



# Methodology for Graph Selection

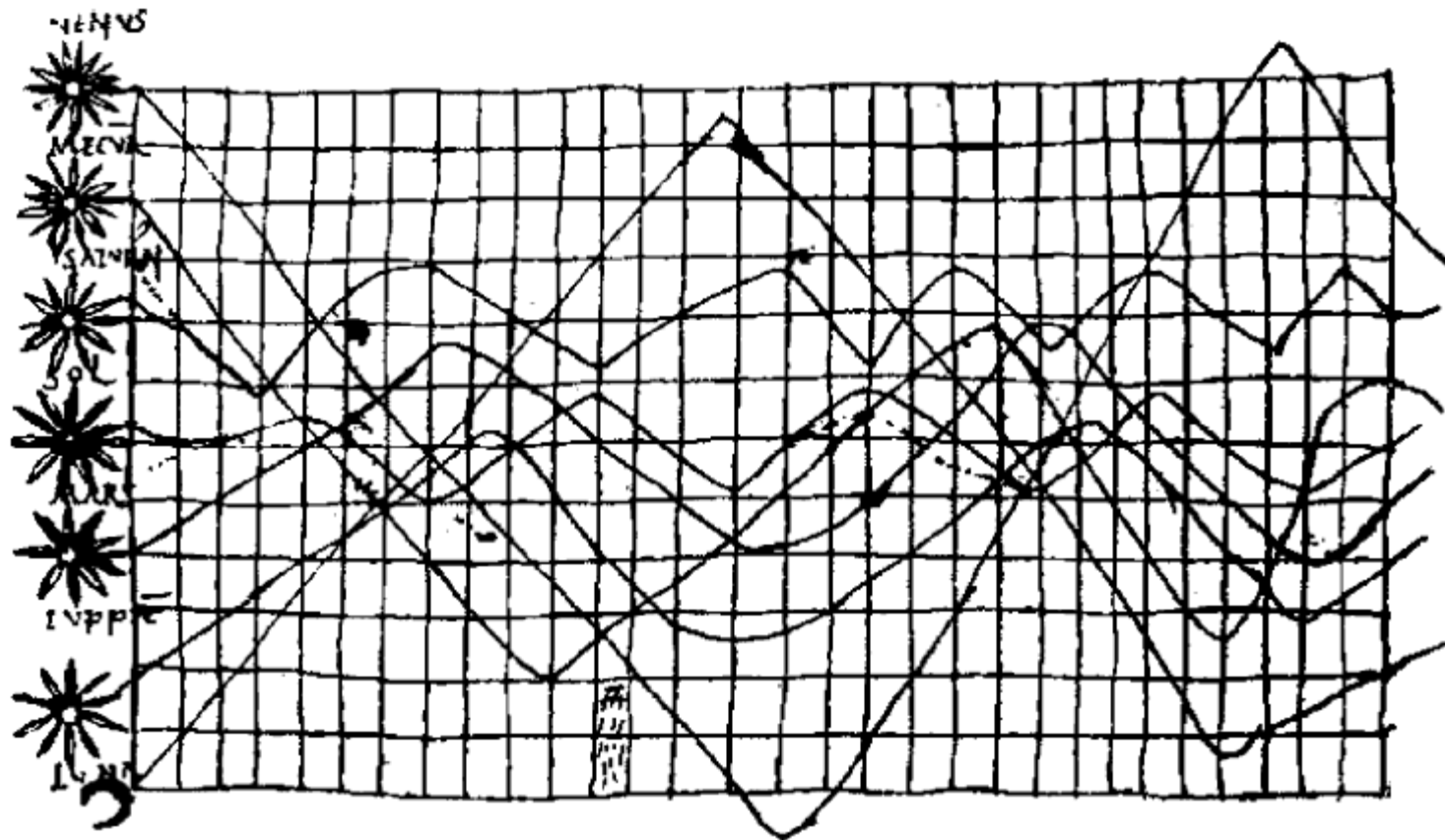


## Objectives

- Learn how to characterize your data
- Determine which graph best displays your data
- Learn techniques for enhancing your graph displays
- Discover which graph types are supported in each Diver Solution component



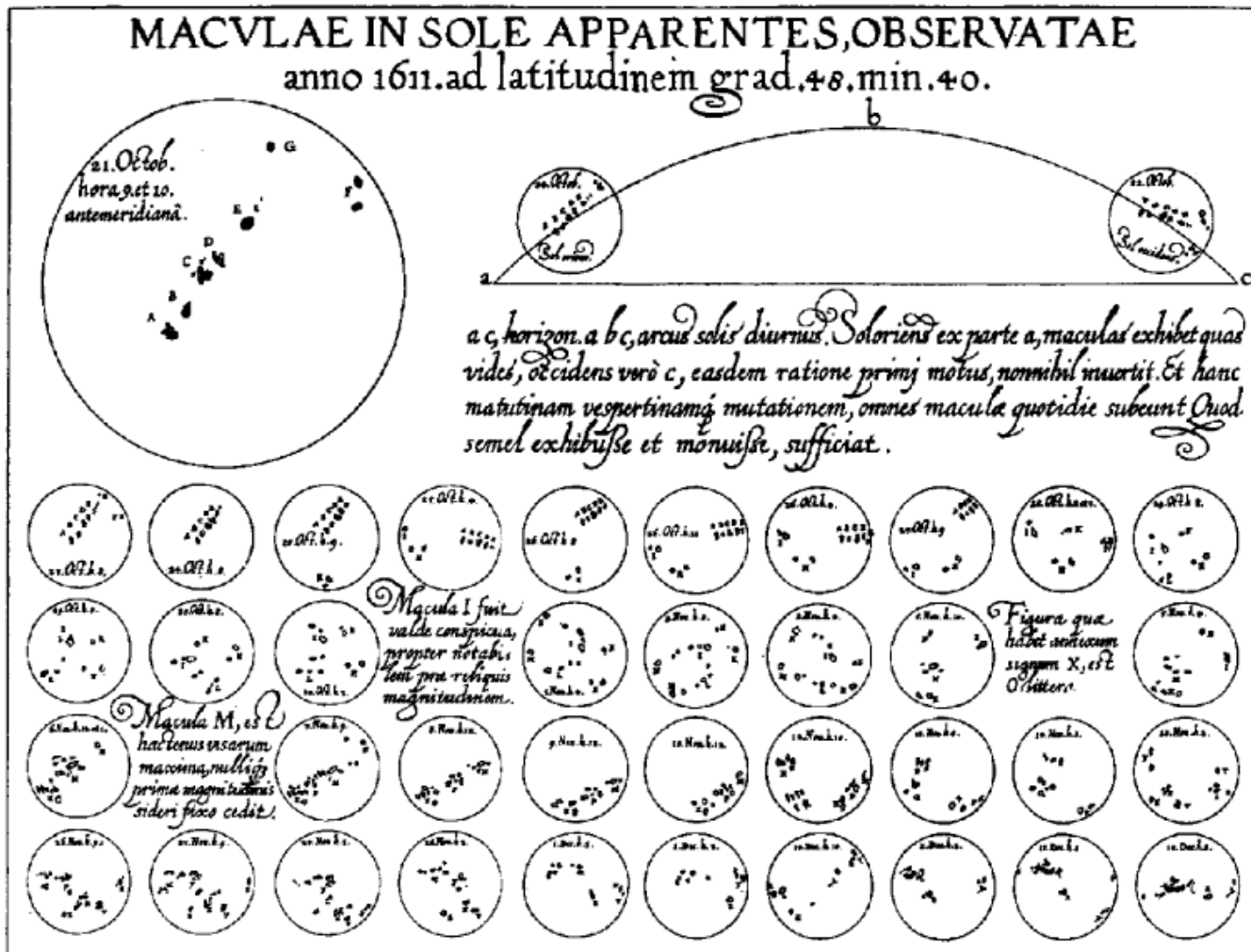
## Historical Perspective 1000 A.D.



*(Myatt & Johnson, 2009)*



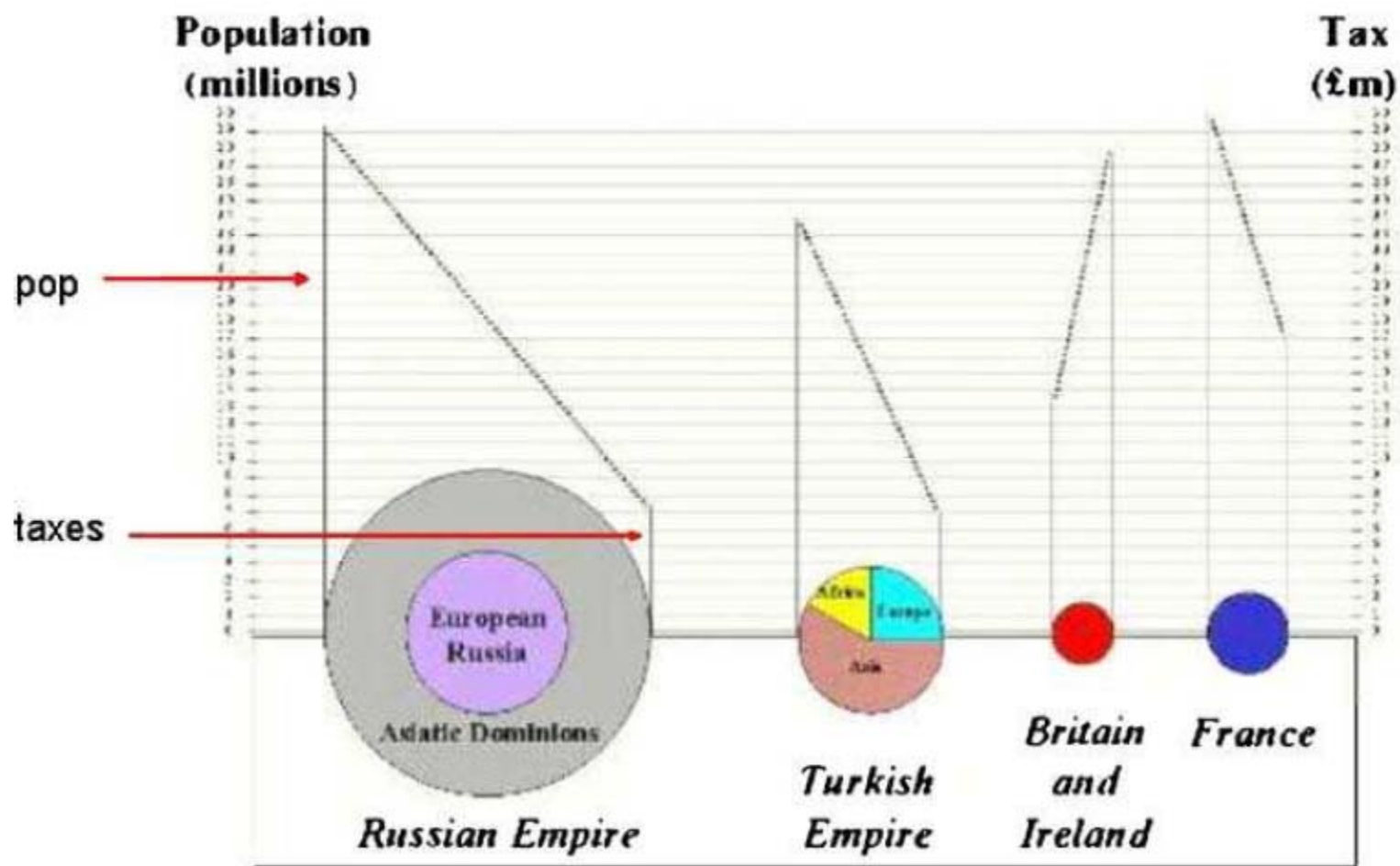
## Historical Perspective 1626 A.D.



(Myatt & Johnson, 2009)



## Historical Perspective 1801 A.D.



(Myatt & Johnson, 2009)



## Objective #1

- Learn how to characterize your data



## Characterizing Your Data

- Qualitative
  - *May be numeric or alphanumeric*
- Quantitative
  - *Must be numeric*
  - *Can be discrete or continuous*



## Qualitative Data

- Nominal: no order or magnitude
  - *Judy, John, Mary, Mark*
  - *Finance, Production, Distribution*
  - *Valid relationships: Equal or Not Equal*



## Qualitative Data

- Ordinal: implies rank order
  - *Hot, Warm, Cold*
  - *1<sup>st</sup> place, 2<sup>nd</sup> place, 3<sup>rd</sup> place*
  - *Conveys magnitude*
  - *Valid relationships: Equal, Not equal, Greater than, Less than*



## Quantitative Data

- Interval: category, magnitude, & equal interval
- Differences make sense, but ratios do not
  - *Time: 8:00 - 6:00 = 4:00 - 2:00*
  - *Temperature (Celsius and Fahrenheit) 100°C is not twice as hot as 50°C*



## Quantitative Data

- Ratio: category, magnitude, equal interval, and absolute zero
  - *Temperature (Kelvin), age, file size*

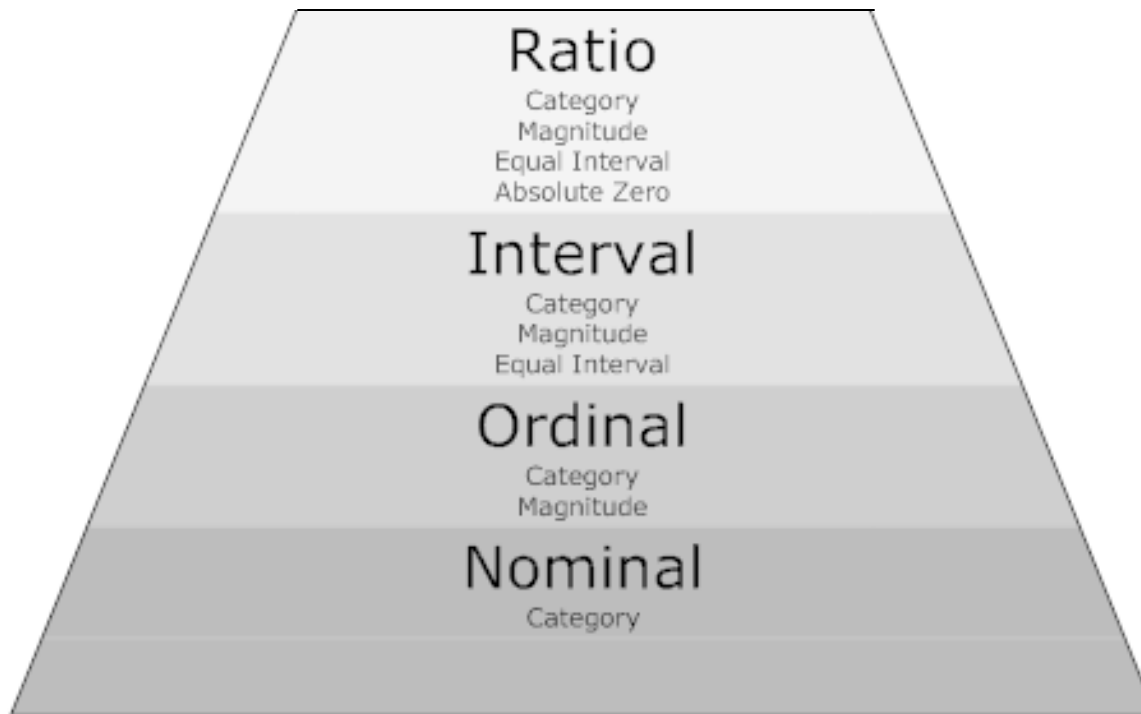


## Data Scaling Properties

	Ratio	Interval	Ordinal	Nominal
Category	Yes	Yes	Yes	Yes
Magnitude	Yes	Yes	Yes	No
Equal Interval	Yes	Yes	No	No
Absolute Zero	Yes	No	No	No



## Information Content Hierarchy





## Nomenclature

- Plot, graph, chart used interchangeably in Diver
- Likewise for plotting, graphing, charting



