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Effective Use of Area Charts

Purpose	This tool provides guidelines and tips on how to effectively use area charts to communicate research findings.
Format	This tool provides guidance on area charts and their purposes, shows examples of preferred practices and practical tips for area charts, and provides cautions and examples of misuse and poor use of area 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, Independent Living, 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.

Area Charts – Component Trends

- The primary use of Area Charts is to display components of trends over time (program participants by qualifying subgroup by year, trends in mortality rates over time by major causes of death) and the relative relationship of the component parts to each other and to the overall trend.
- The key feature of Area Charts is that the relative part-to-whole magnitude of a trend component is represented by color-shaded areas under a line or between other component boundary lines.
- The Time unit (years, quarters, months) is distributed evenly along the horizontal axis.
- Area charts varieties include Non-Stacked Area charts, Numeric Stacked Area Charts, and Distribution Stacked Area Charts.

Overview and Organization

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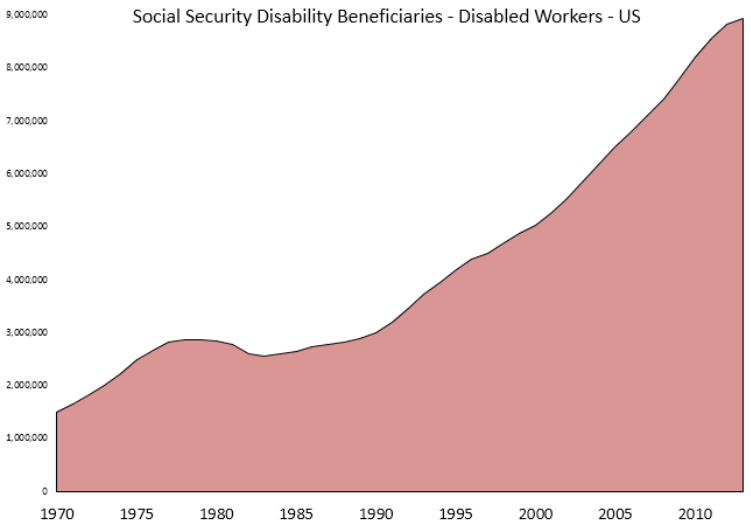
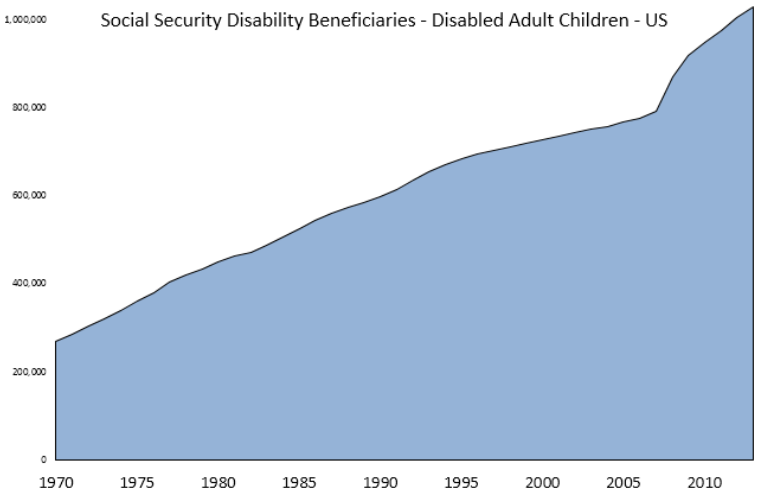
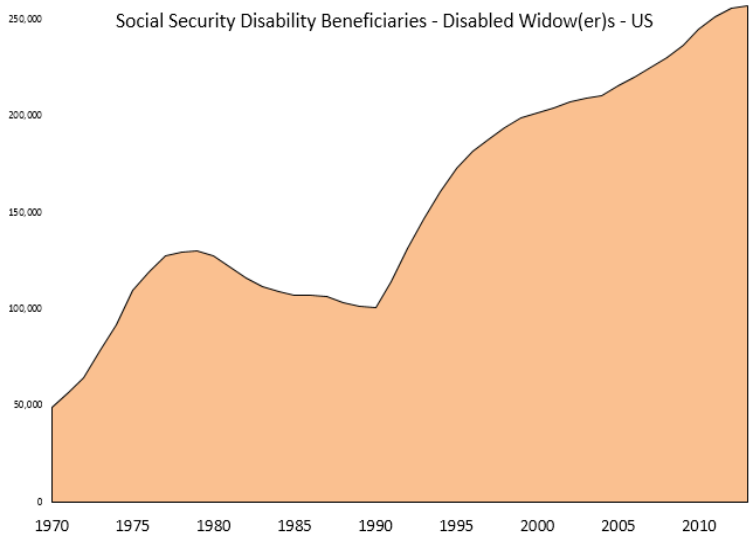
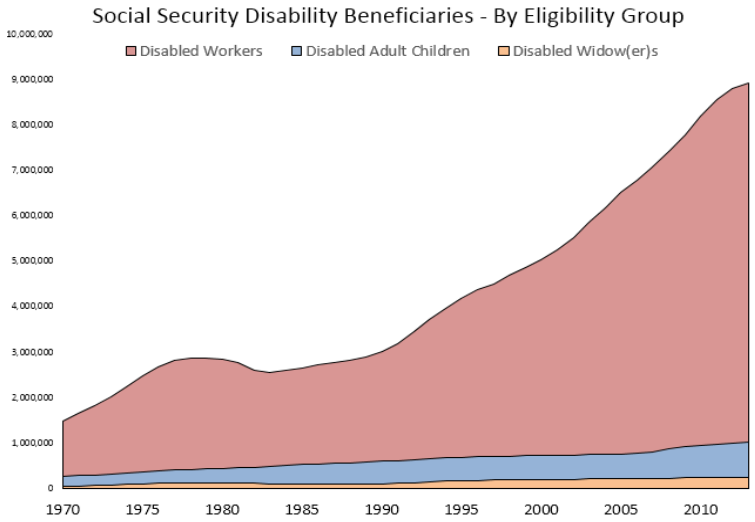
Stacked Area Charts – Component Trends

