity vs Atmospheric Carbon Dioxide