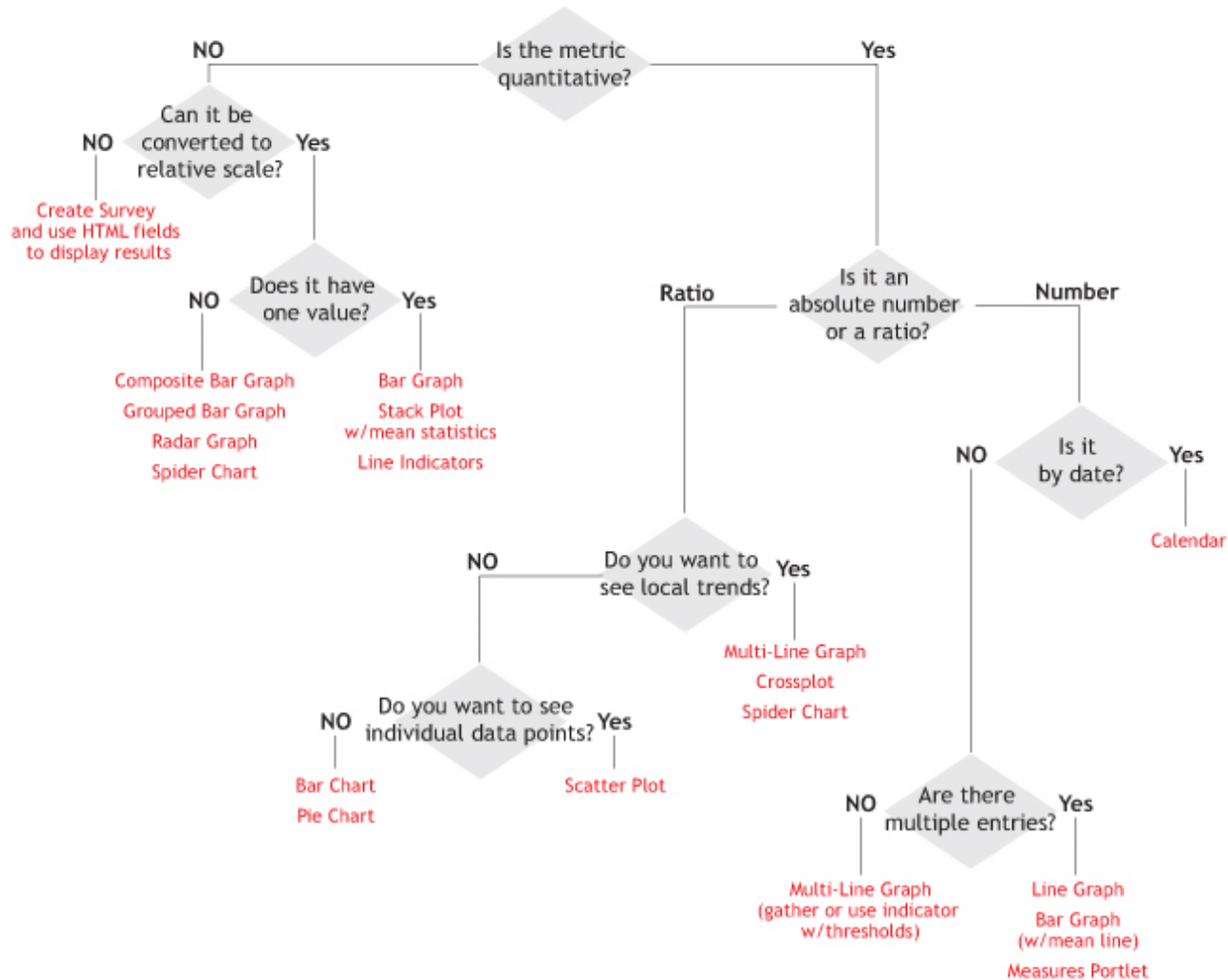
## Objective #2

- Determine which graph best displays your data



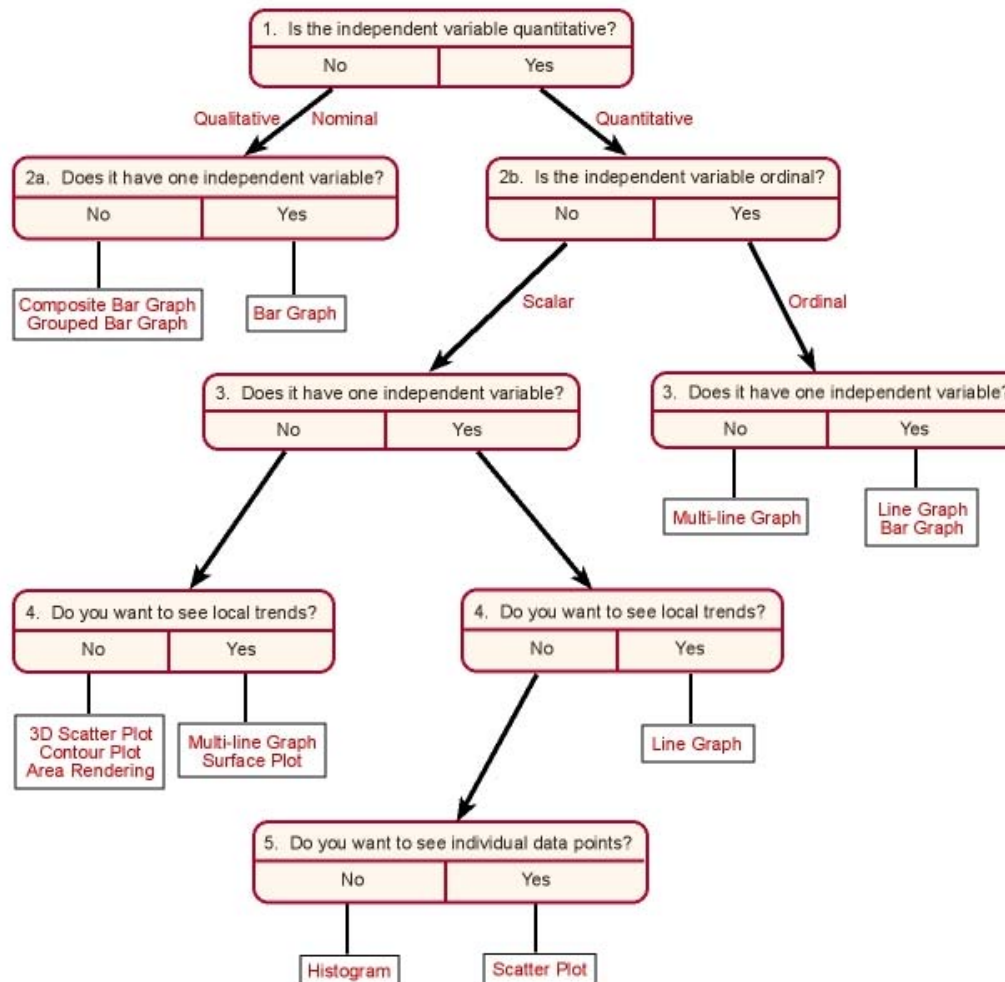
# METHODOLOGY FOR GRAPH SELECTION

## DI's Graph Selection Flowchart





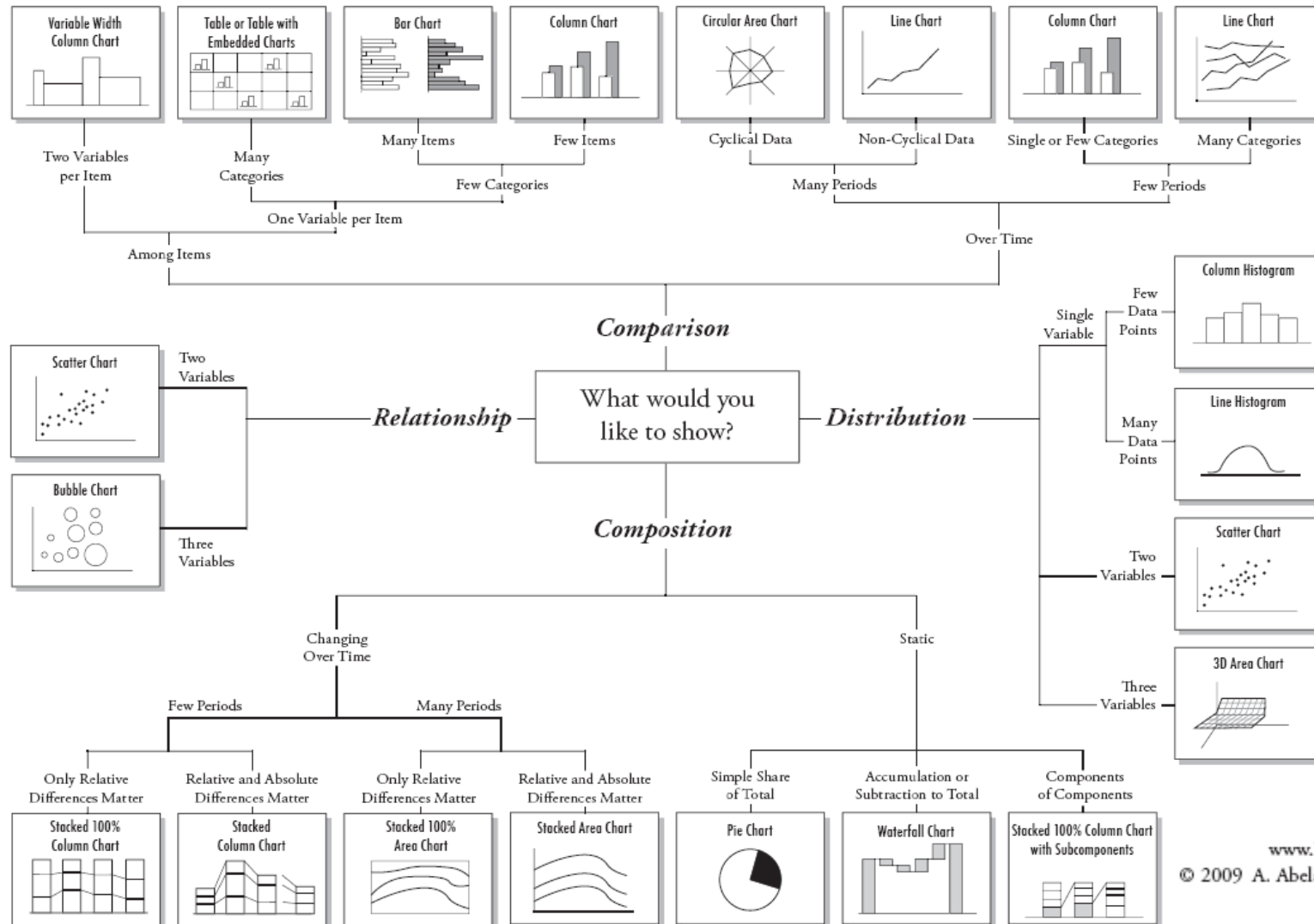
## An Alternate Flowchart





# METHODOLOGY FOR GRAPH SELECTION

## Yet Another Flowchart





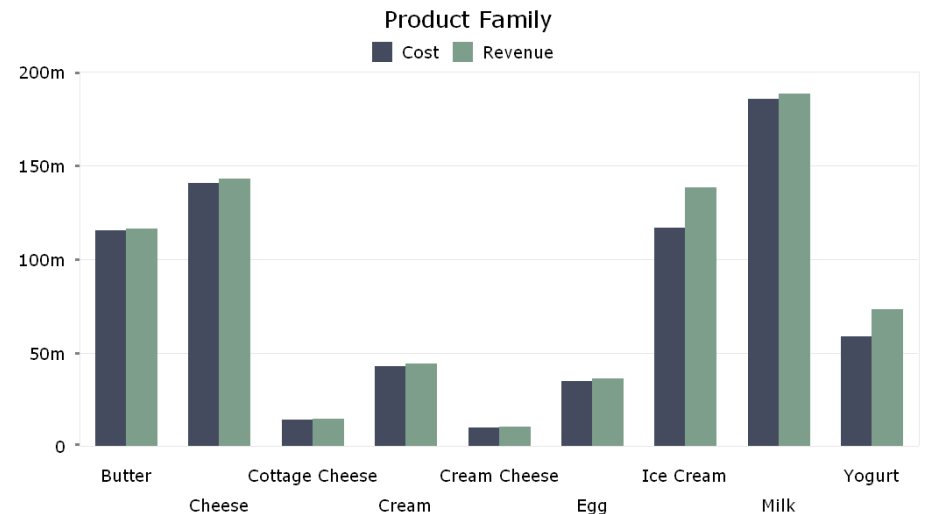
## Diver Graph Data Requirements

Graph Type	Summary + DimCounts + Counts + Calculated Columns	Dimensions
Basic	Up to 16	1
Stack	1	2
Cross	1	2
Bubble	2	2
Calendar	Up to 8	1
Radar	Up to 16	1



## Basic Graphs

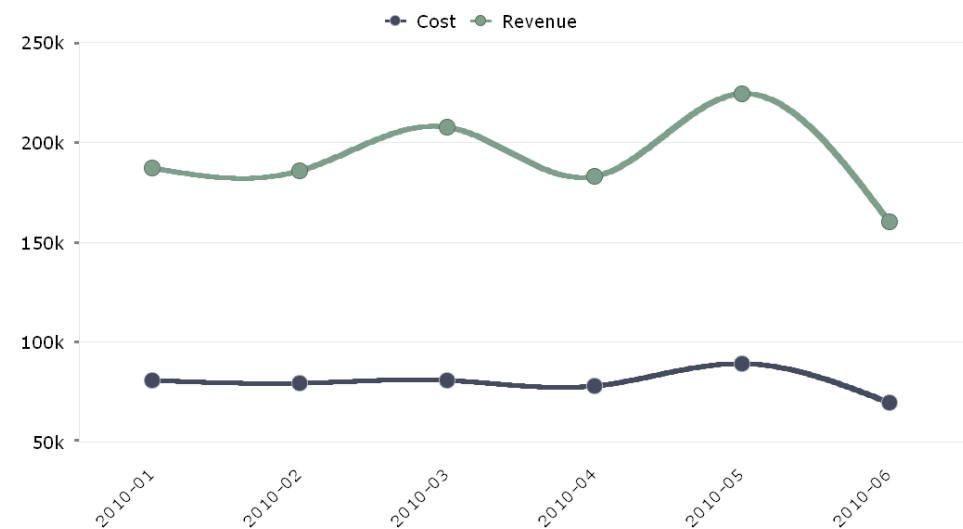
- Bar
- Line
- Point
- Area
- Spline
- Area Spline
- 3D Bar
- 3D Line
- Linear Bubble





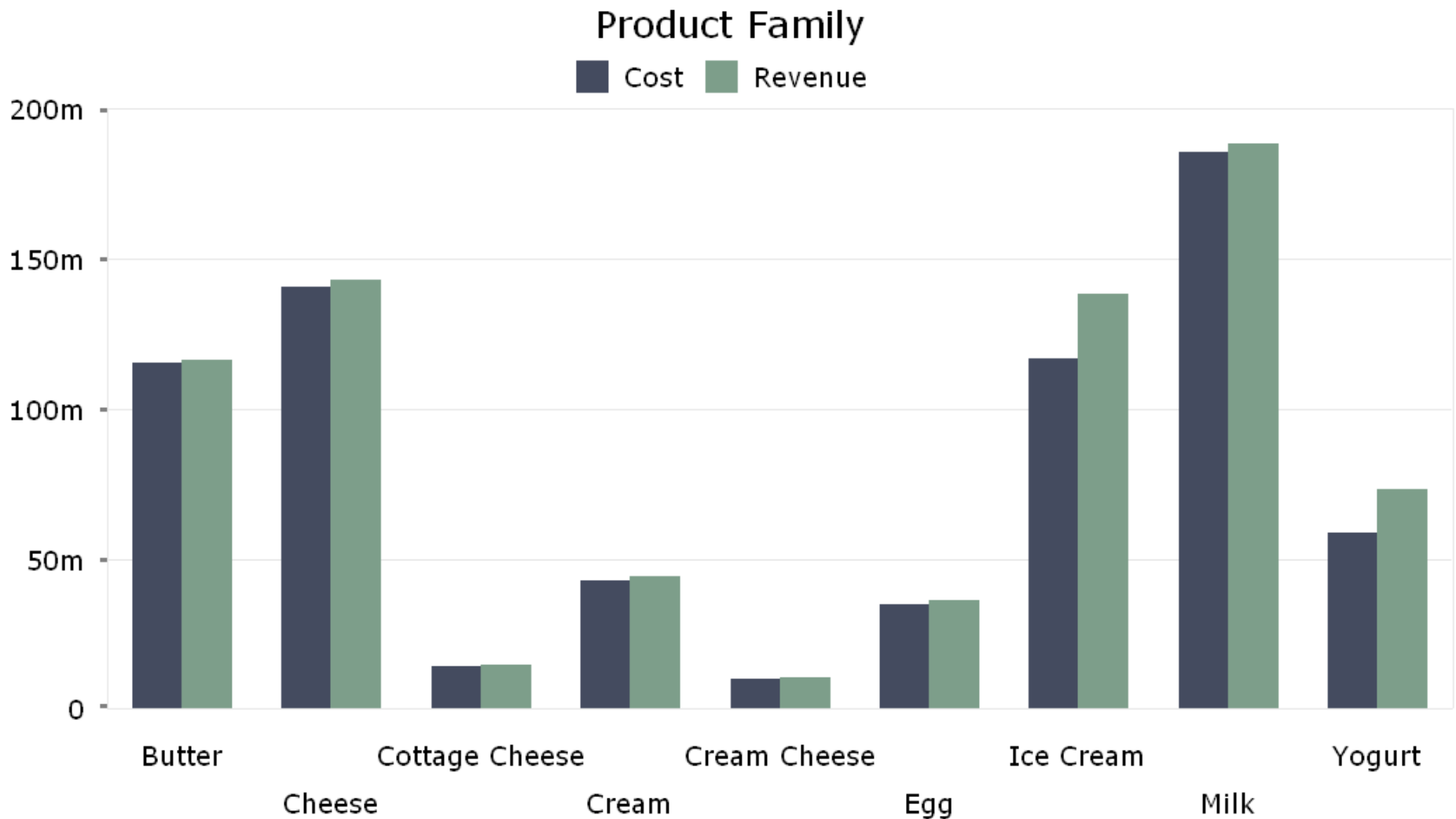
## Basic Plot Display Types

- Bar
- Line
- Point
- Area
- Spline
- Area Spline
- Bar-Sum
- Line-Sum
- Point-Sum





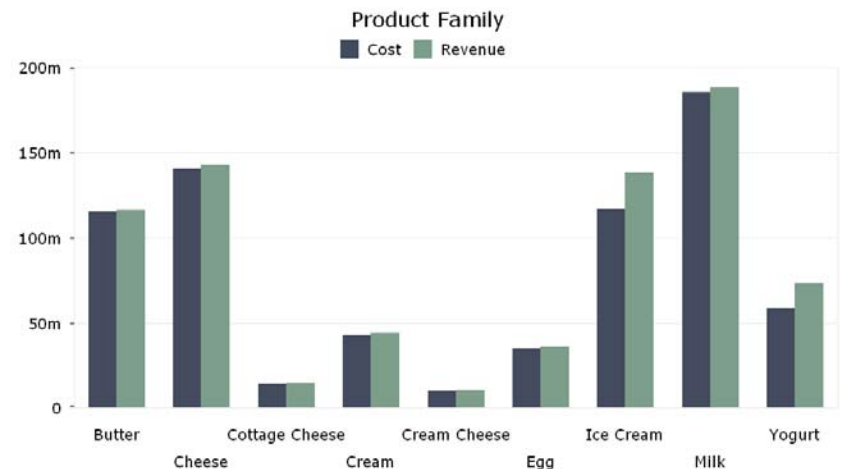
## Bar Graphs





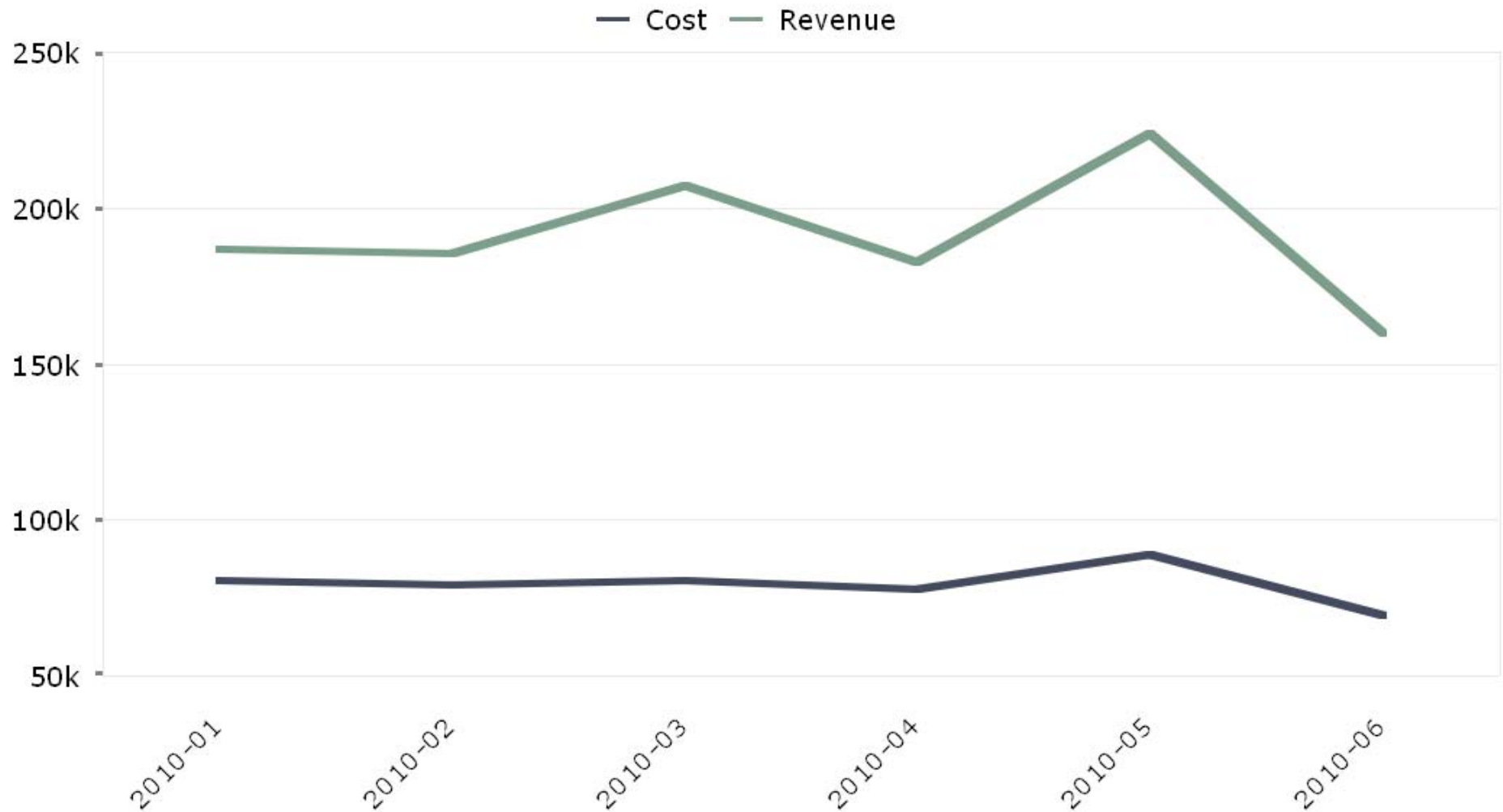
## Bar Graphs

- Good for quick visual comparisons
- Displays both positive and negative values
- Use for comparing a set of items side by side to show quantitative behavior
- Use for discrete, not continuous data
- Horizontal or vertical orientation