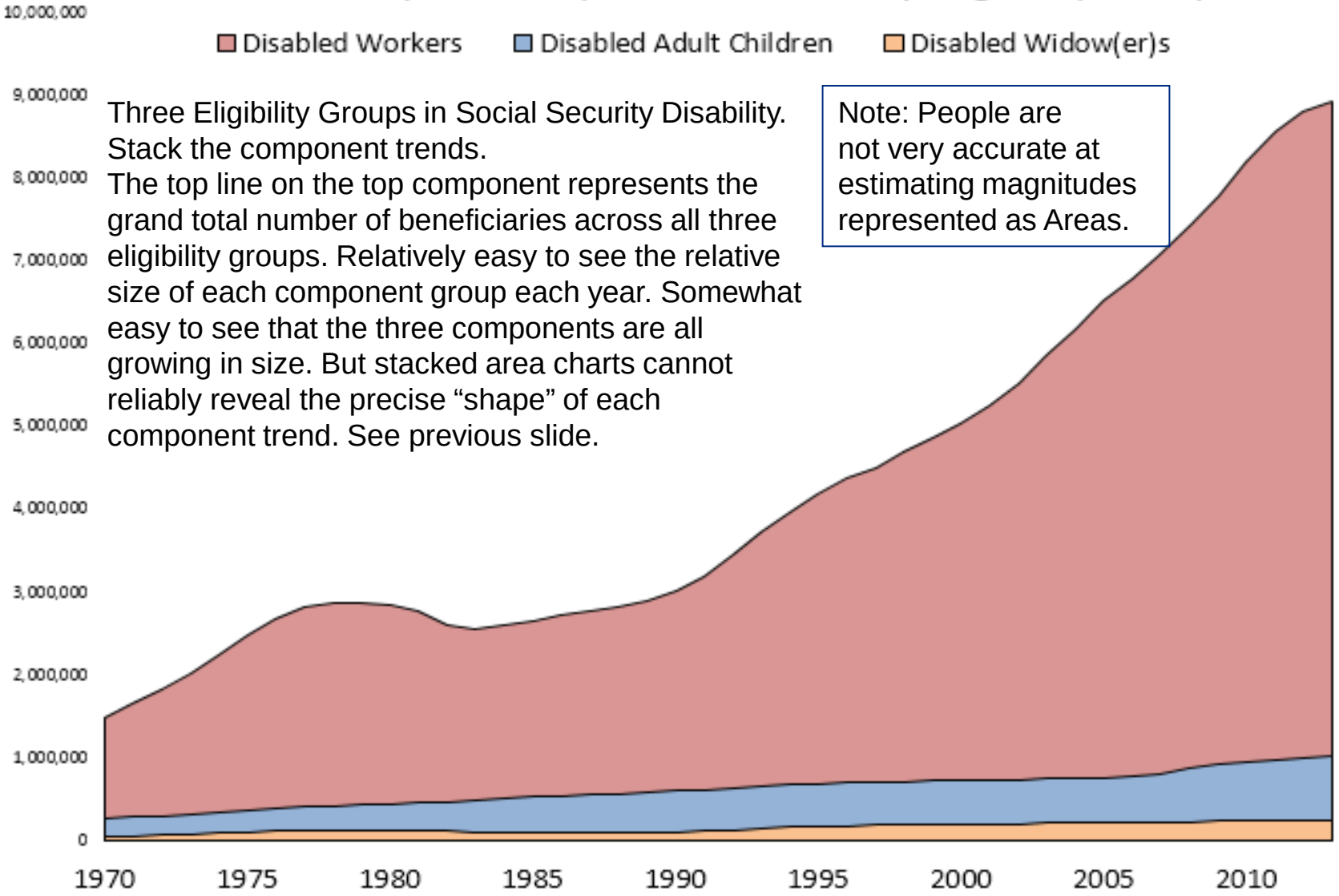








Stacked Area Charts – Component Trends

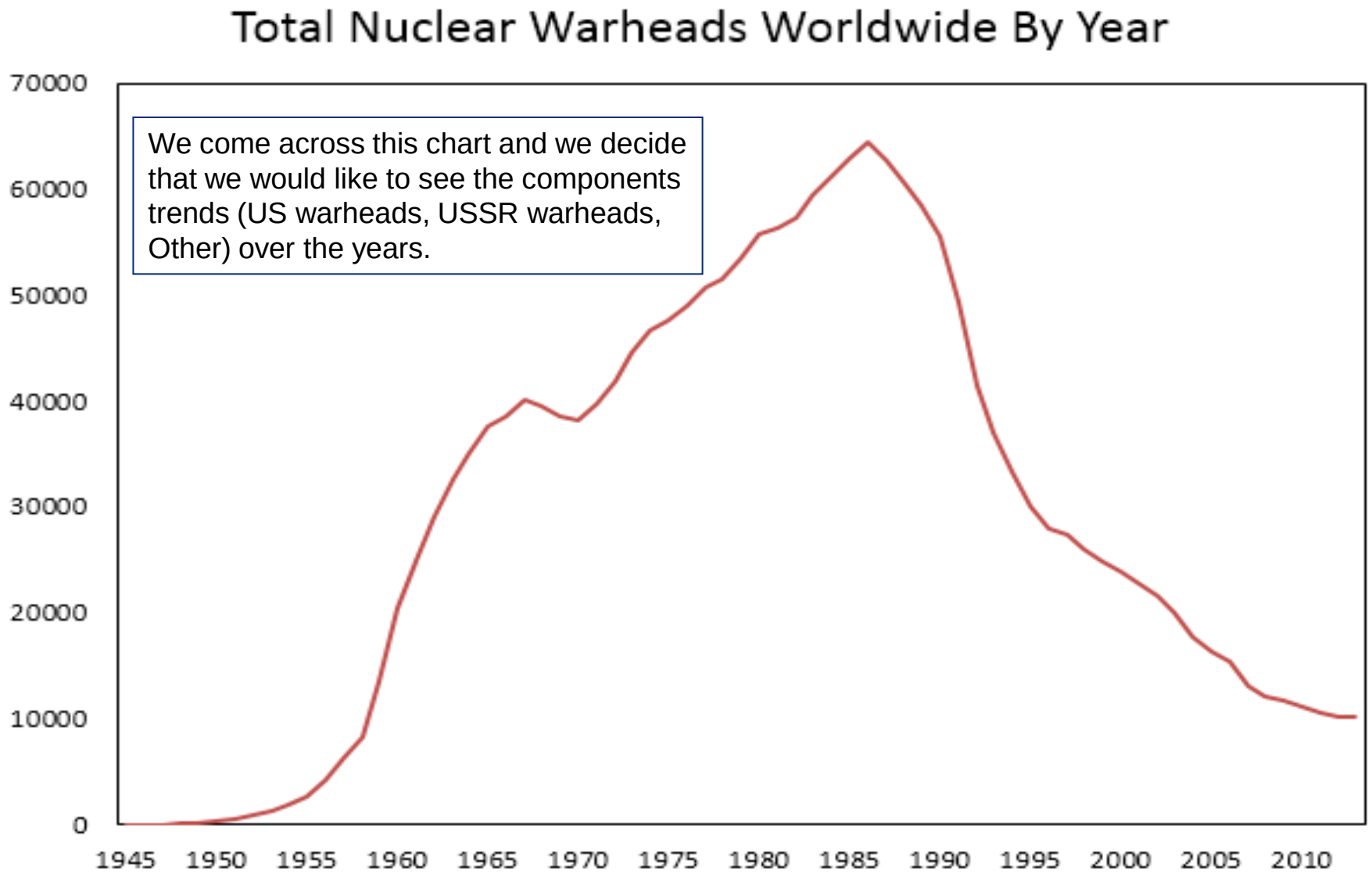


Three Eligibility Groups in Social Security Disability. Stack the component trends.
The top line on the top component represents the grand total number of beneficiaries across all three eligibility groups. Relatively easy to see the relative size of each component group each year. Somewhat easy to see that the three components are all growing in size. But stacked area charts cannot reliably reveal the precise "shape" of each component trend. See previous slide.

Note: People are not very accurate at estimating magnitudes represented as Areas.