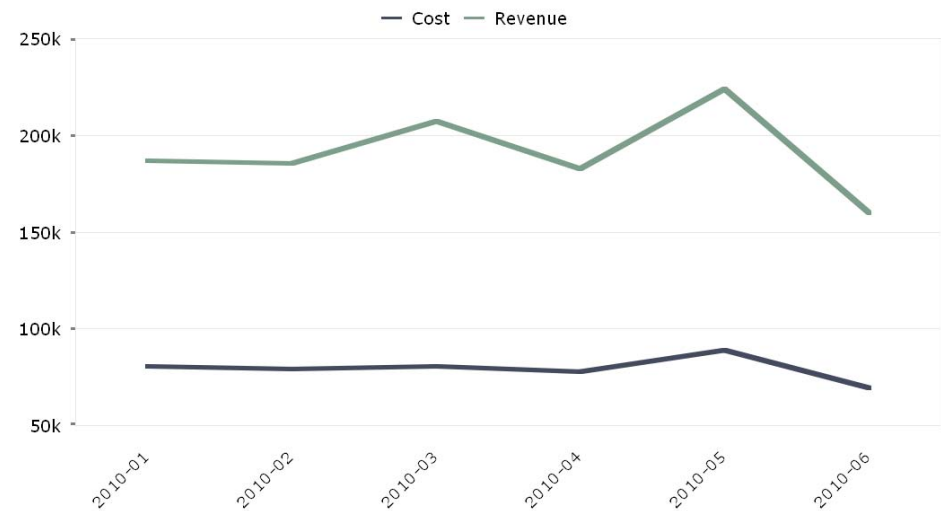
## Line Plots





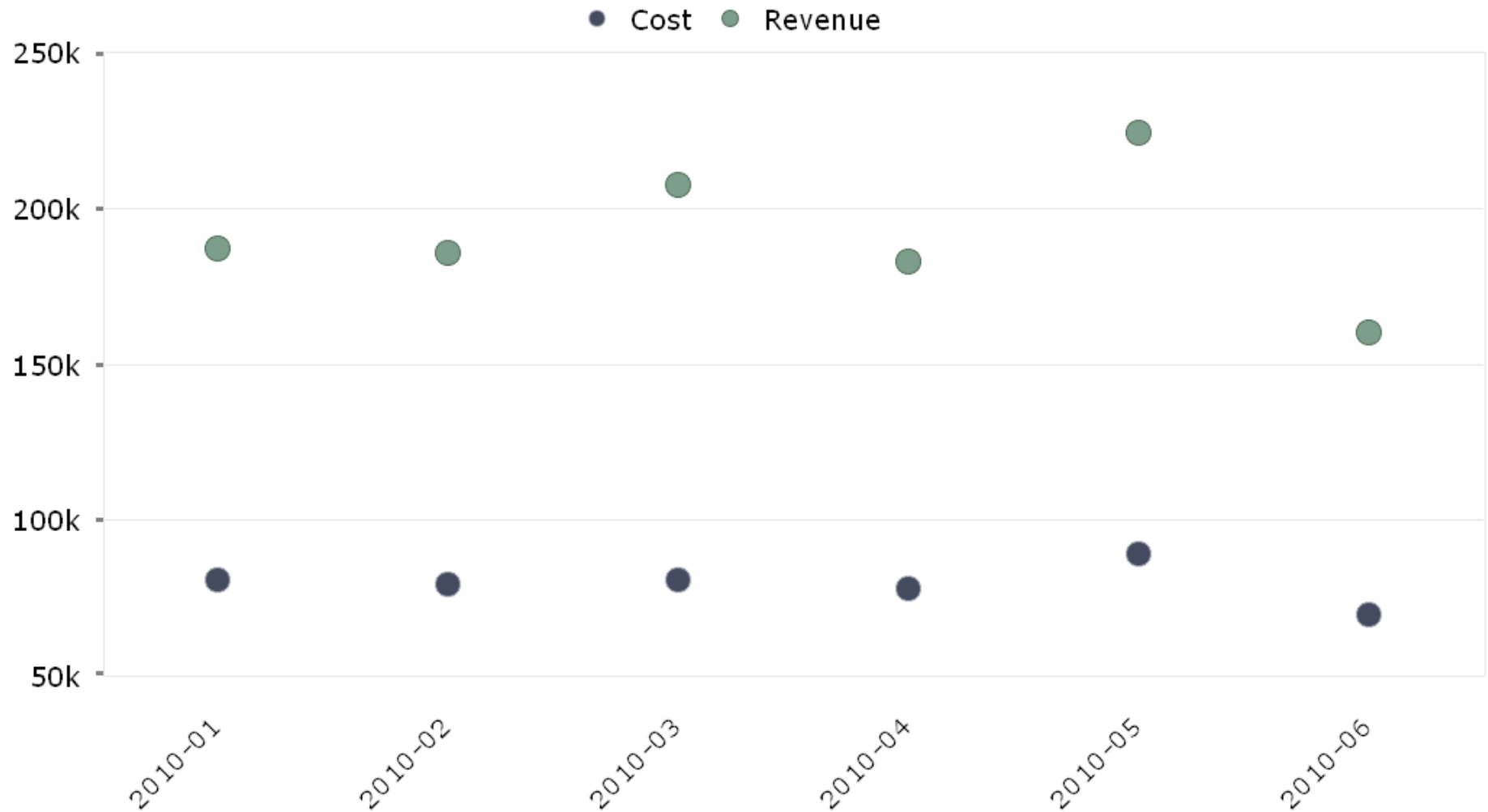
## Line Plots

- Use to display and compare time-based trends
- X-axis should be time based
- Be mindful of the “interpolation effect”





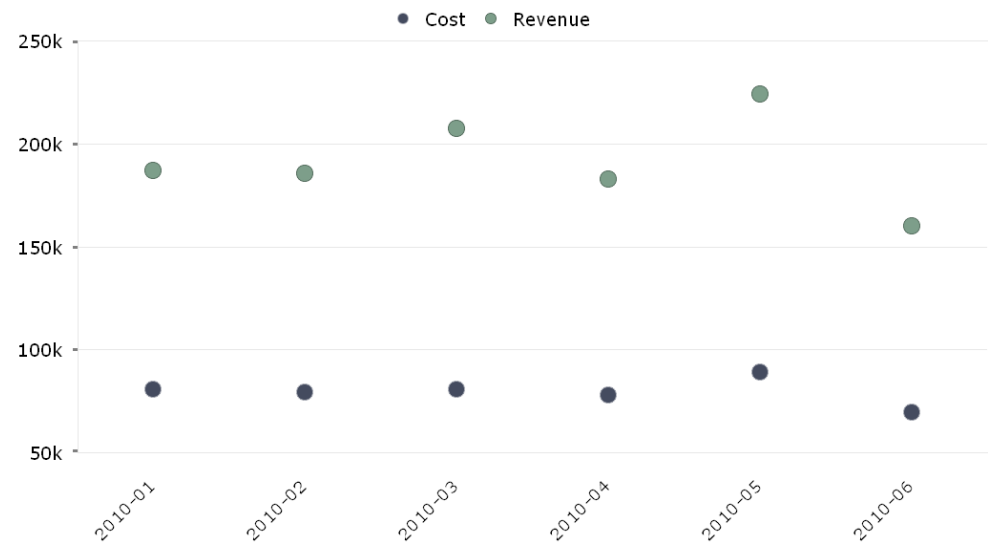
## Point Plots





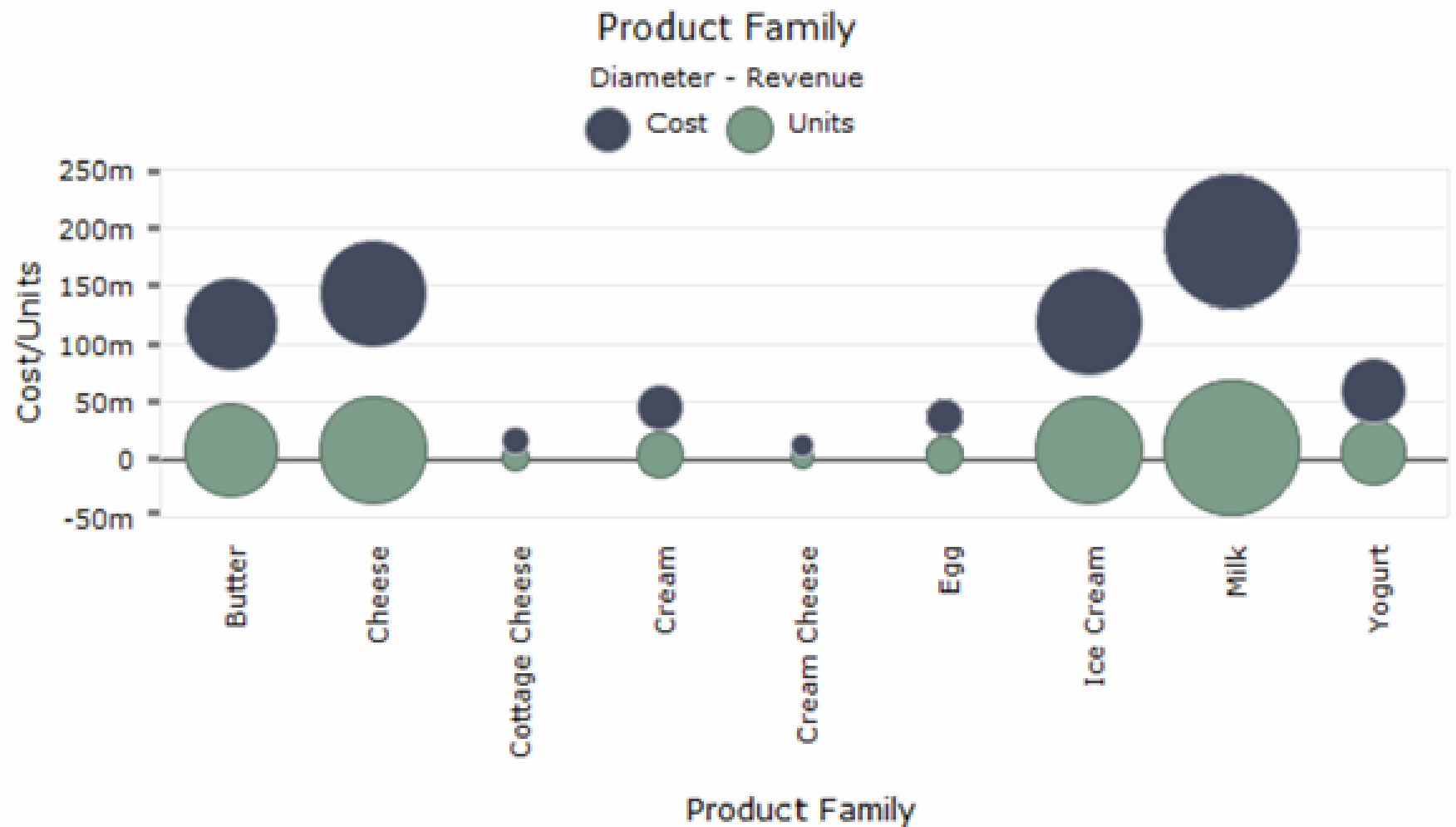
## Point Plots

- Least cluttered graph type
- Too many summary fields will lead to visual chaos





## Linear Bubble Graphs





## Linear Bubble Graphs

- Only Diver graph type for 2 Dimensions and 2 Summaries

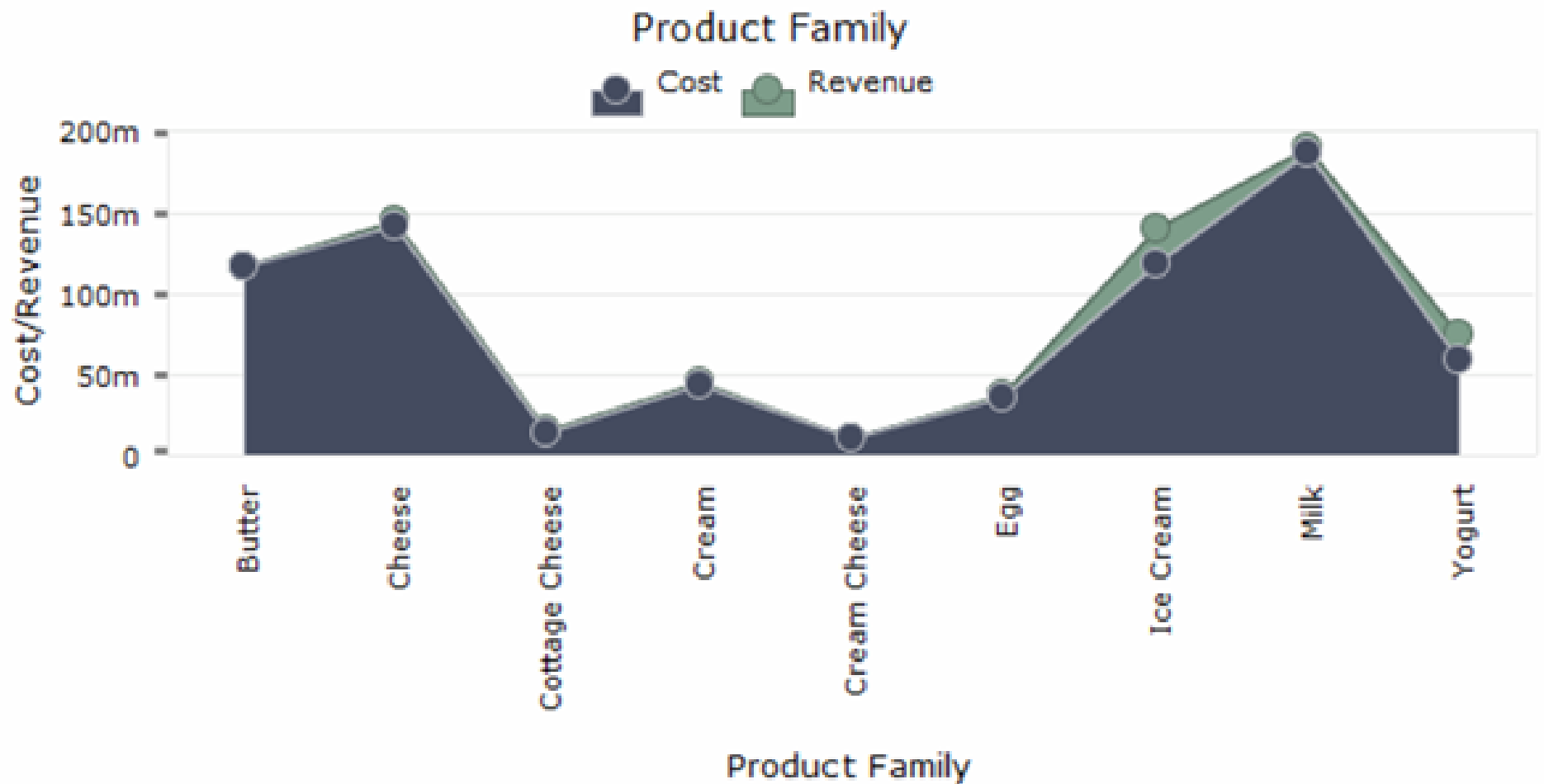


## Point Plots

- Least cluttered plot type
- Trends are less obvious



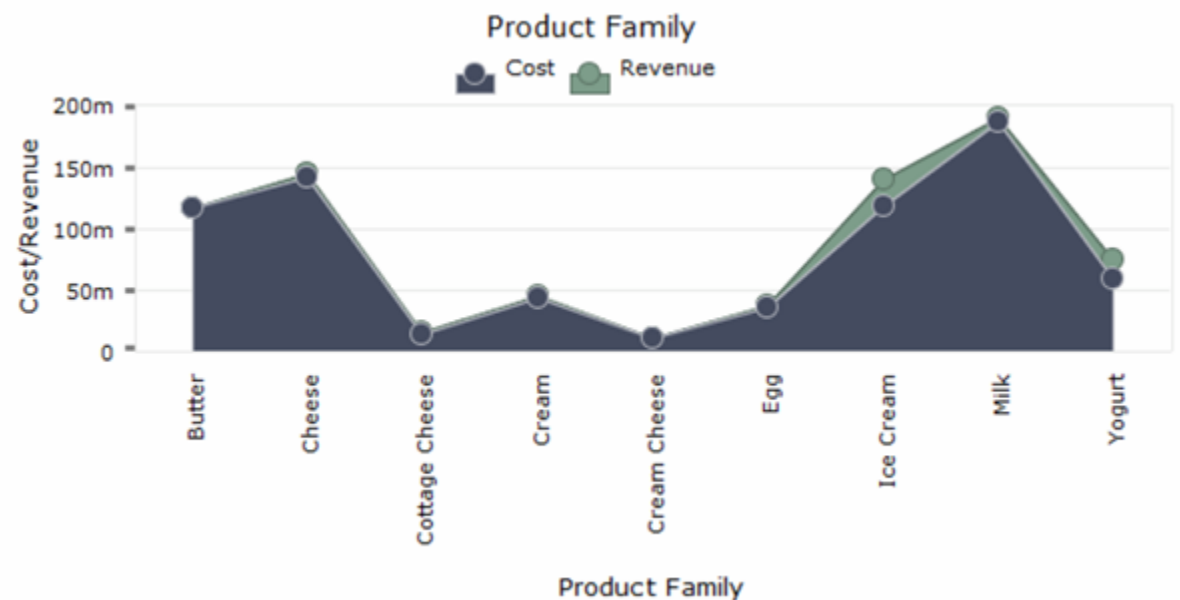
## Area Plots





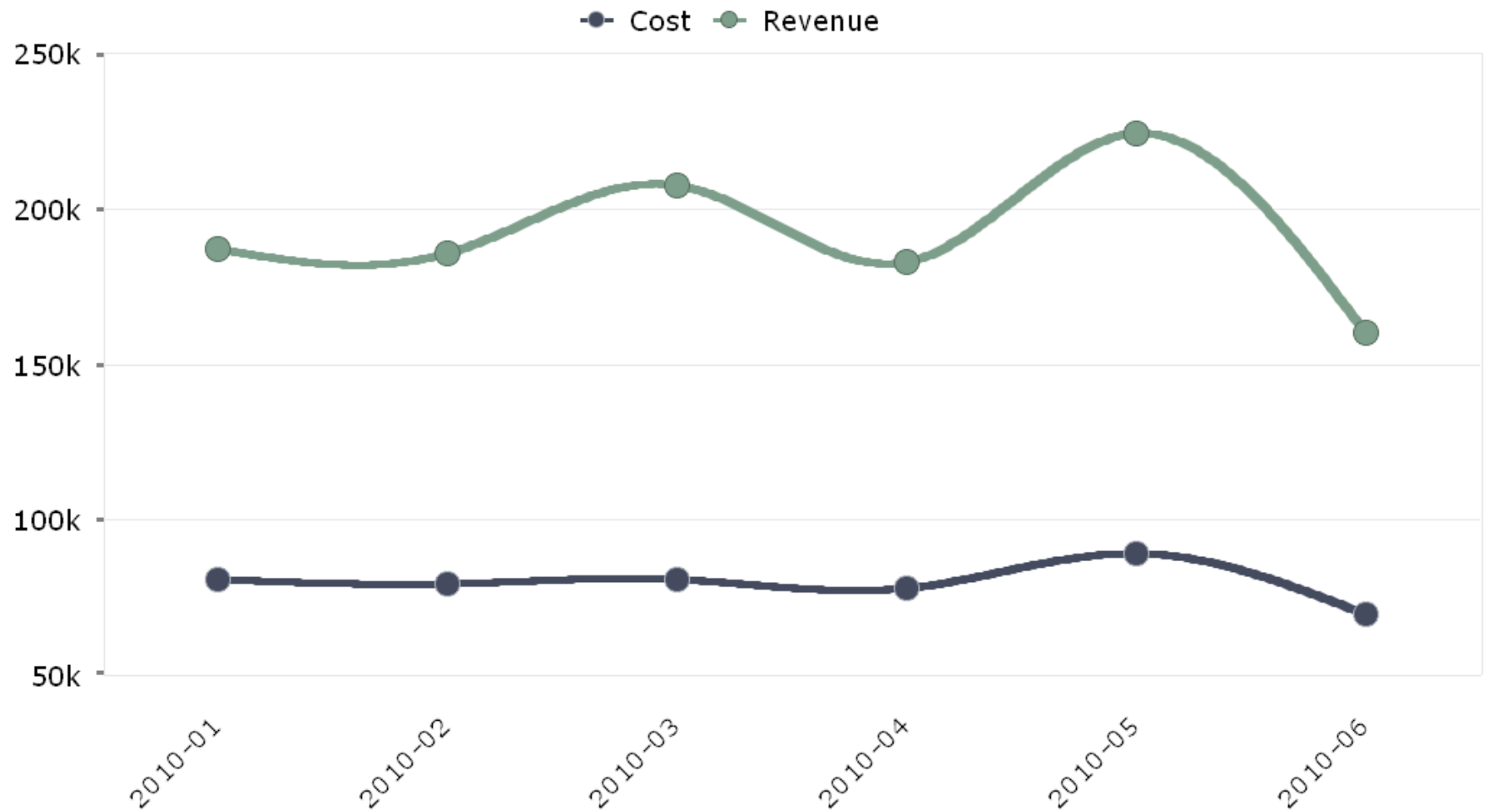
## Area Plots

- Emphasize magnitude between categories or time periods
- Can display both negative and positive values



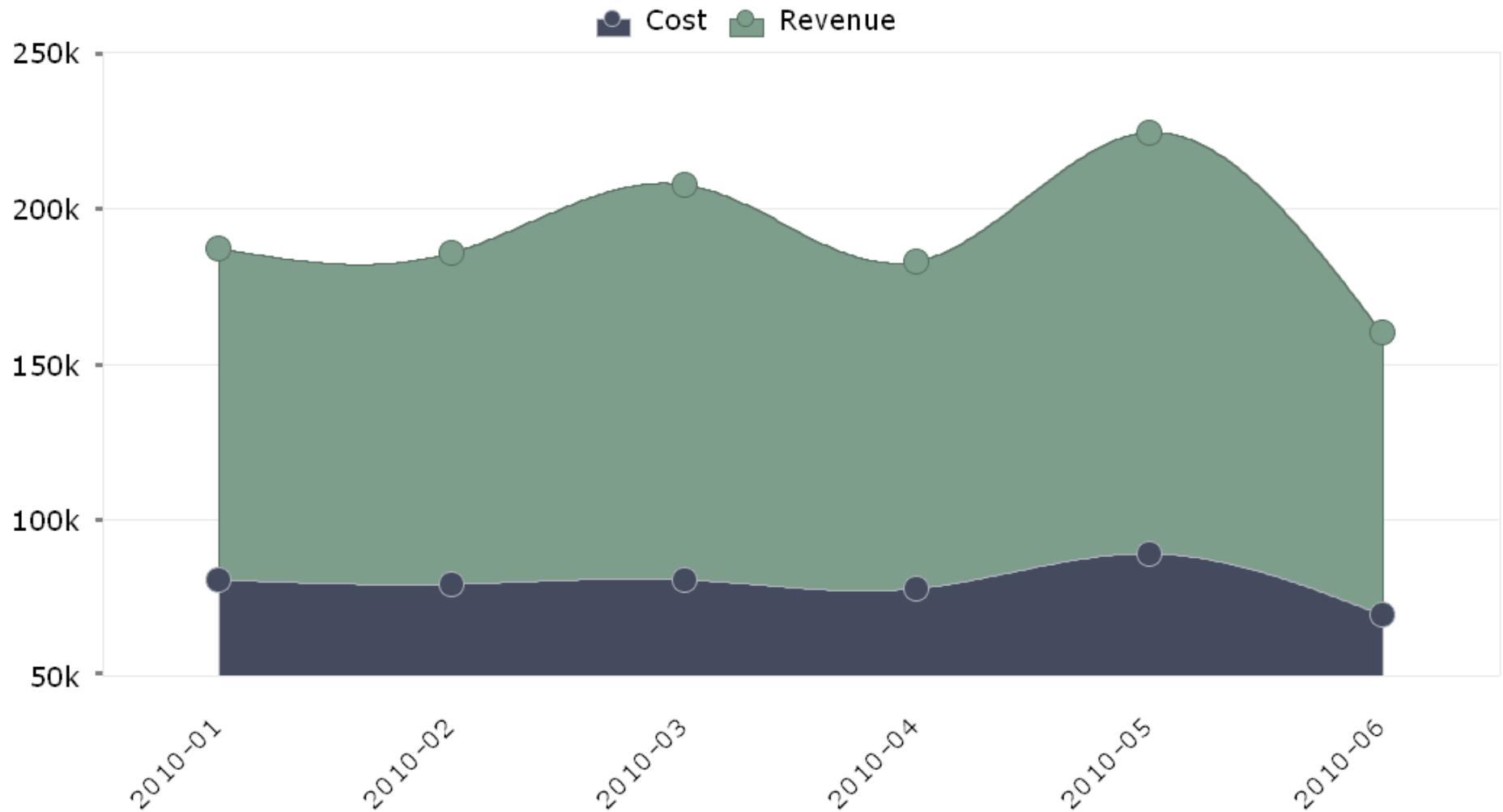


## Spline Plots





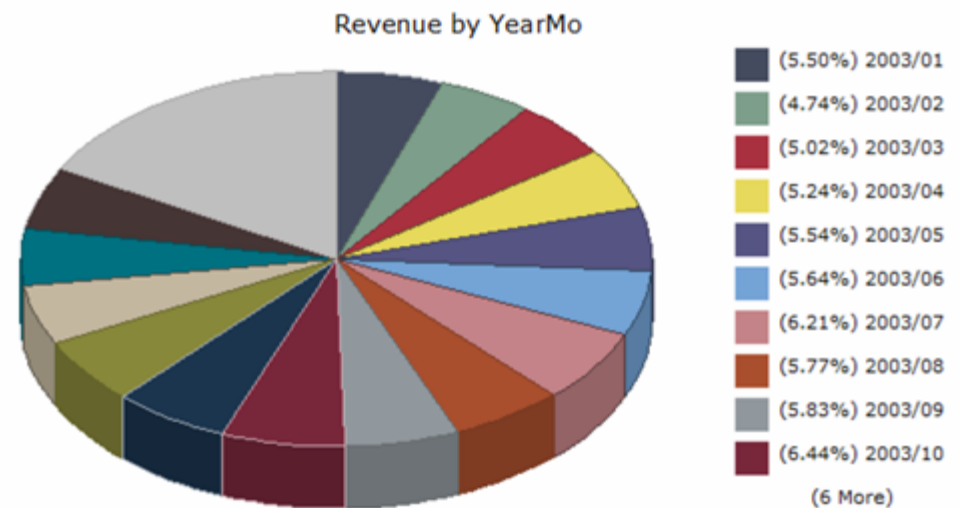
## Area Spline Plots





## Pie Graphs

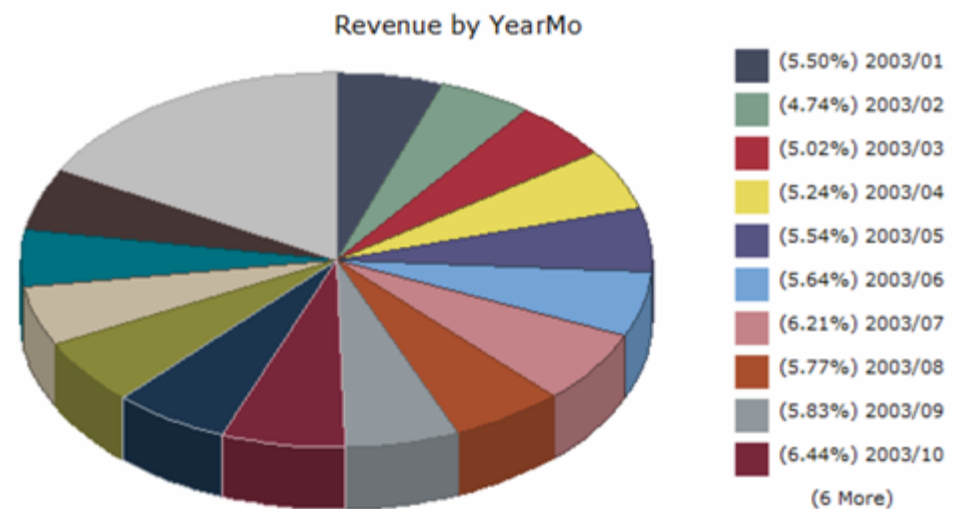
- 2D
- 3D





## Pie Graphs

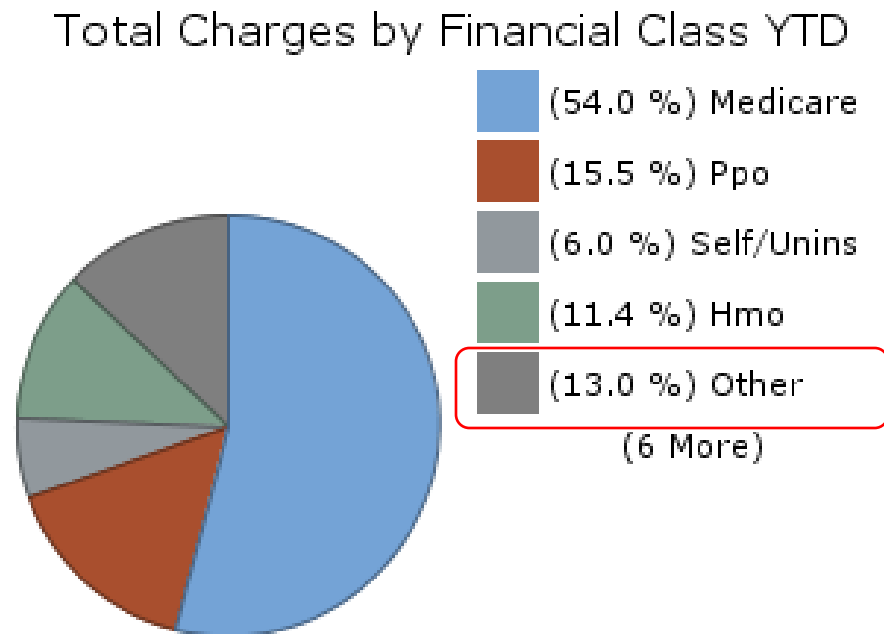
- Useful for single Dimensions
- Values must be non-negative
- Categories must represent part of a whole





## Pie Graphs

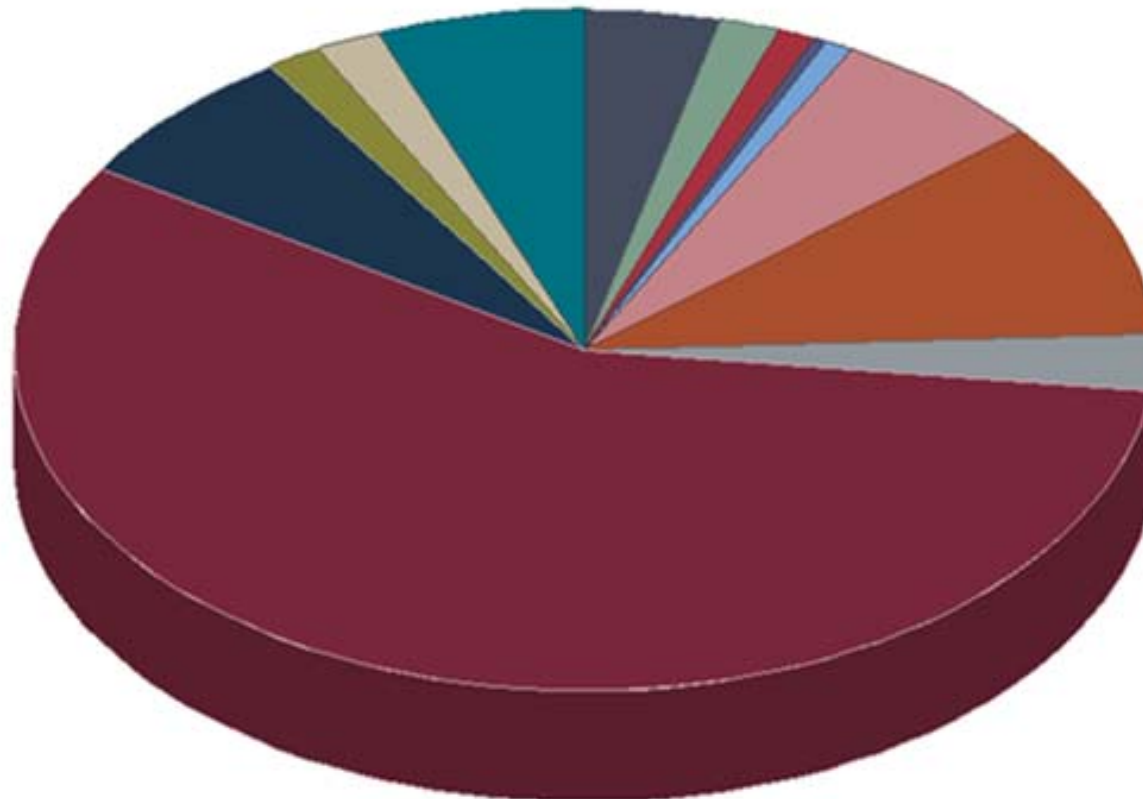
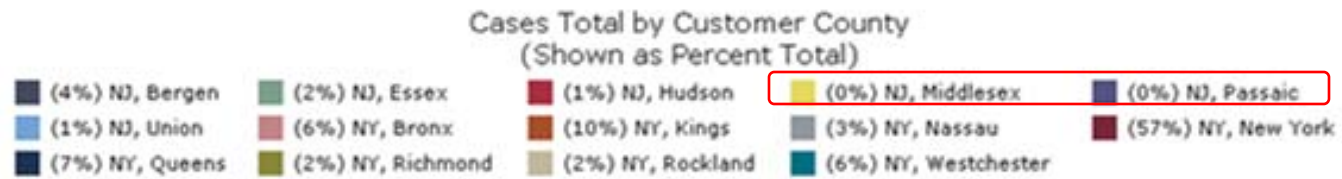
- “Other” category avoids graph clutter





# METHODOLOGY FOR GRAPH SELECTION

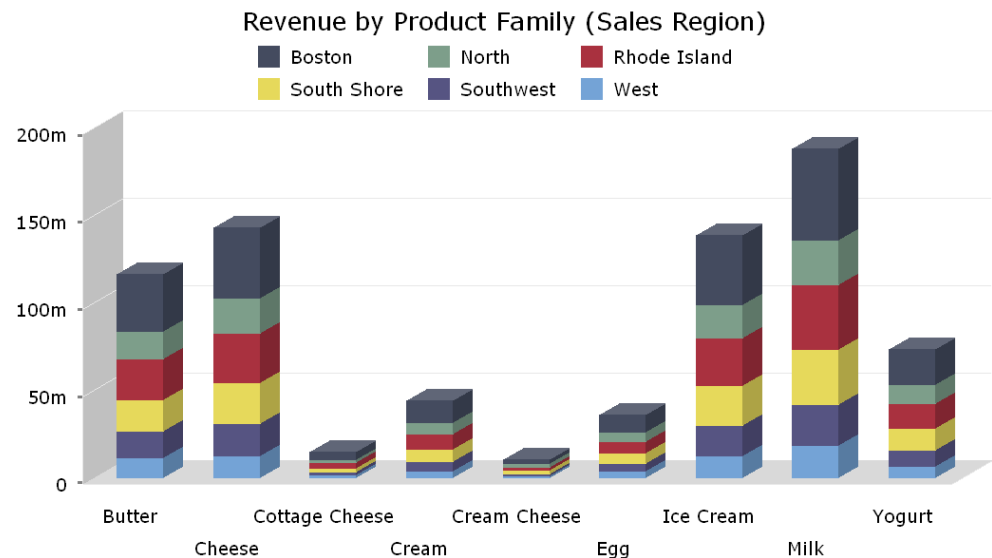
## DO NOT Include Zero Categories





## Stack Plots

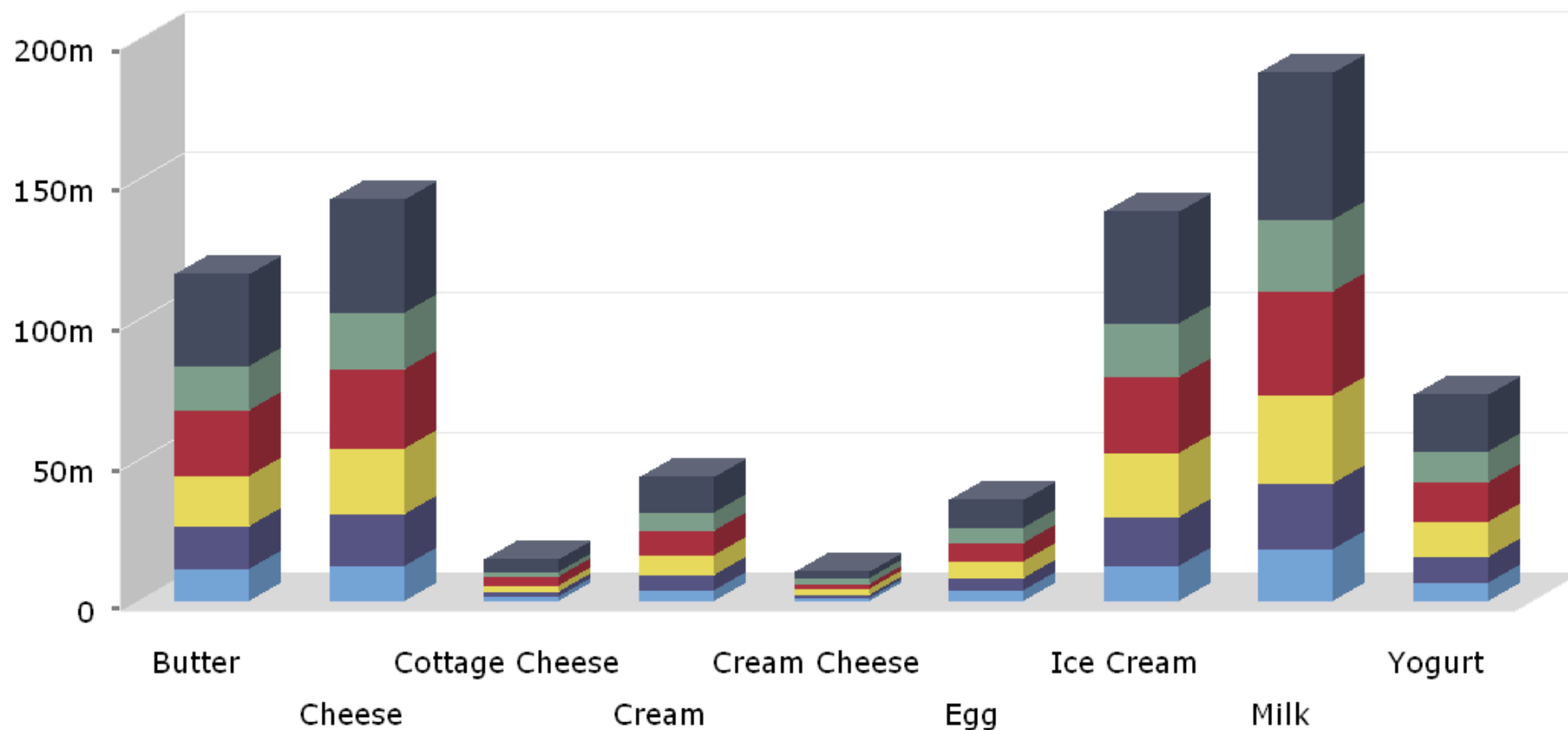
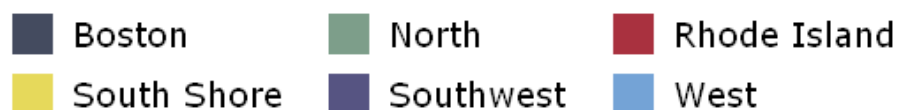
- Bar Stack Plot
- 3D Bar Stack Plot
- Percentage Stack Plot
- 3D Percentage Stack Plot