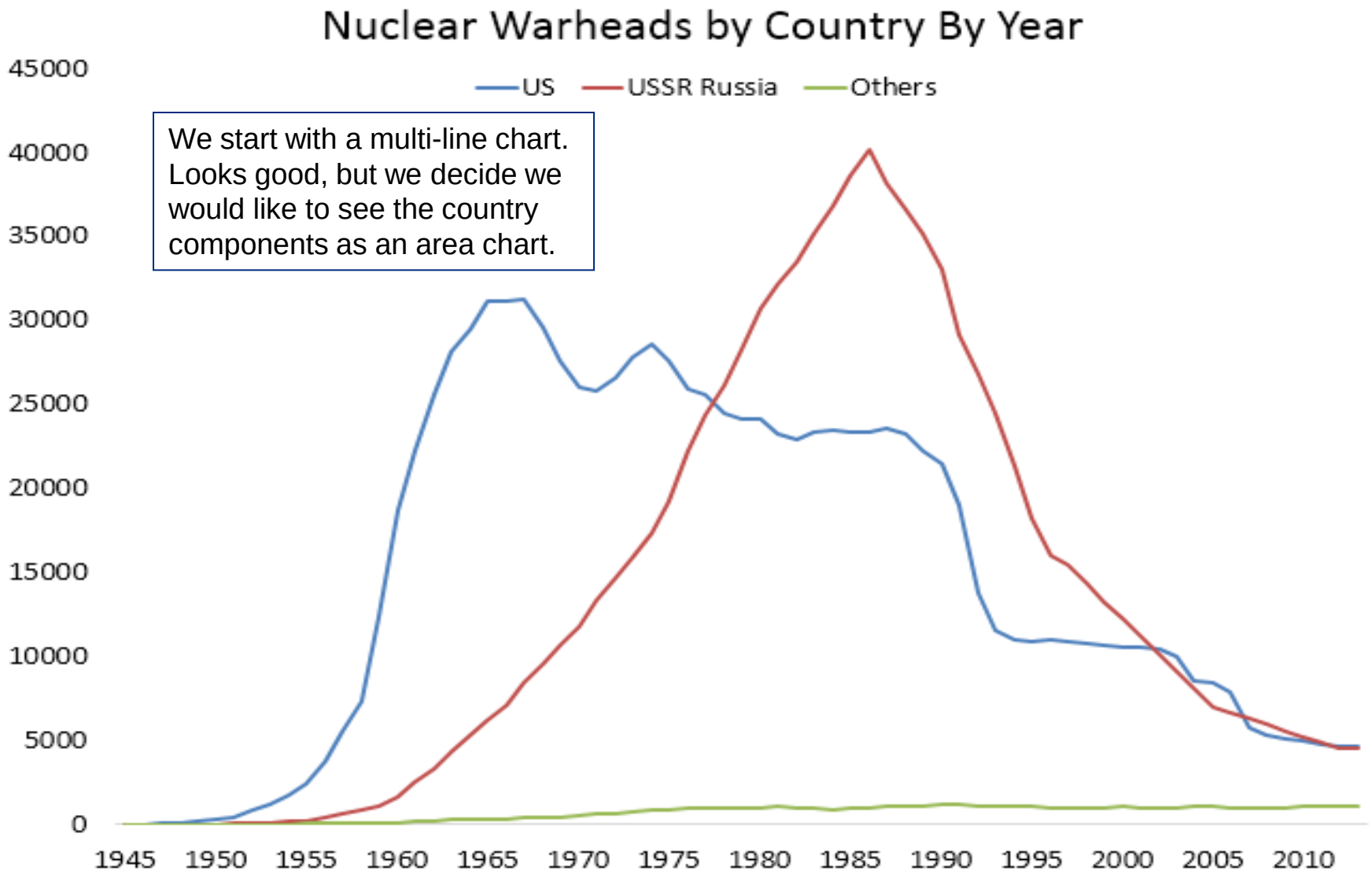
Source: Social Security Disability

Area Charts – Component Trends



Source: Bulletin of the Atomic Scientists

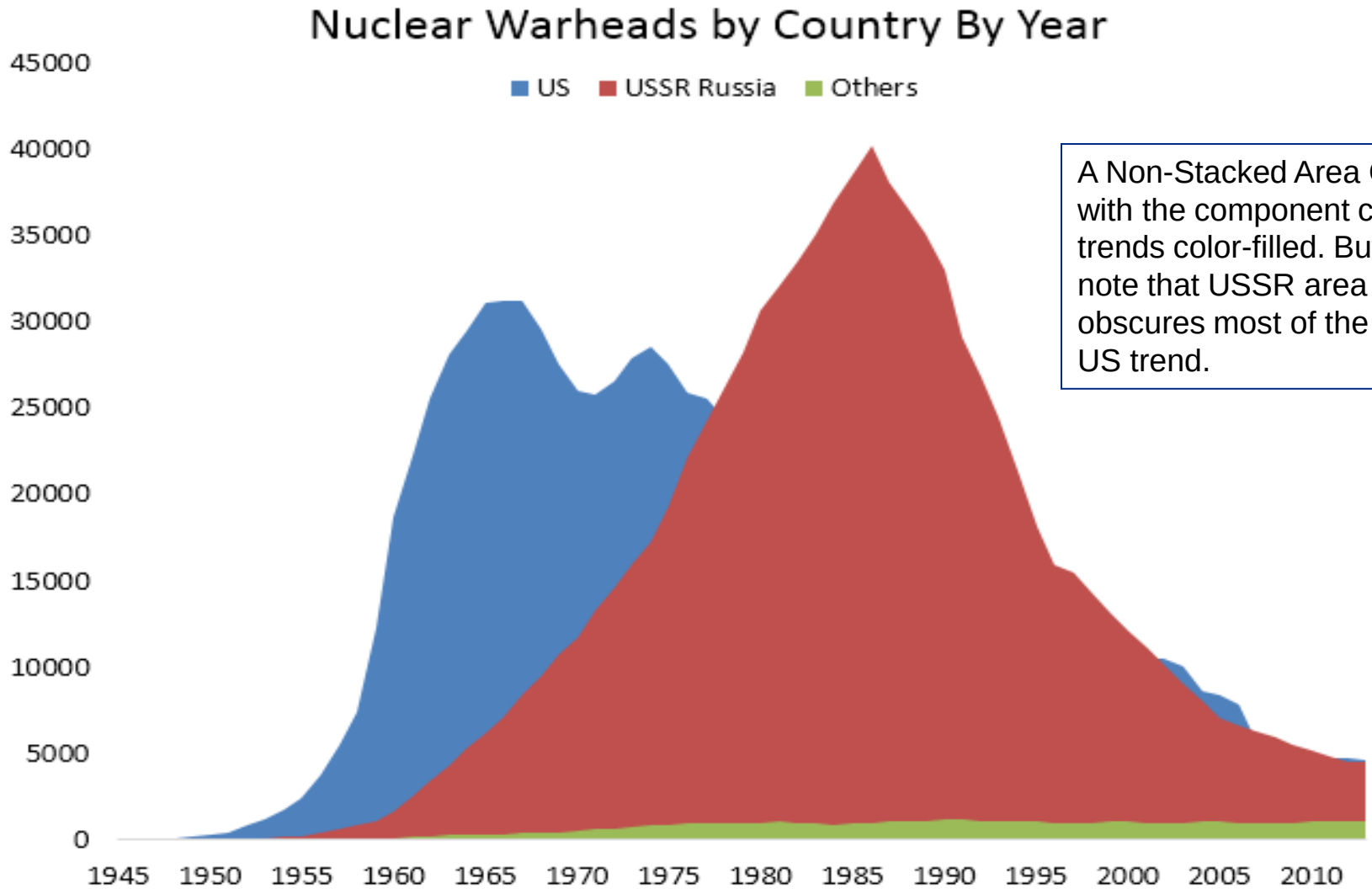
Area Charts – Component Trends



We start with a multi-line chart. Looks good, but we decide we would like to see the country components as an area chart.

Source: Bulletin of the Atomic Scientists
Other = France, China, UK, Pakistan, India, Israel

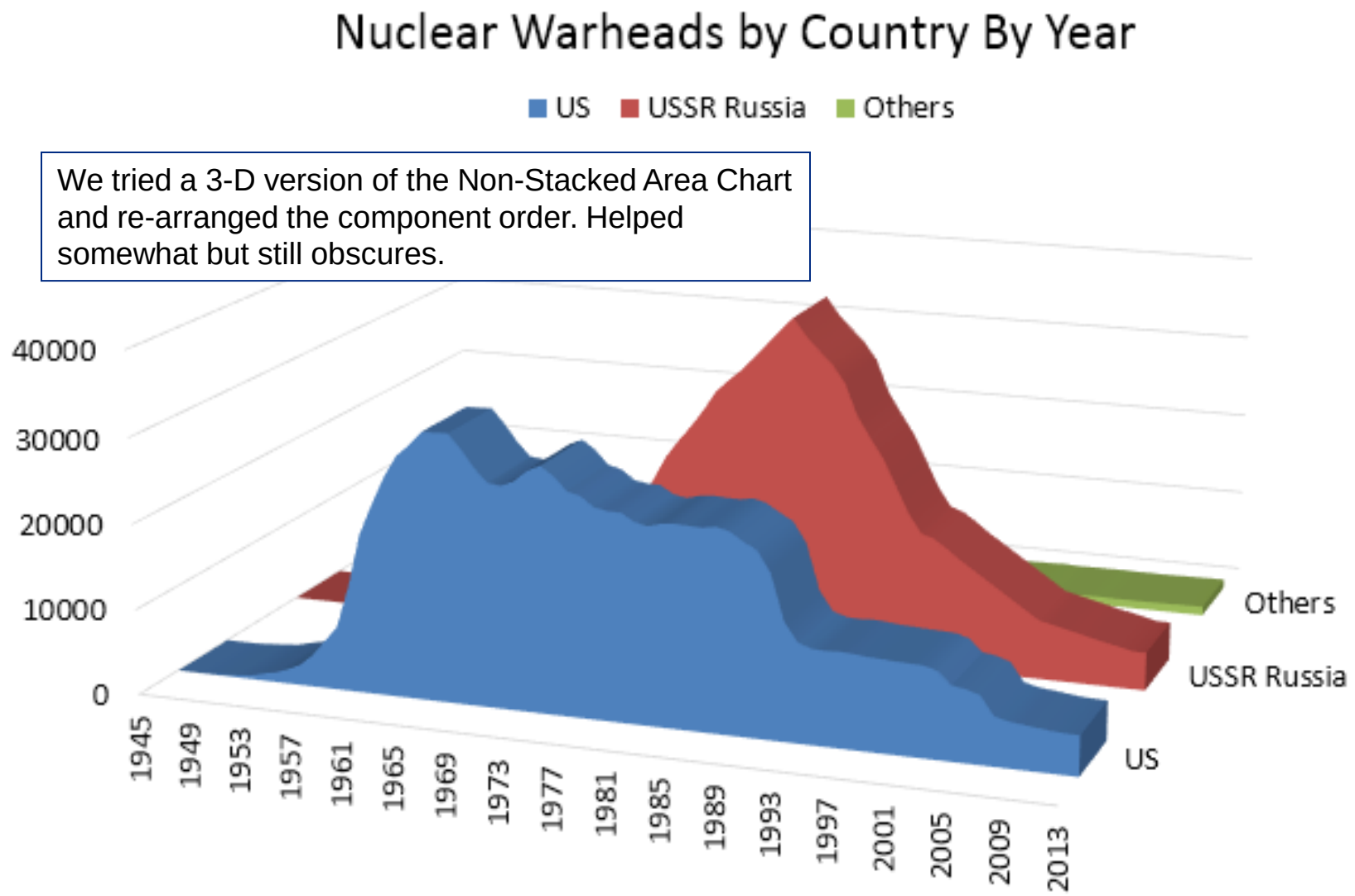
Area Charts – Non-Stacked Area Chart



A Non-Stacked Area Chart with the component county trends color-filled. But also note that USSR area obscures most of the later US trend.

Source: Bulletin of the Atomic Scientists

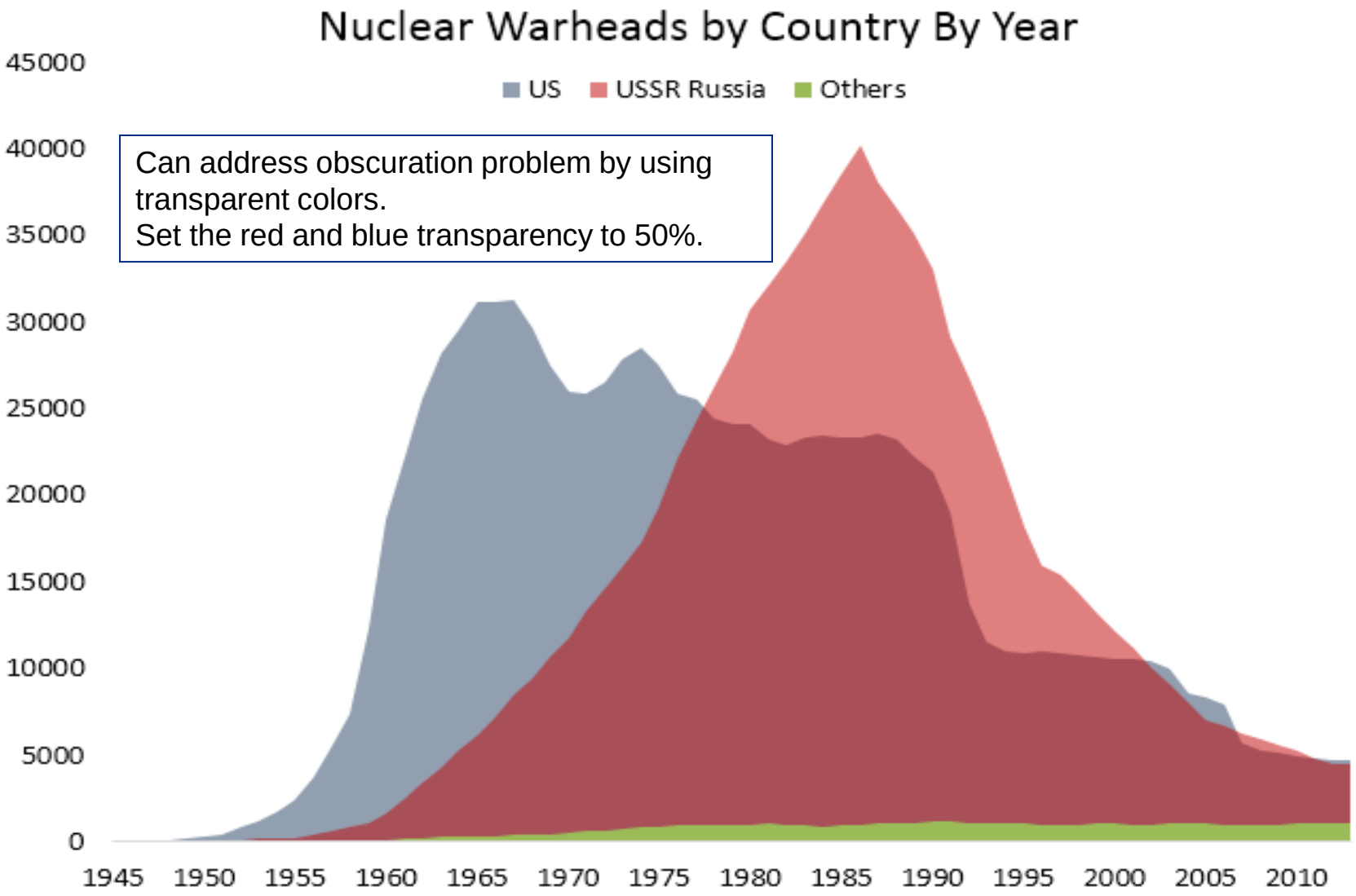
Area Charts – Non-Stacked Area Chart



We tried a 3-D version of the Non-Stacked Area Chart and re-arranged the component order. Helped somewhat but still obscures.

Source: Bulletin of the Atomic Scientists

Area Charts – Non-Stacked Area Chart



Can address obscuration problem by using transparent colors.
Set the red and blue transparency to 50%.

Transparency works for a few components - but becomes a messy blur of complex shades when you have five or more overlapping components trends