## 3D Bar Stack Plot

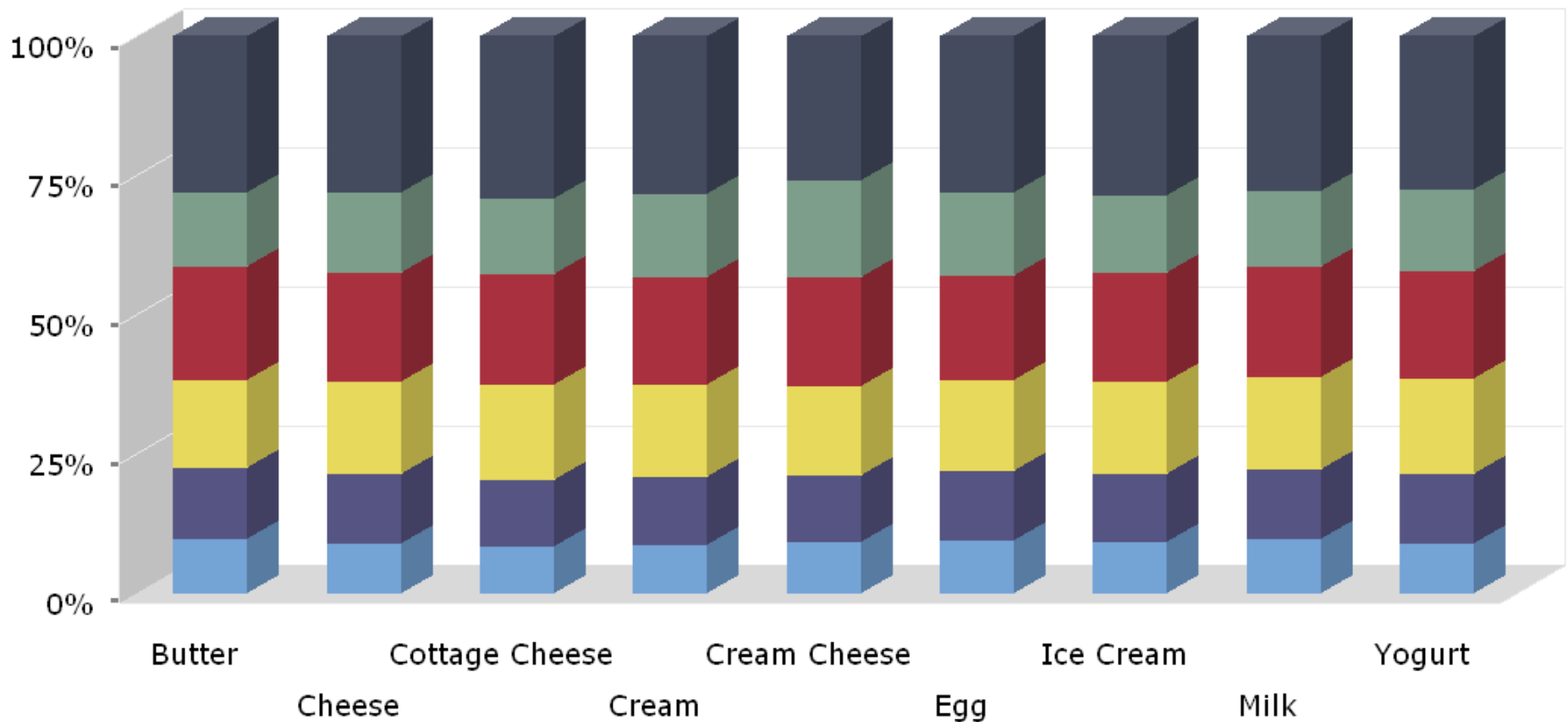
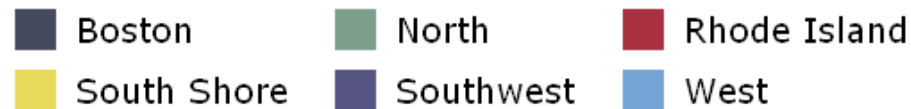
Revenue by Product Family (Sales Region)





## 3D Percentage Stack Plot

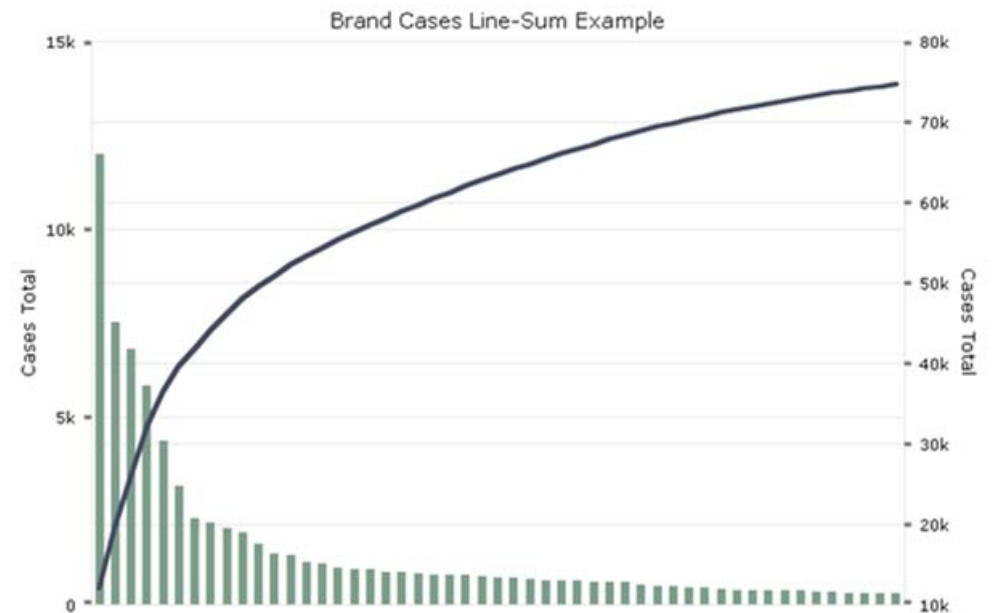
Revenue by Product Family (Sales Region)





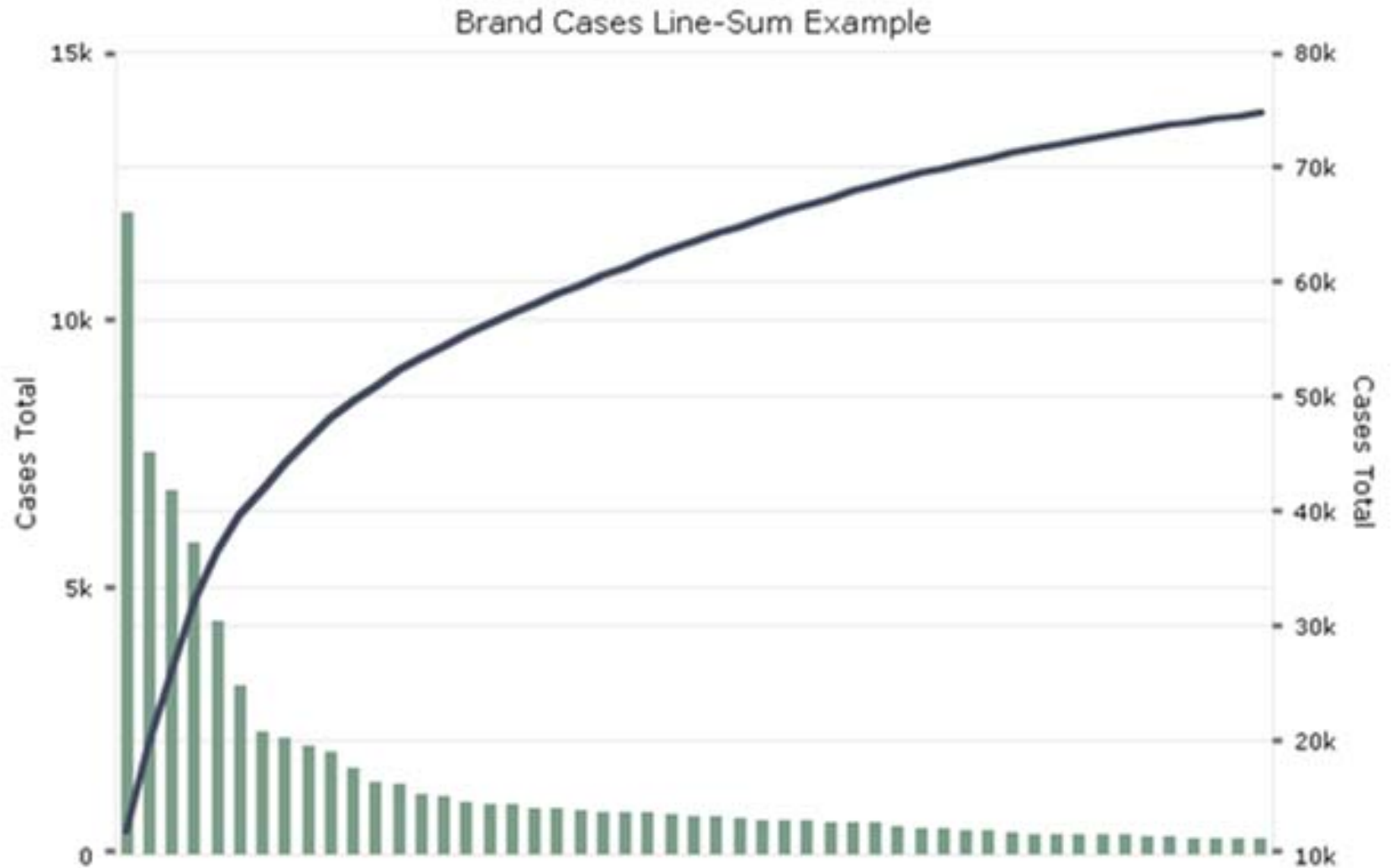
## Sum Plot

- Pareto-like display of cumulative contribution to a total
- Independent right and left scales





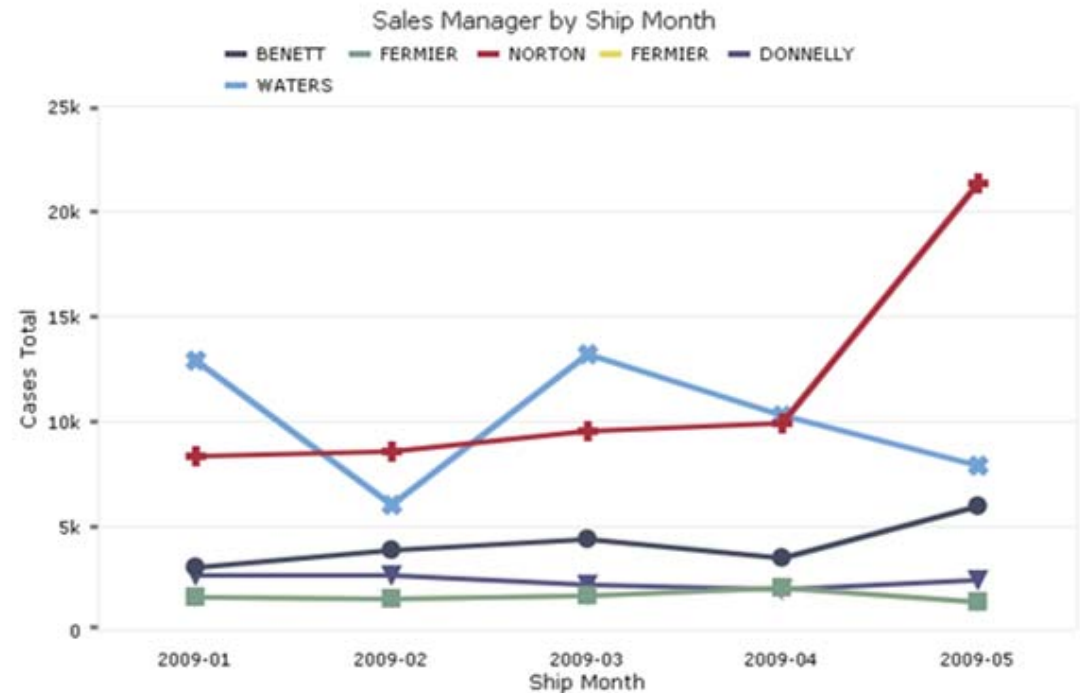
## Sum Plot





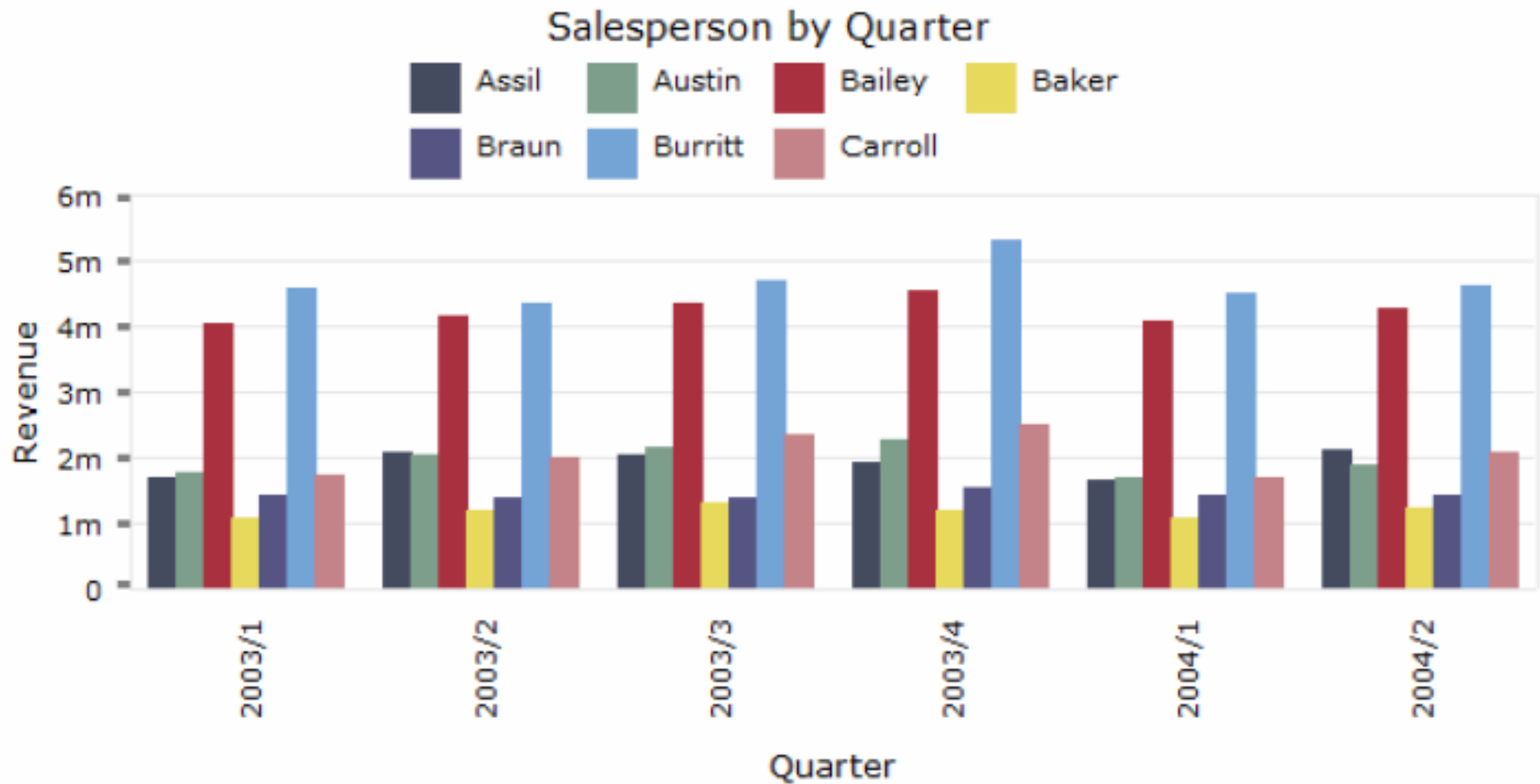
## CrossPlots

- Bar CrossPlot
- 3D Bar CrossPlot
- Line CrossPlot
- 3D Line CrossPlot
- Point CrossPlot
- Bubble CrossPlot