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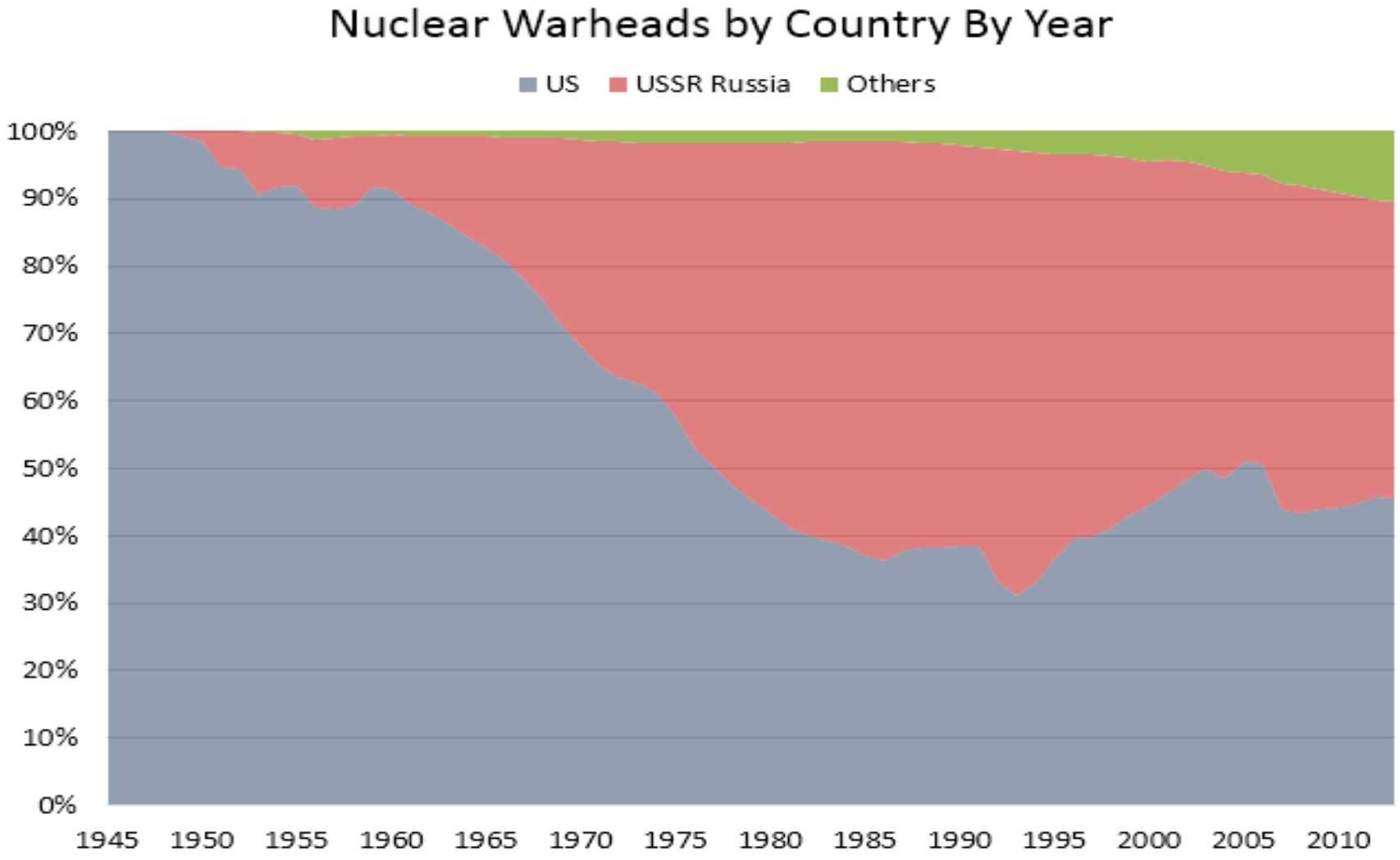
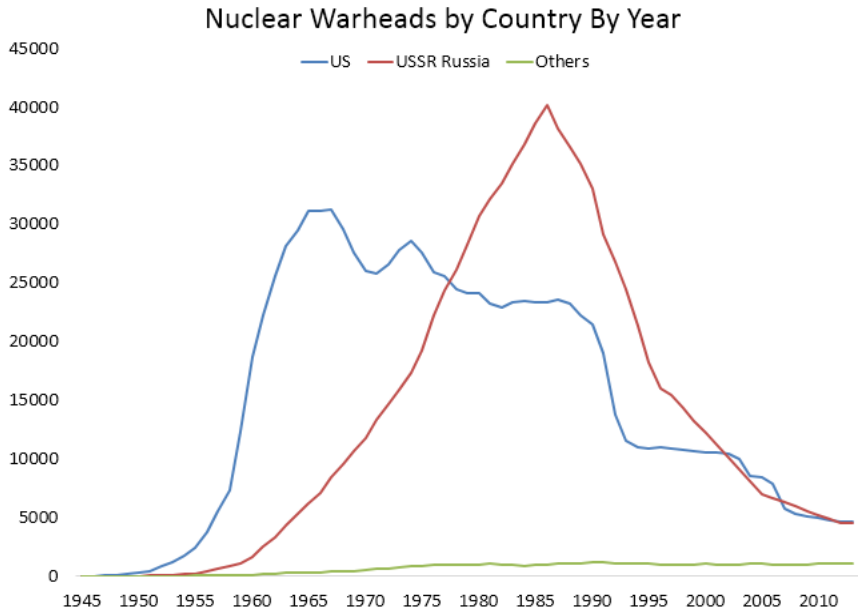
Area Charts – Distribution Stacked Area Chart

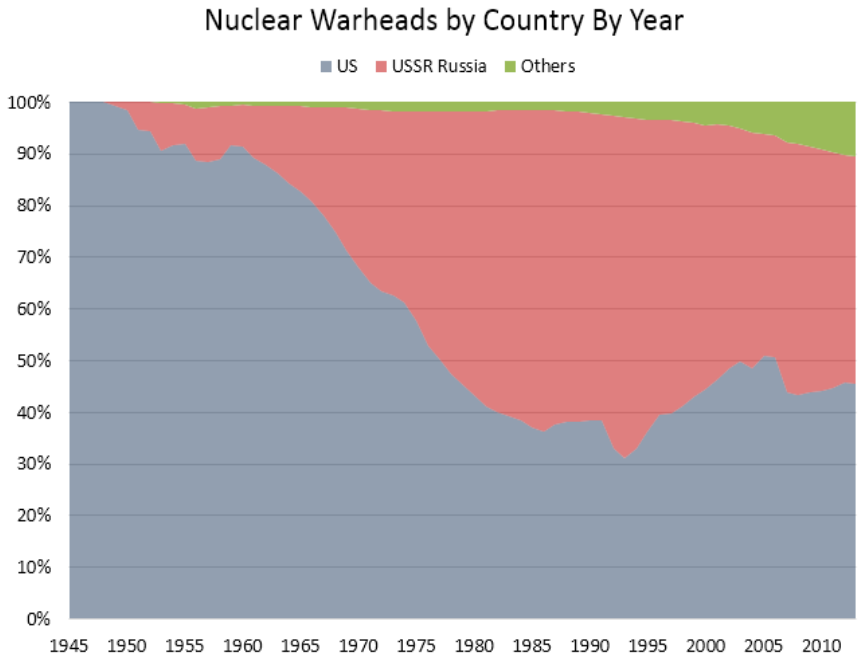


Could create a Distribution Stacked Area Chart. Each country's proportion of total worldwide nuclear warheads over time. In this chart it is more obvious that Other countries now control 11% of world's nuclear warheads.

Line Charts vs Area Charts

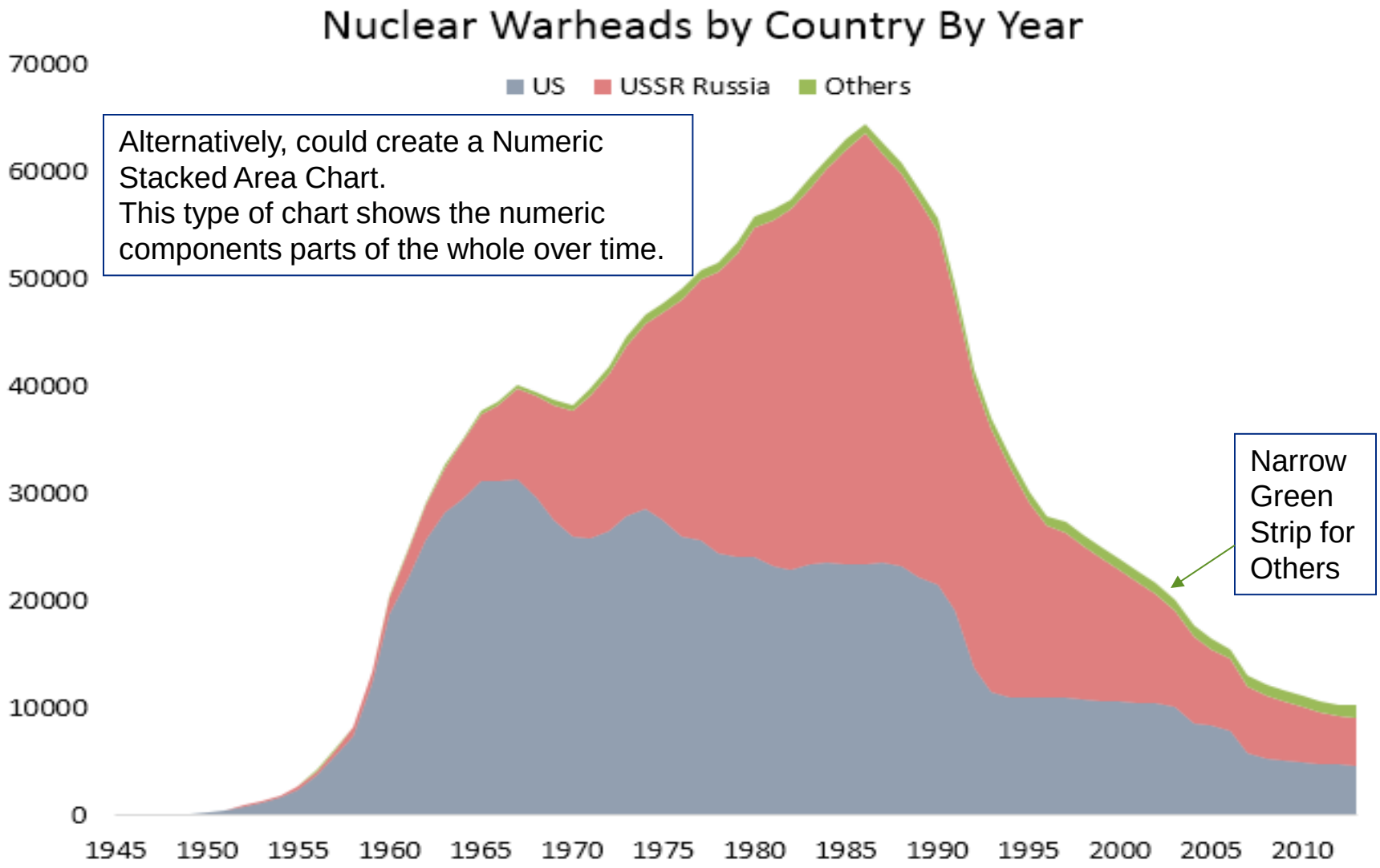
If your primary purpose is to display the magnitude of components over time or to compare the performance of various subgroups), the simple Line Chart communicates such quicker and more reliably.