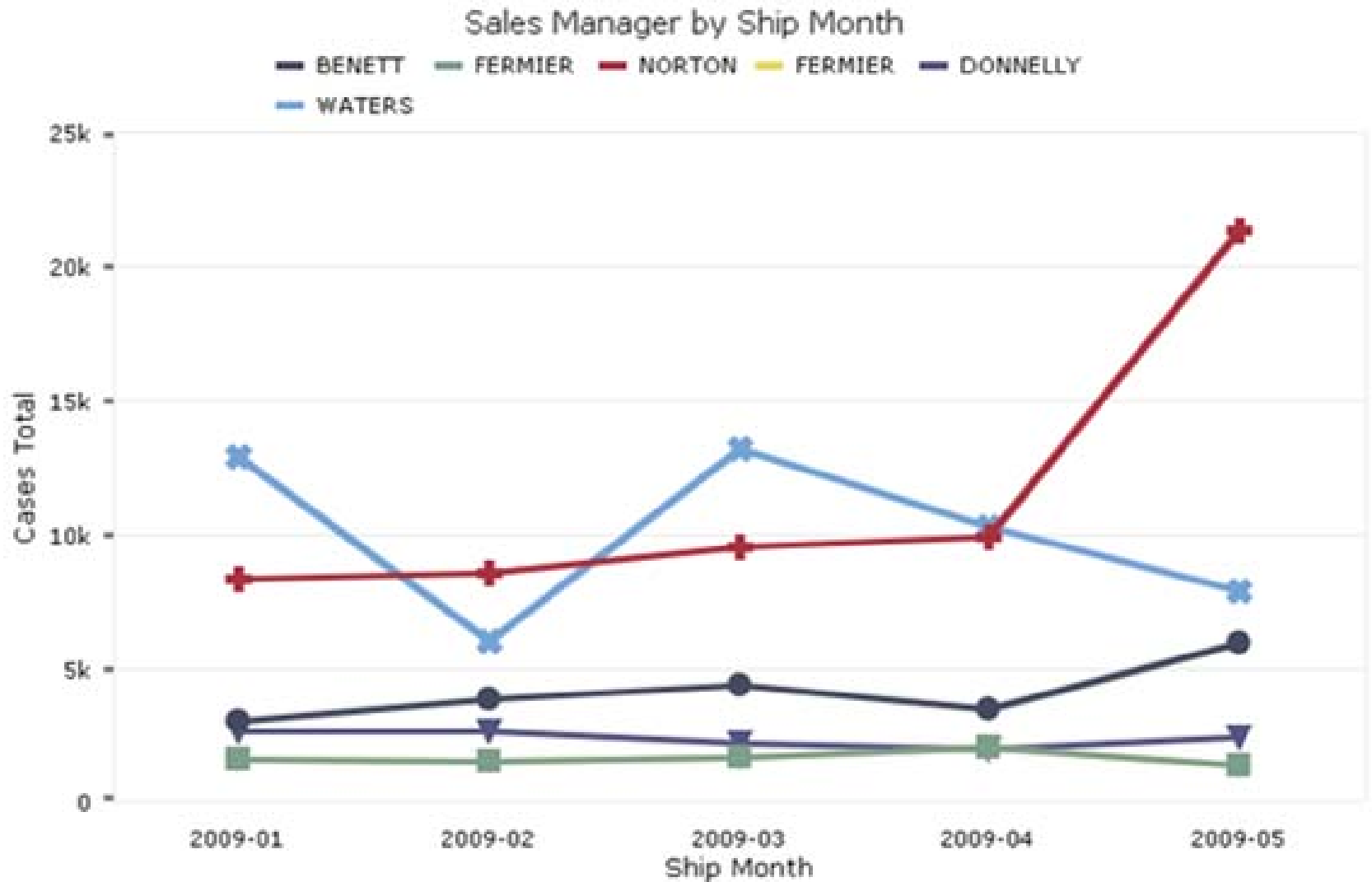


## Bar CrossPlot



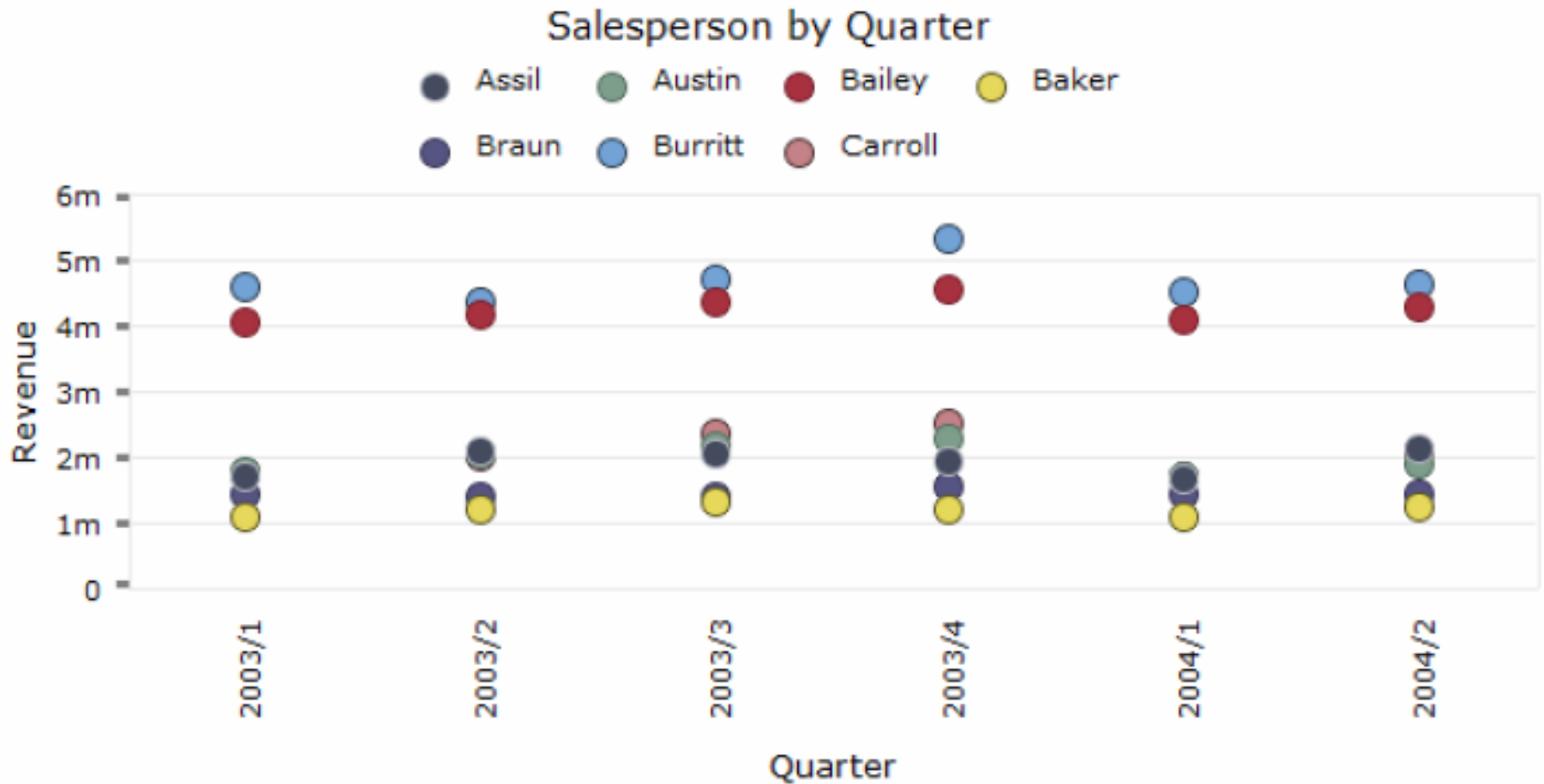


## Line CrossPlot



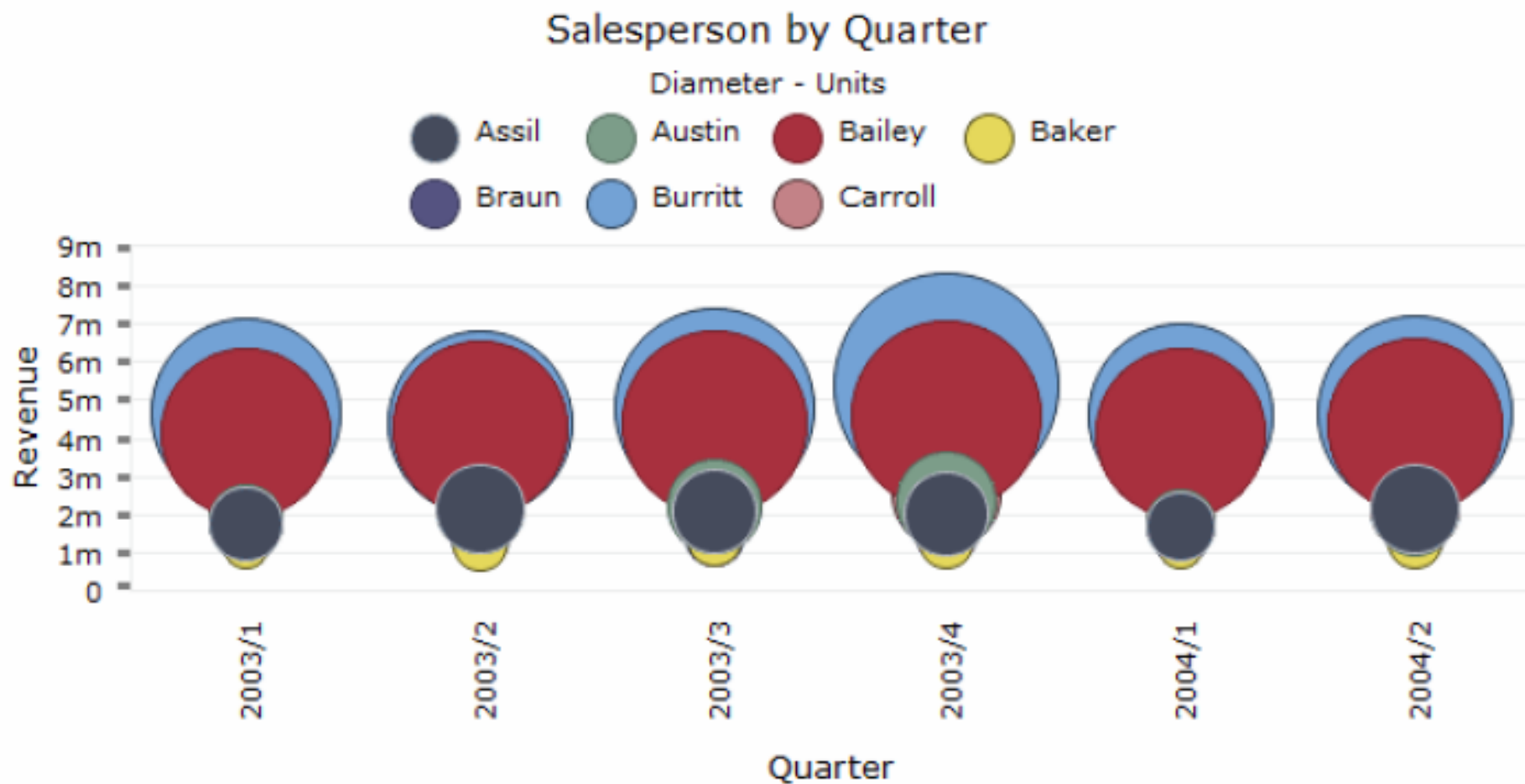


## Point CrossPlot





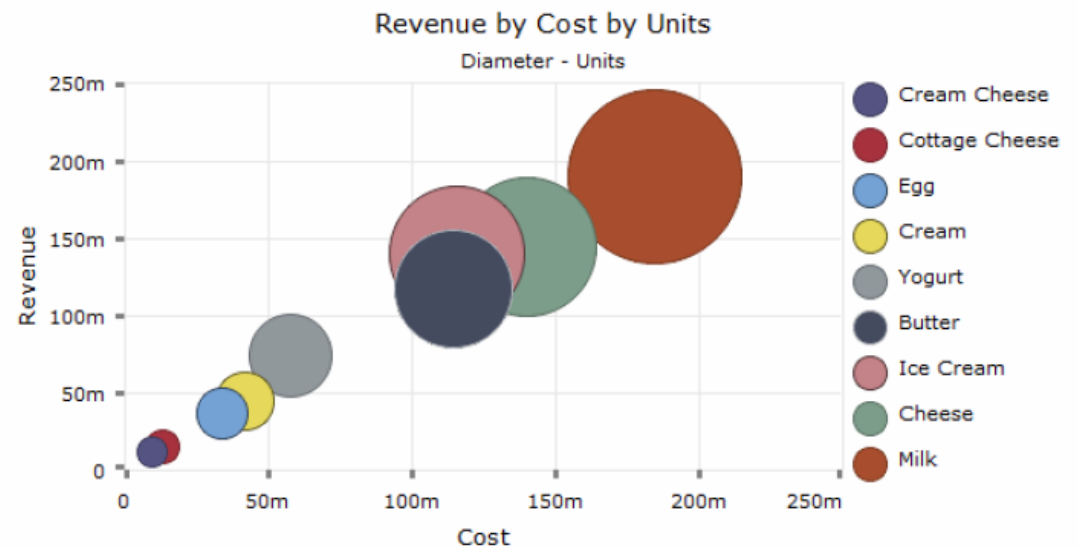
## Bubble CrossPlot





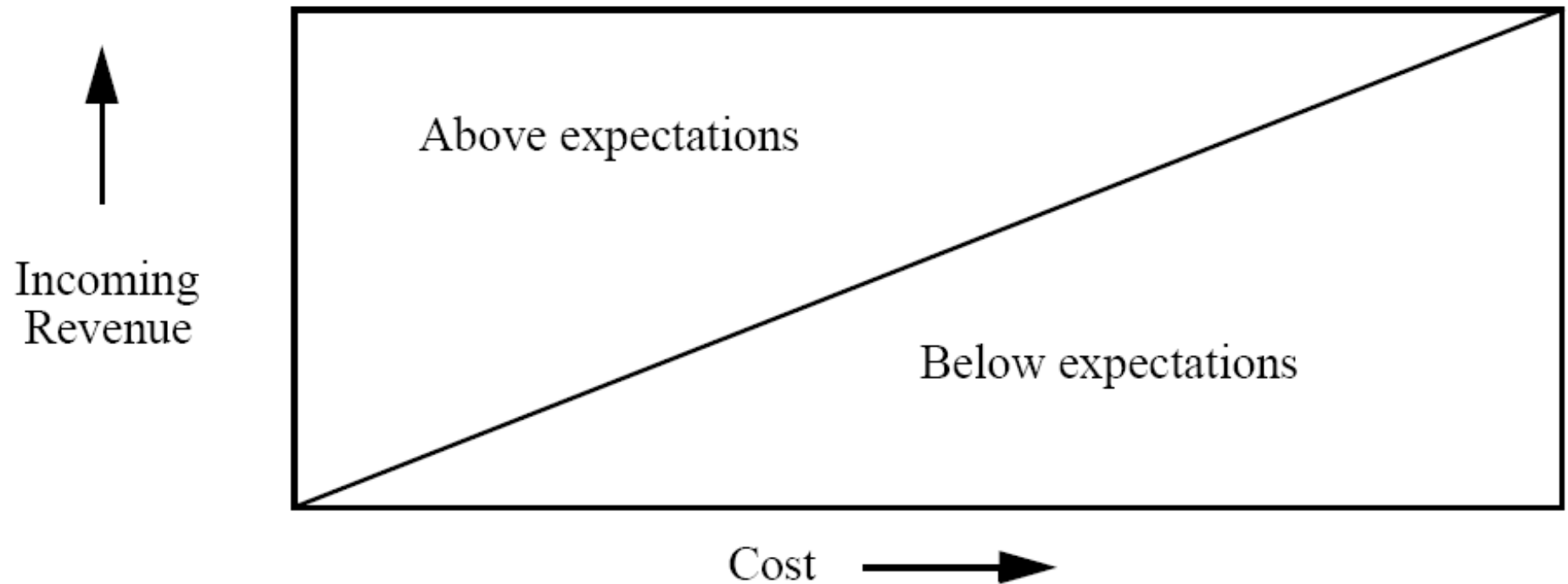
## Scatter Plots

- Scatter
- Scatter (Point)
- Scatter (Line)
- Scatter (Bubble)



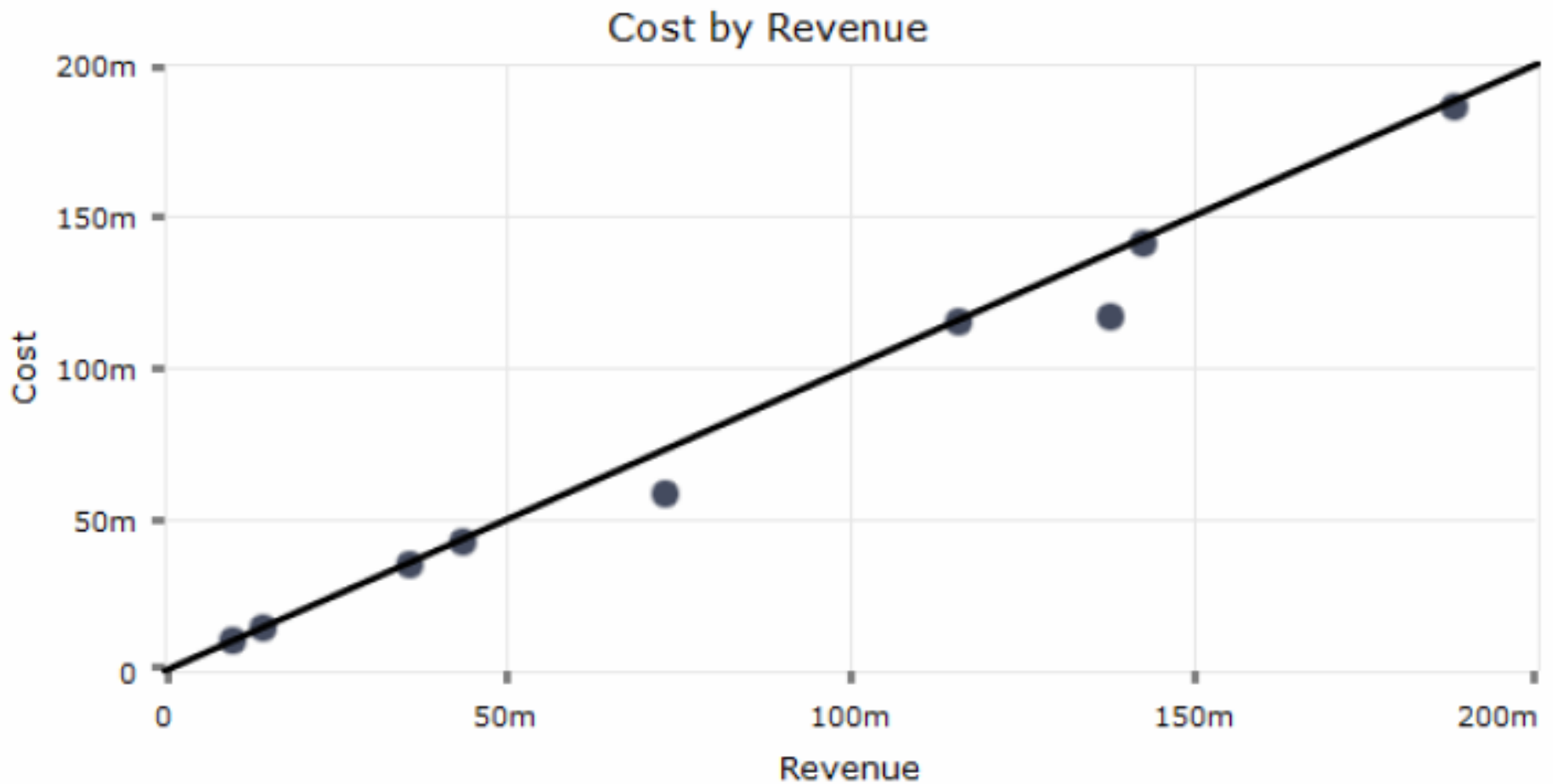


## Scatter Plots



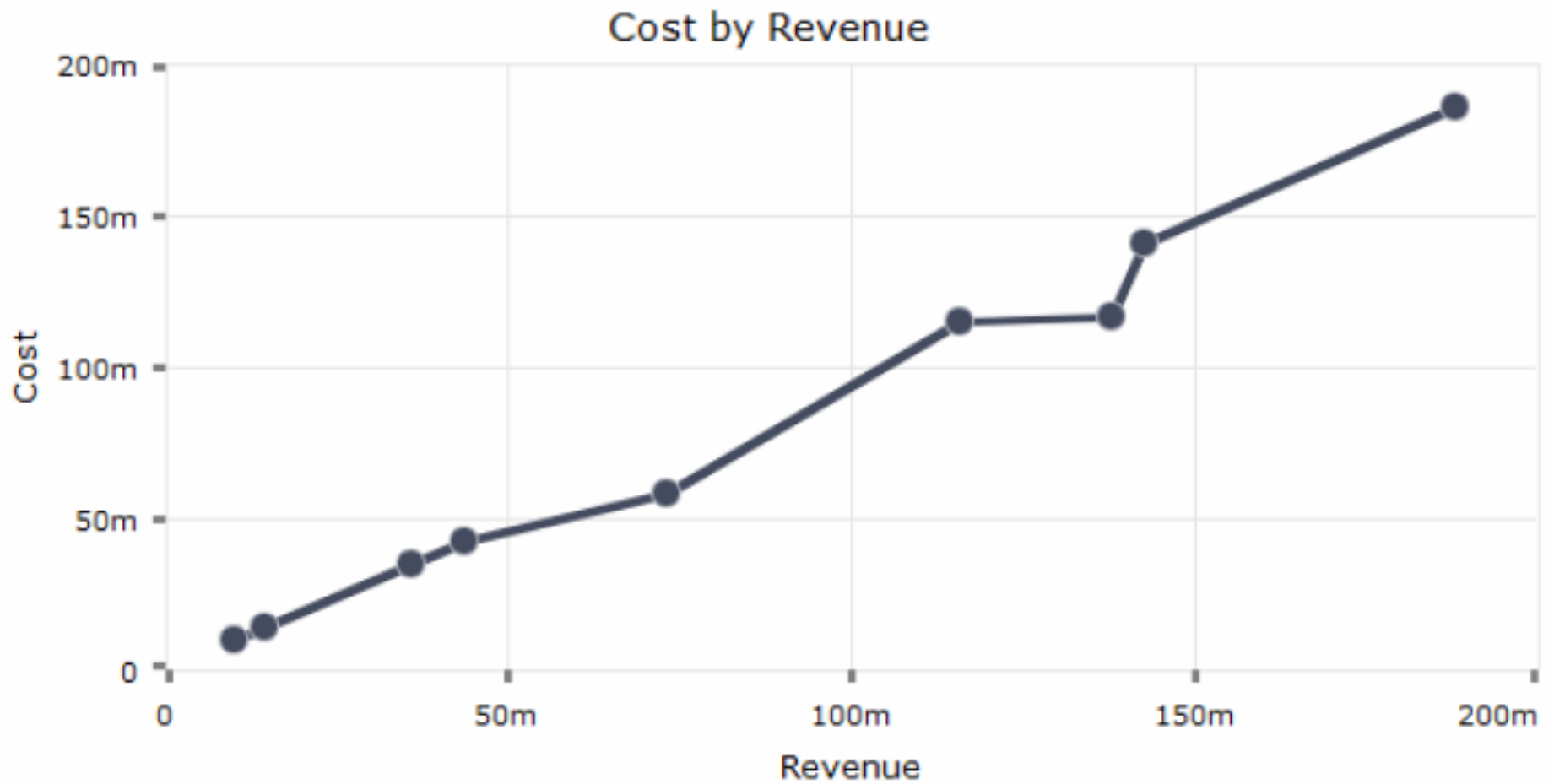


## Scatter (Point) Plot



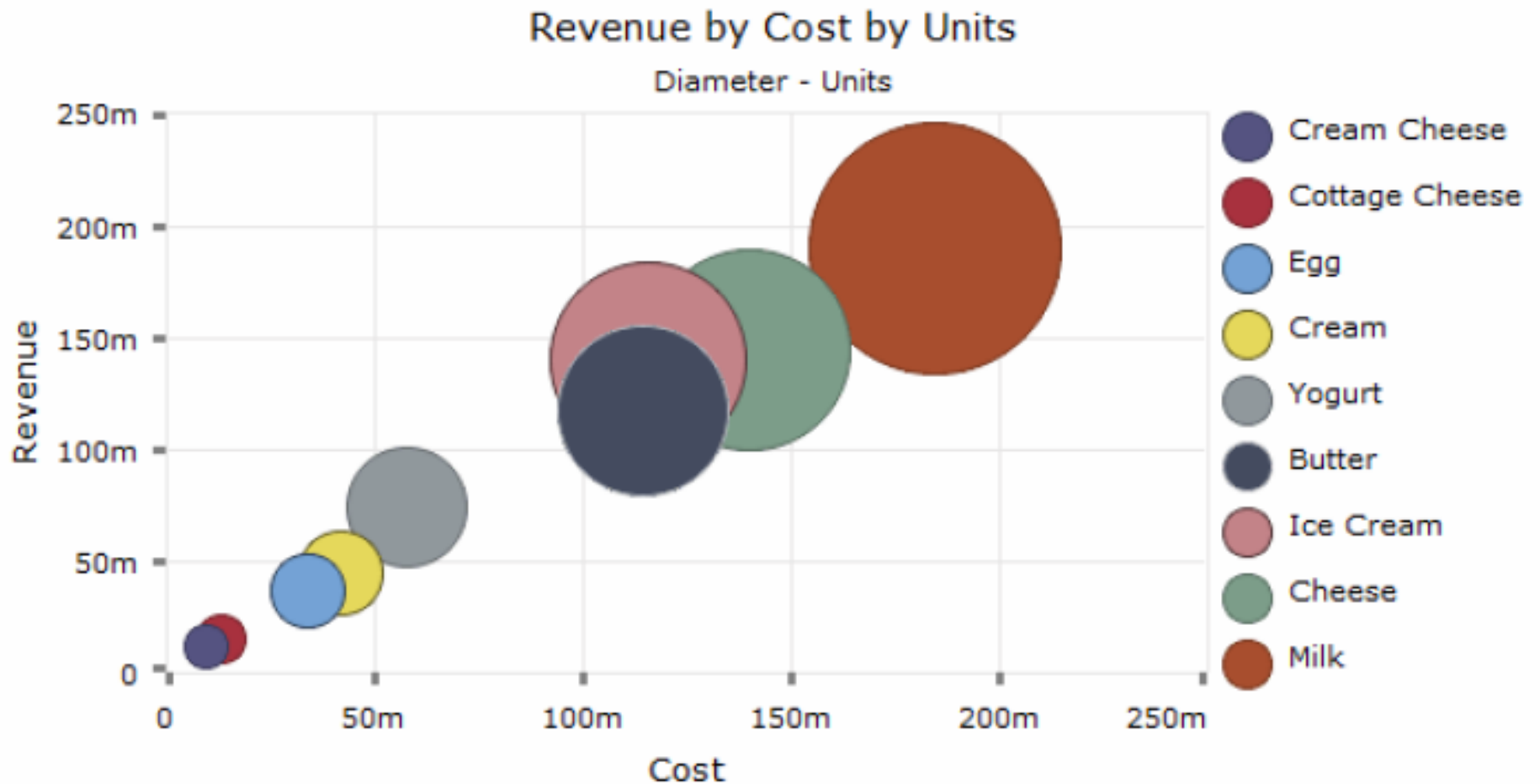


## Scatter (Line) Plot





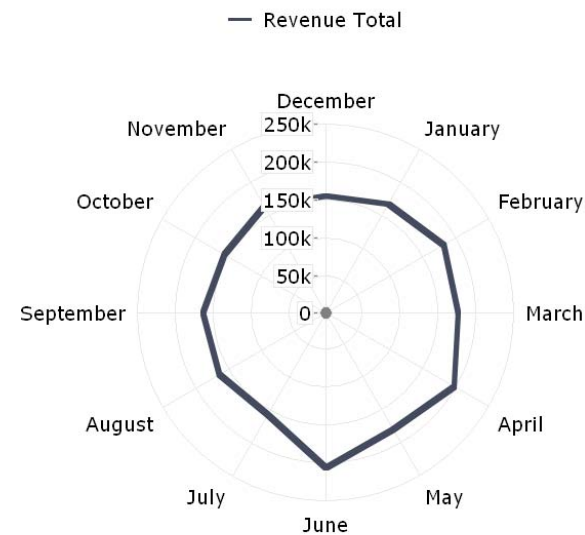
## Scatter Bubble Plots





## Radar (Spider) Graphs

- Radar Line Graph
- Radar Area Graph
- Radar Point Graph



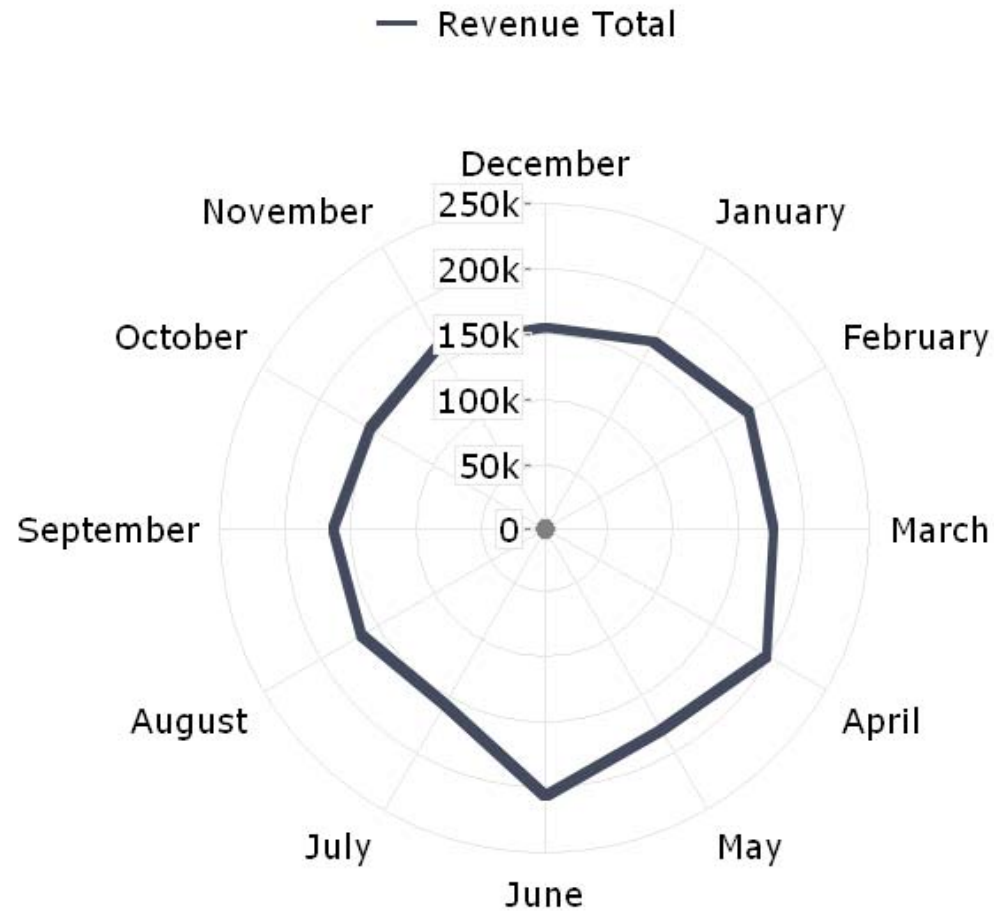


## Radar (Spider) Graphs

- Data is plotted radially from a center point
- Each data point has a vertical component - distance from center
- Can overlay goals and thresholds
- Variant of a basic line graph
- Useful for displaying departure from norm