If your primary focus is to illustrate the relative contribution of components to an overall trend, then a Distribution Area Chart would be useful.

Area Charts – Numeric Stacked Area Chart

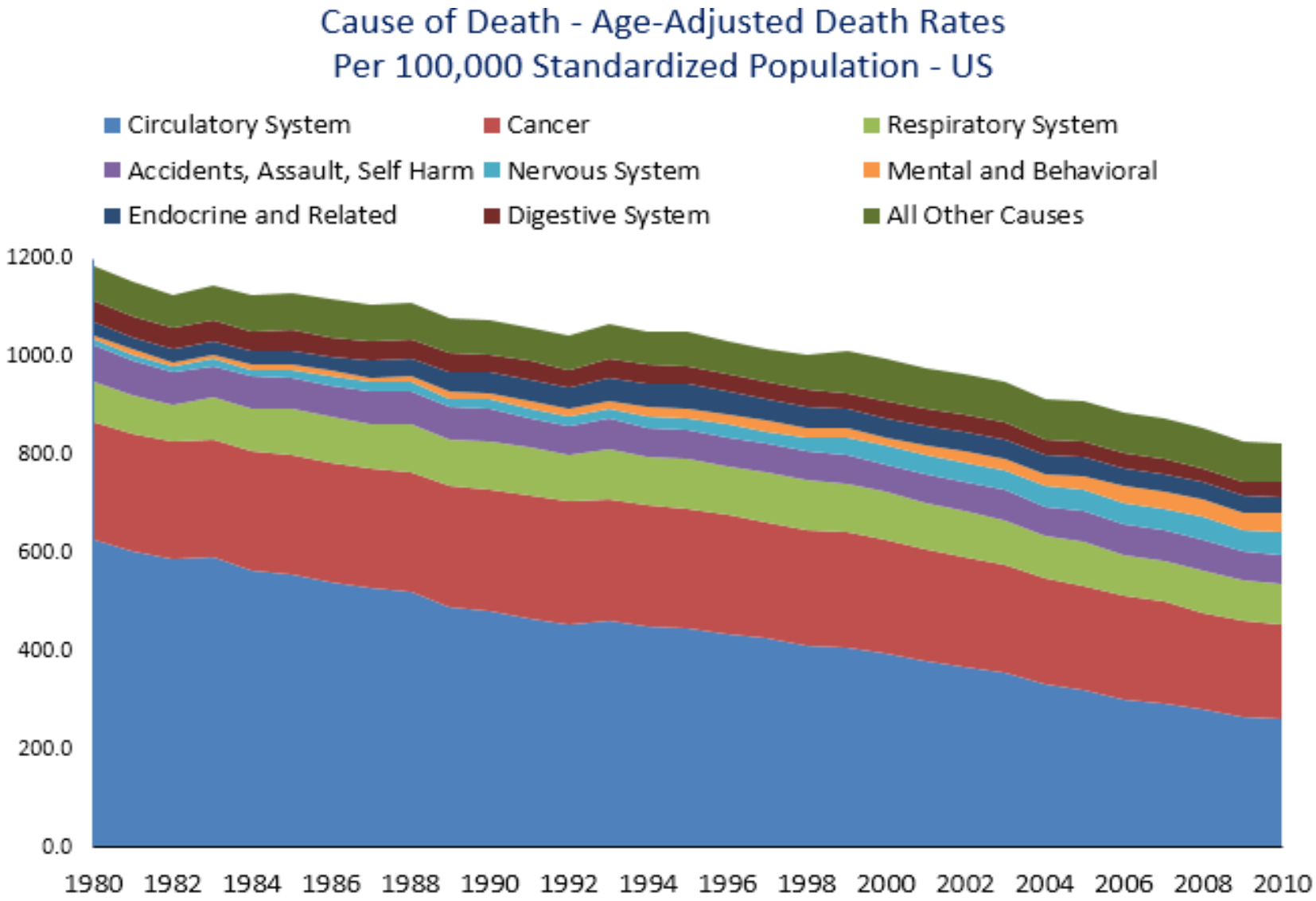


Alternatively, could create a Numeric Stacked Area Chart.
This type of chart shows the numeric components parts of the whole over time.

Narrow Green Strip for Others

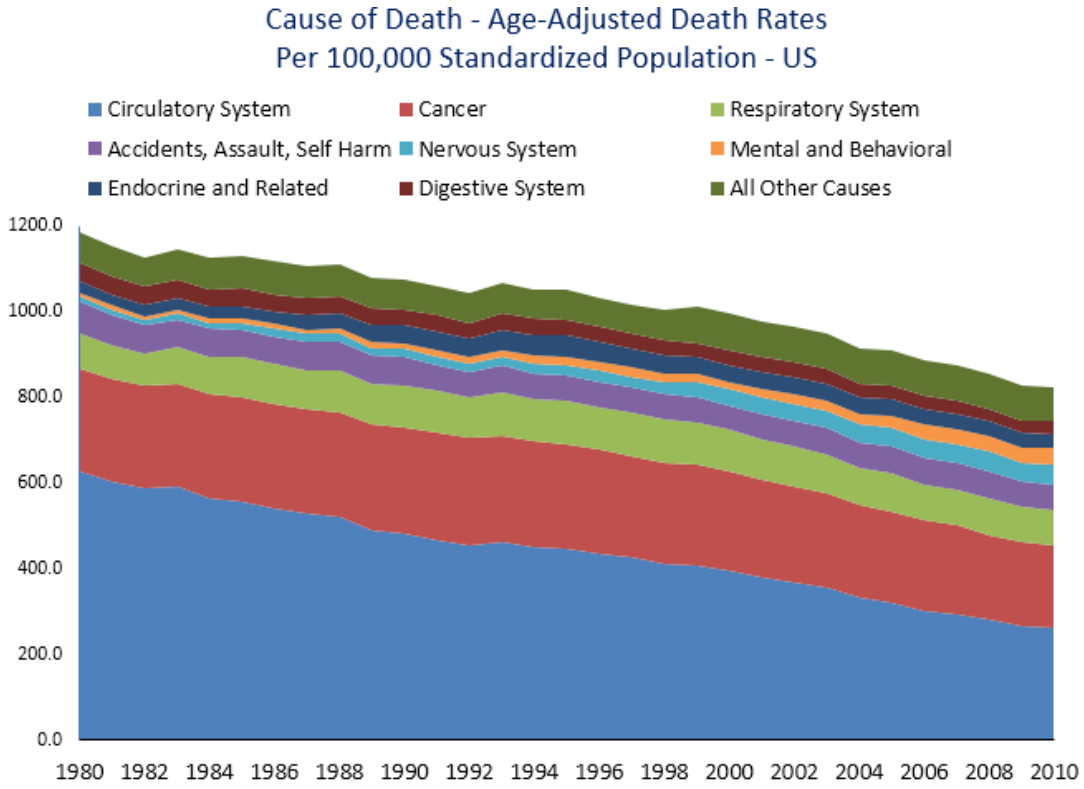
However, this type of charts is less intuitively meaningful, requires more mental processing, and can easily be misinterpreted by the reader. Use with caution.

Numeric Stacked Area Charts



Source: OECD Health Statistics Database

Numeric Stacked Area Charts



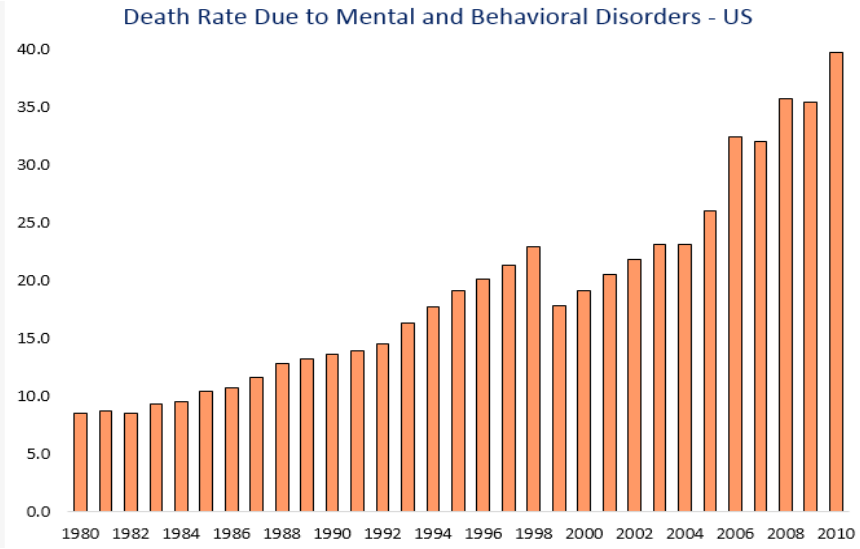
Generally sort the component trends so that the larger series form the base layer of the charts. Exception: All Other Causes as top layer.

Note: Purposely include a decimal point on the vertical axis as a quick indicator that the display values are rates (as opposed to integer counts such as the raw number of deaths).

Note that in numeric stacked charts, the dominant driver component (here the decline in the death rate due to circulatory disease) influences the overall perception of the trends as improving (downward).

Finer trend detail is often unnoticed or obscured in stacked area charts. For example, deaths rates due to Mental and Behavior Disorders (Alcohol and Drug etc) (orange) have increased over time, as have the death rates for Nervous System Disorders (Alzheimer's etc) (light blue).

Numeric Stacked Area Charts



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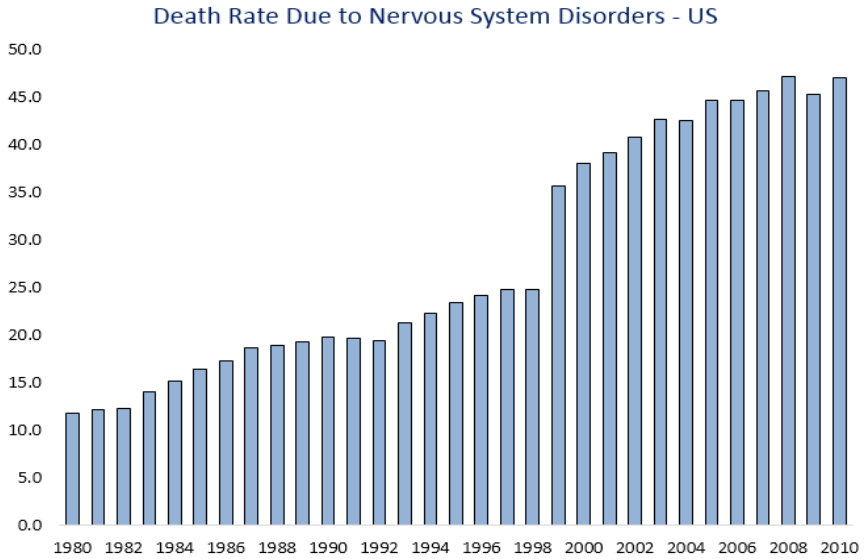
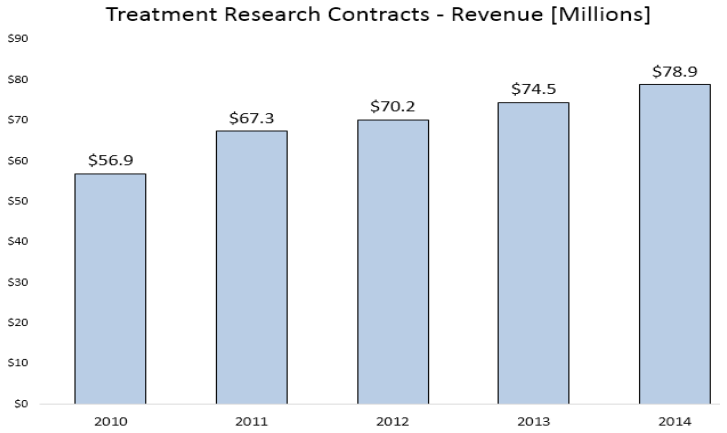


Also note that external impacts to trend data are often obscured in numeric stacked area charts. In this case, the impact of the change to ICD-10 coding on death certificates beginning in 1999 is generally lost in the stacked area charts, but if apparent in the more simple column charts. Always include notes to guide interpretation where needed.

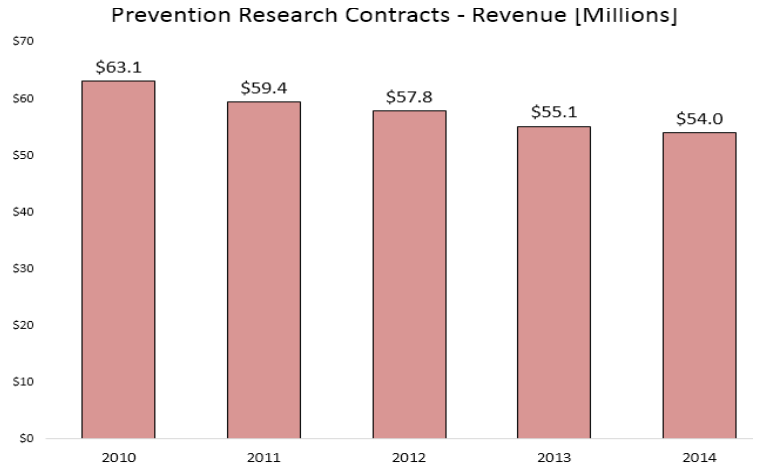
Note: Discontinuity in series beginning in 1999 is due to adoption of ICD-10 Coding on death certificates.

A research company has four divisions representing its major lines of research contracts: Treatment Research, Intervention Research, Prevention Research, and Research Management Contracts. The annual contract revenue trends over the past five years for these four Research Contract Divisions is as follows:

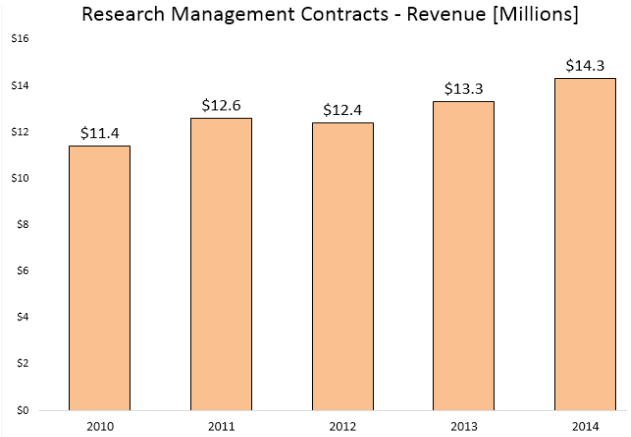


Treatment Strongly Up

Intervention Stable, Slightly Up

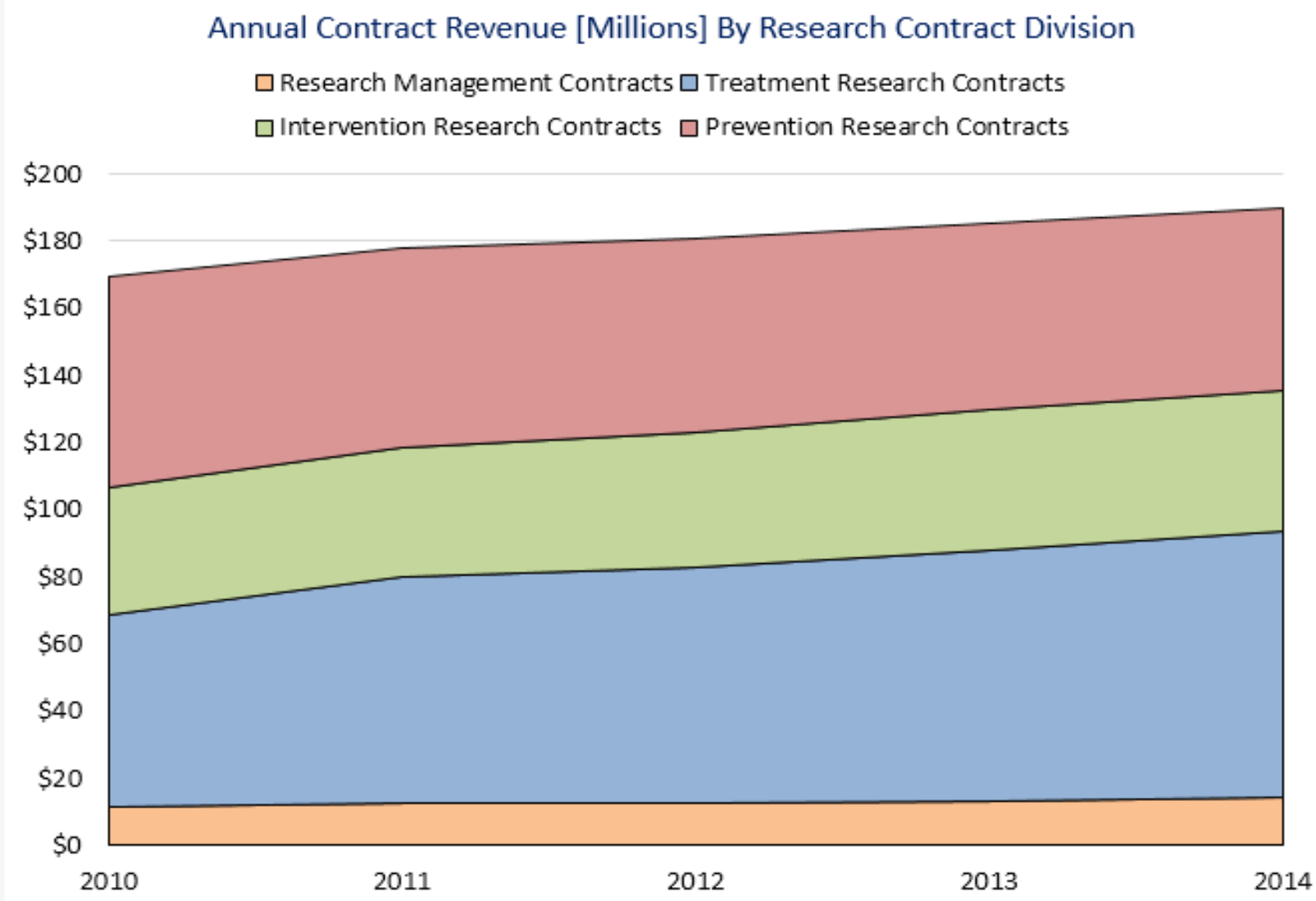


Prevention Significantly Down



Management Contracts Up

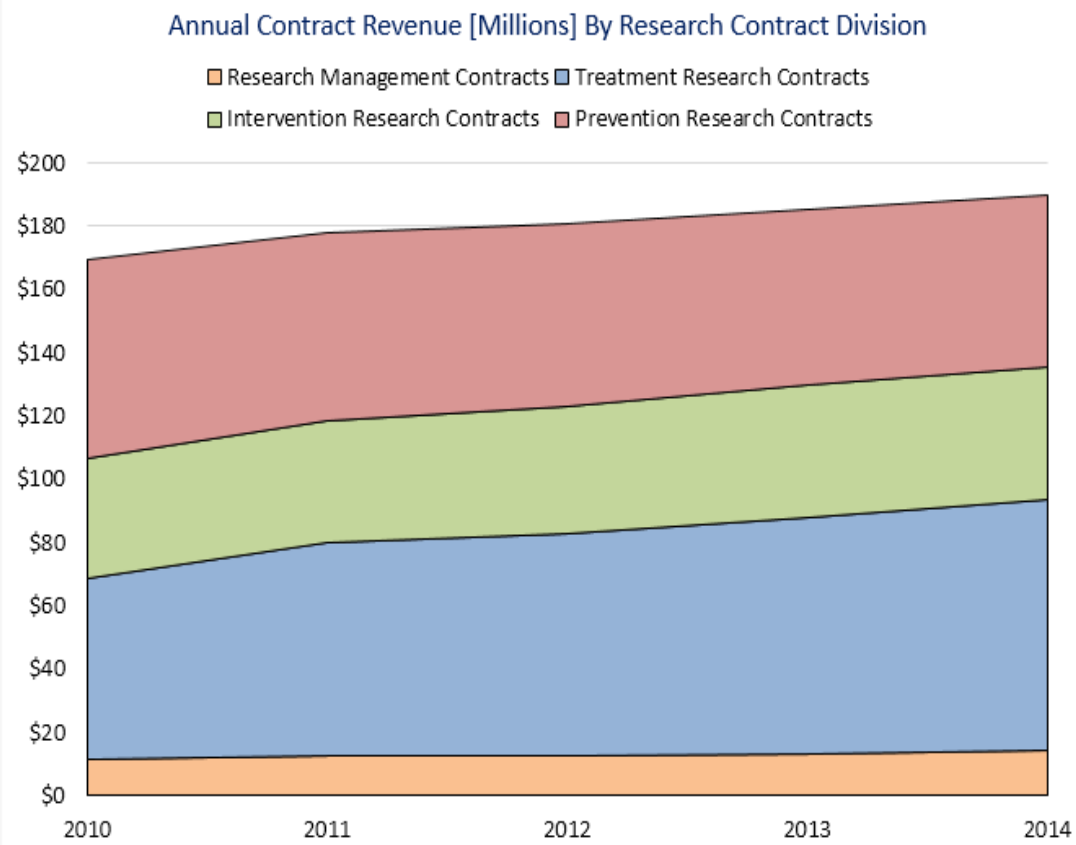
Numeric Stacked Area Charts



What may be the problem with this chart?

Source: Mock Data

Numeric Stacked Area Charts



Note that the Numeric Stacked Area Chart somewhat obscures the fact that Prevention is losing money, because the pink Prevention slice is floating on top on a cumulatively increasing trend provided by the other three Divisions. The eye notices that the top line of the pink Prevention slice is rising and often assumes that the Prevention slice itself is increasing as well.

Numeric Stacked Areas charts also frequently obscure rising trends that you wish would be falling – such as rapidly increasing Expenses in a particular division. Either intentionally or unintentionally, the rising component to be obscured can be sandwiched between other components to reduce the chance that someone will notice the offending slice. Use Area charts only as truly appropriate. Consider simpler column or line charts in most circumstances.