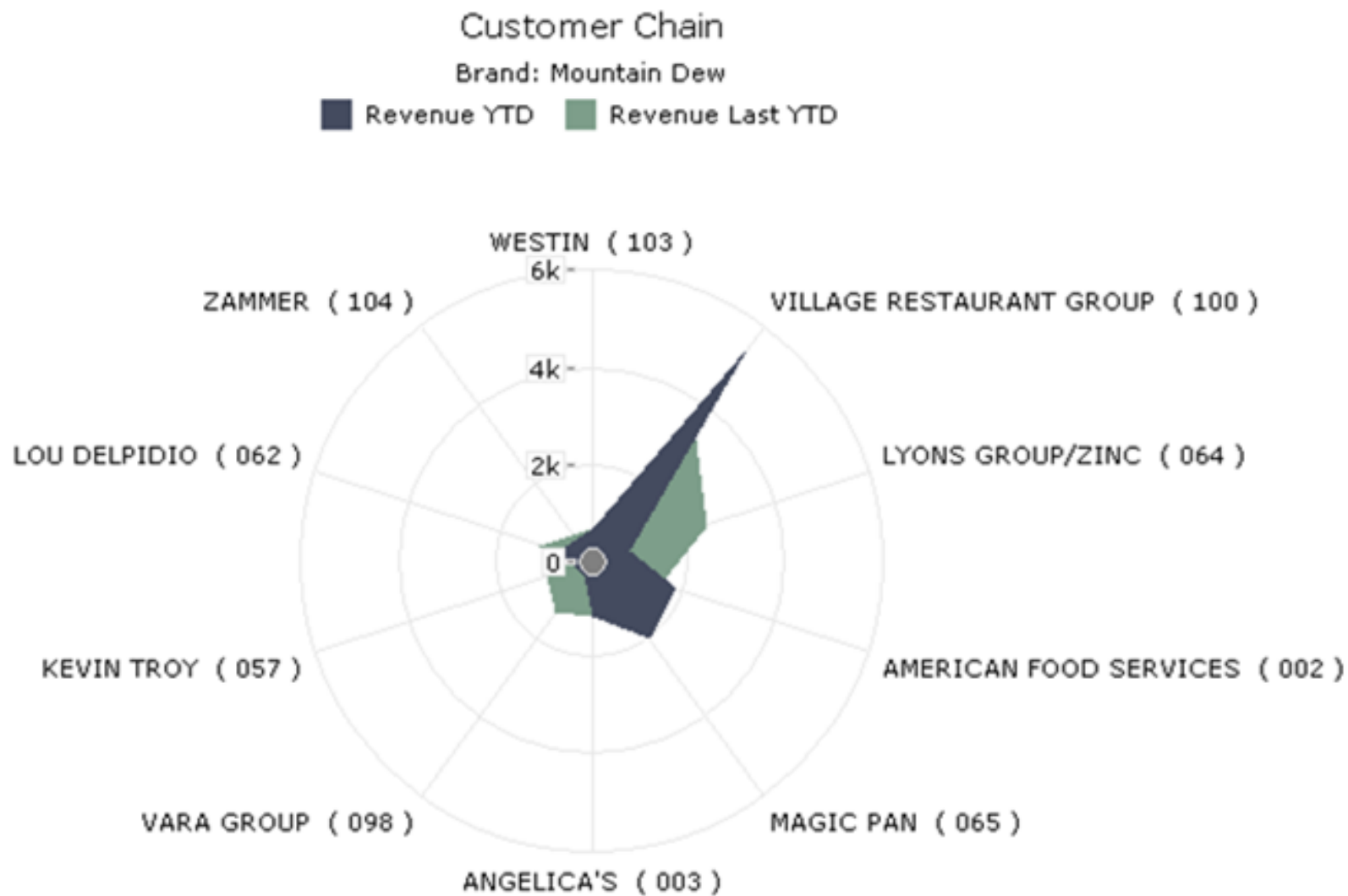


## Radar Line Graphs



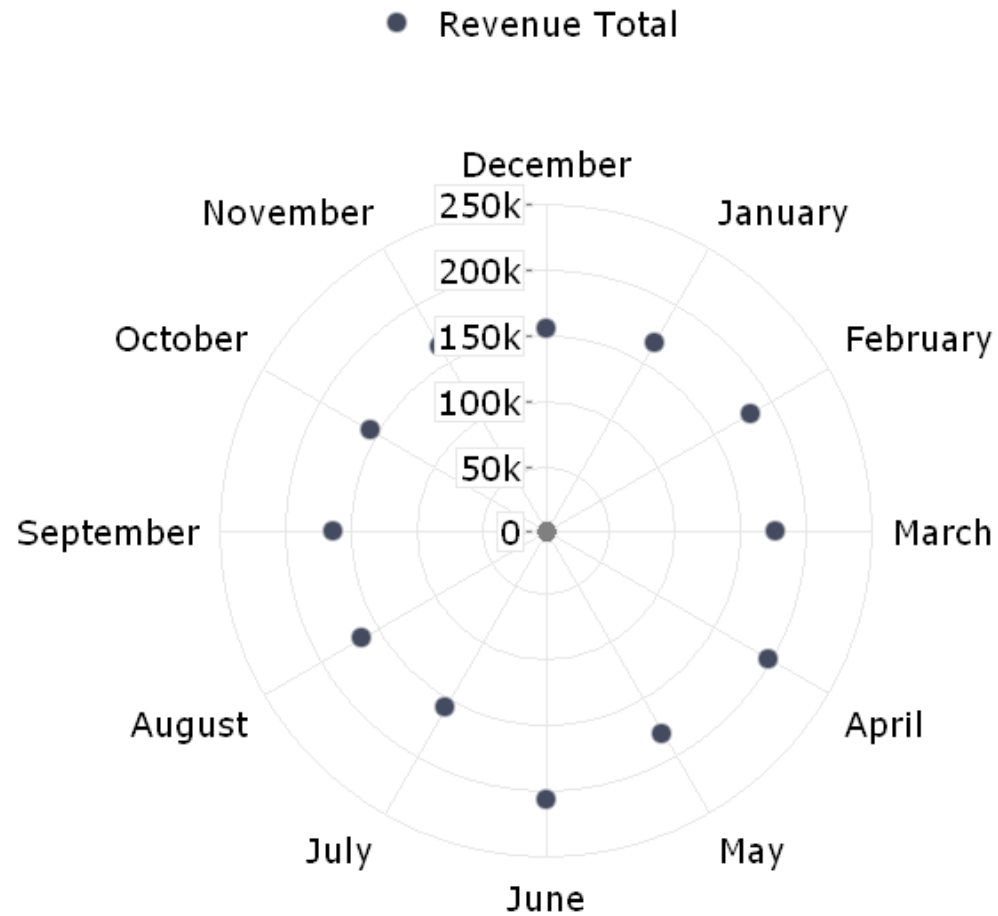


## Radar Area Graphs





## Radar Point Graphs





## Special Purpose Graphs

- Maps
- Calendar Charts
- Control Charts

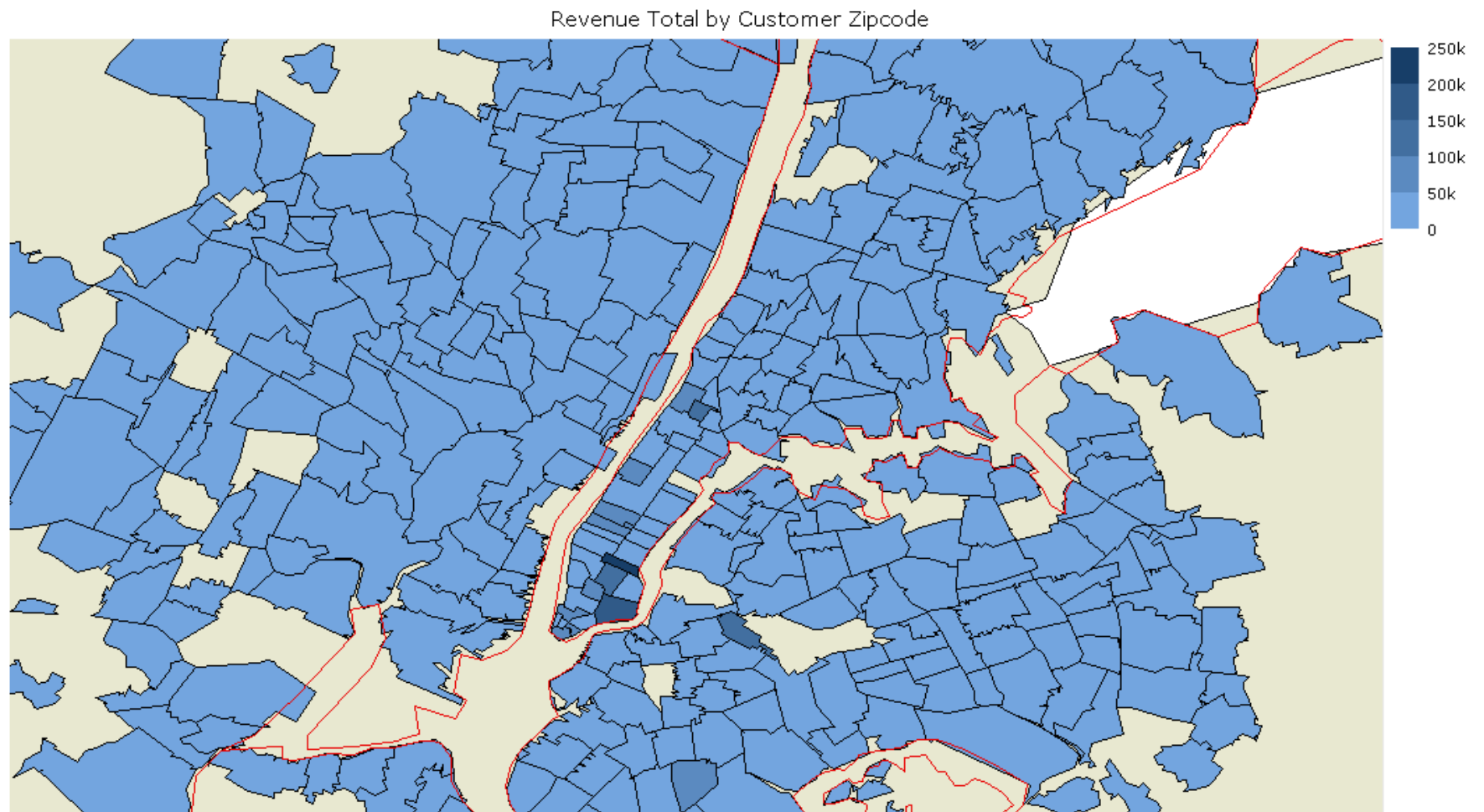


## Maps

- Boundary Maps
- Point Maps

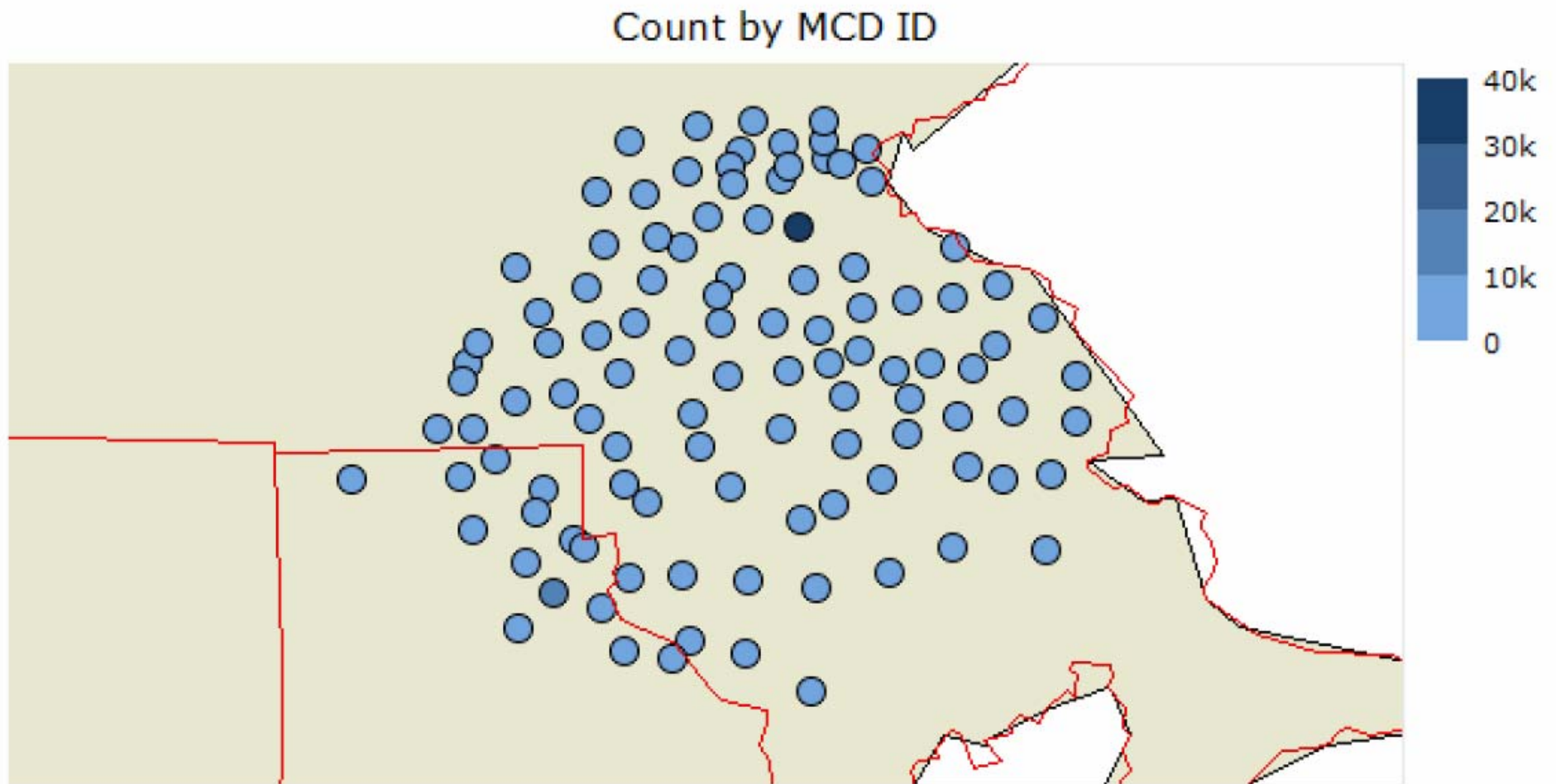


## Boundary Maps





## Point Maps



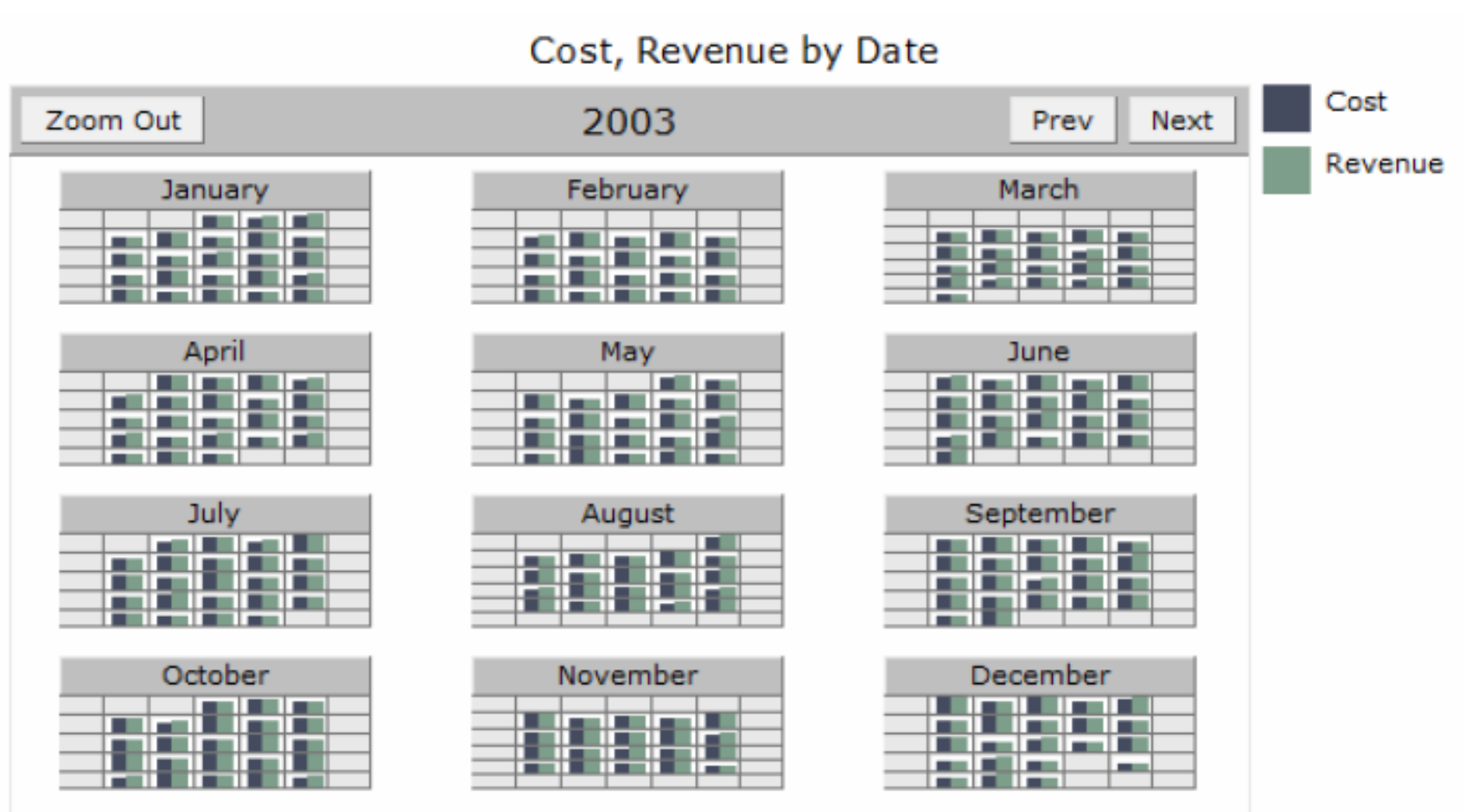


## Calendar Charts

- Calendar View with Bar Plots
- Calendar Active view
- Calendar Sorted view

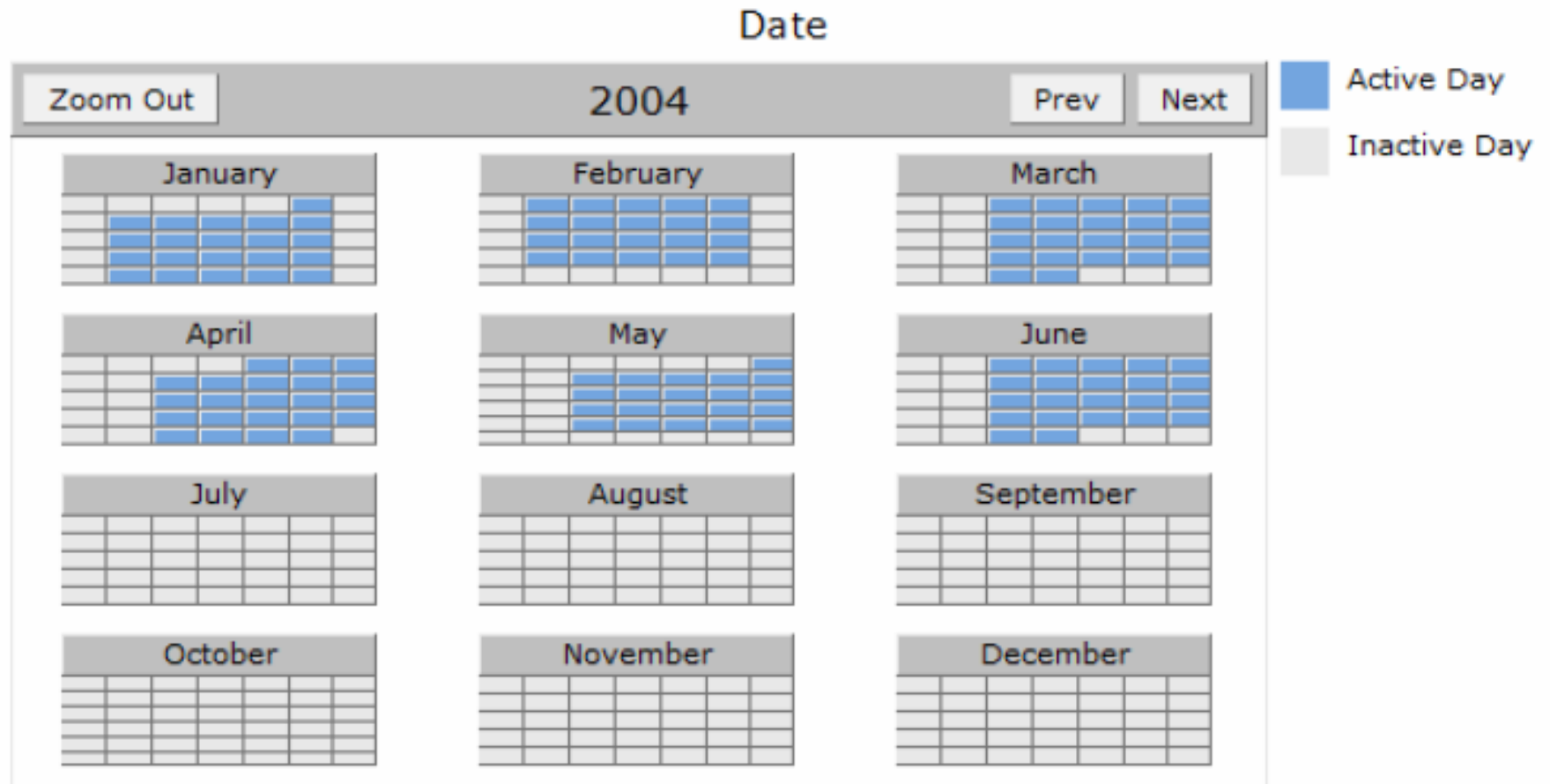


## Calendar View with Bar Plots





## Calendar Active View

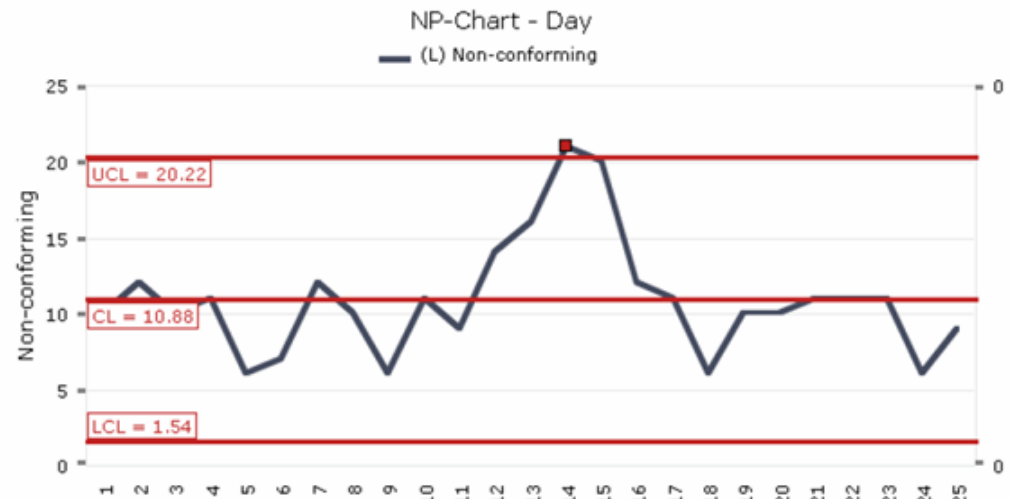






## Control Charts

- Attribute:
  - *P-Chart*
  - *NP-Chart*
  - *C-Chart*
  - *U-Chart*
- Variable
  - *MR-Chart*
  - *Individual MR-Chart*





## Objective #3

- Learn techniques for enhancing your graph displays

*“Data graphics should draw the viewer’s attention to the sense and substance of data, not to something else”*

(Tufte, 1983)



## Eliminate Graph Clutter

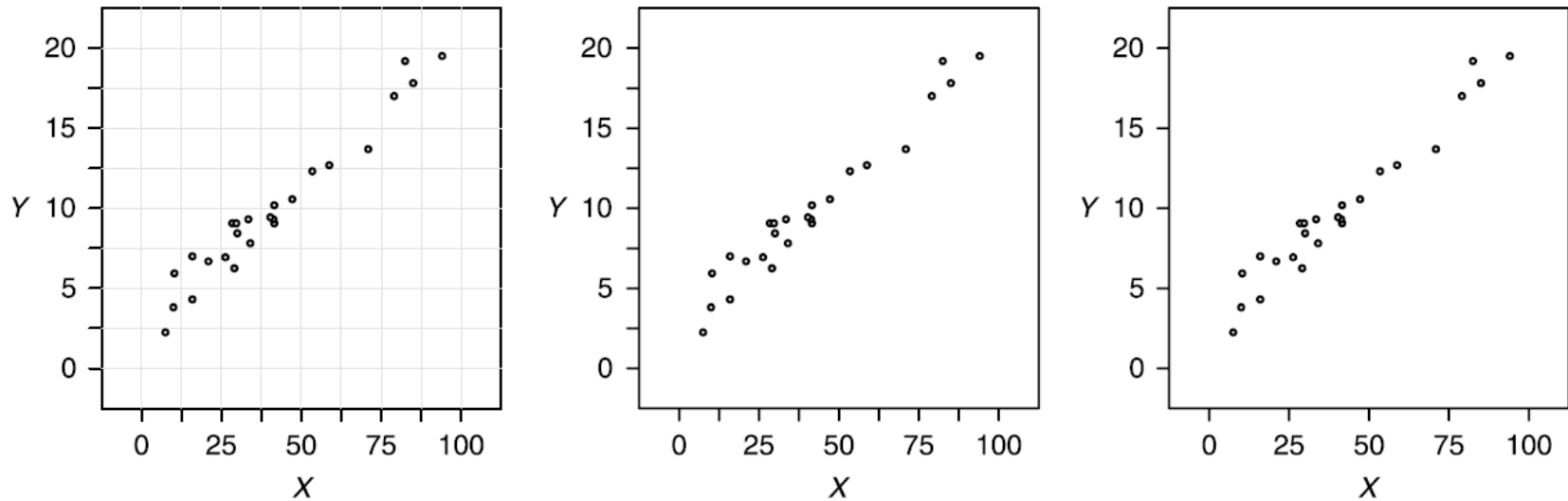


Figure 2.3 Revising graphs to show more data  
(Myatt & Johnson, 2009)



## Aspect Ratio

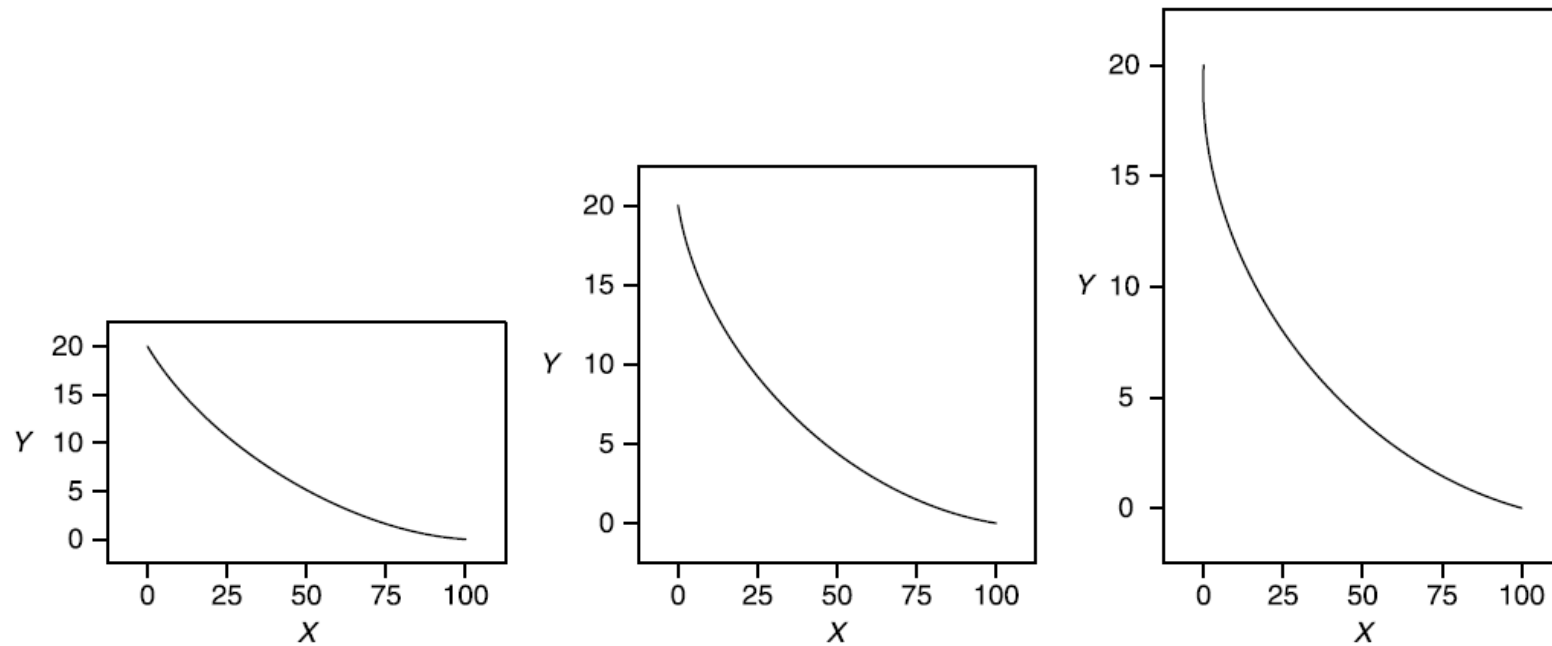


Figure 2.4 Making a more dramatic statement by adjusting only the aspect ratio  
(Myatt & Johnson, 2009)



## Horizontal Scaling

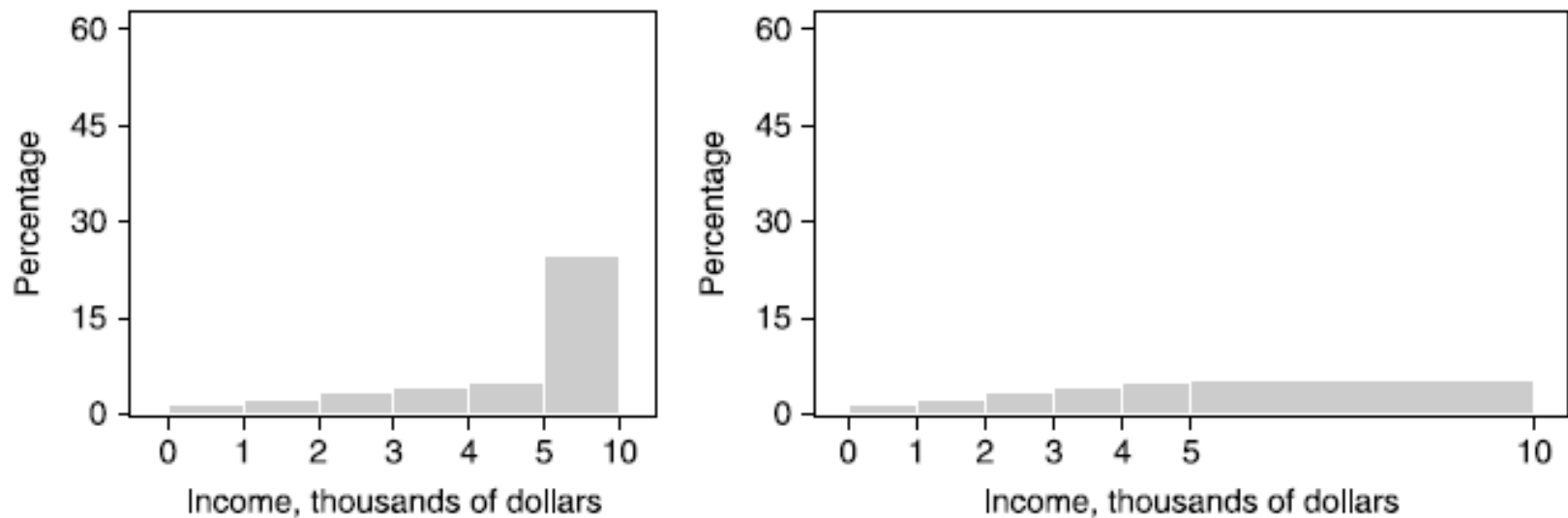


Figure 2.5 An irregular scale distorts magnitudes of unit values  
(Myatt & Johnson, 2009)



## Vertical Scaling

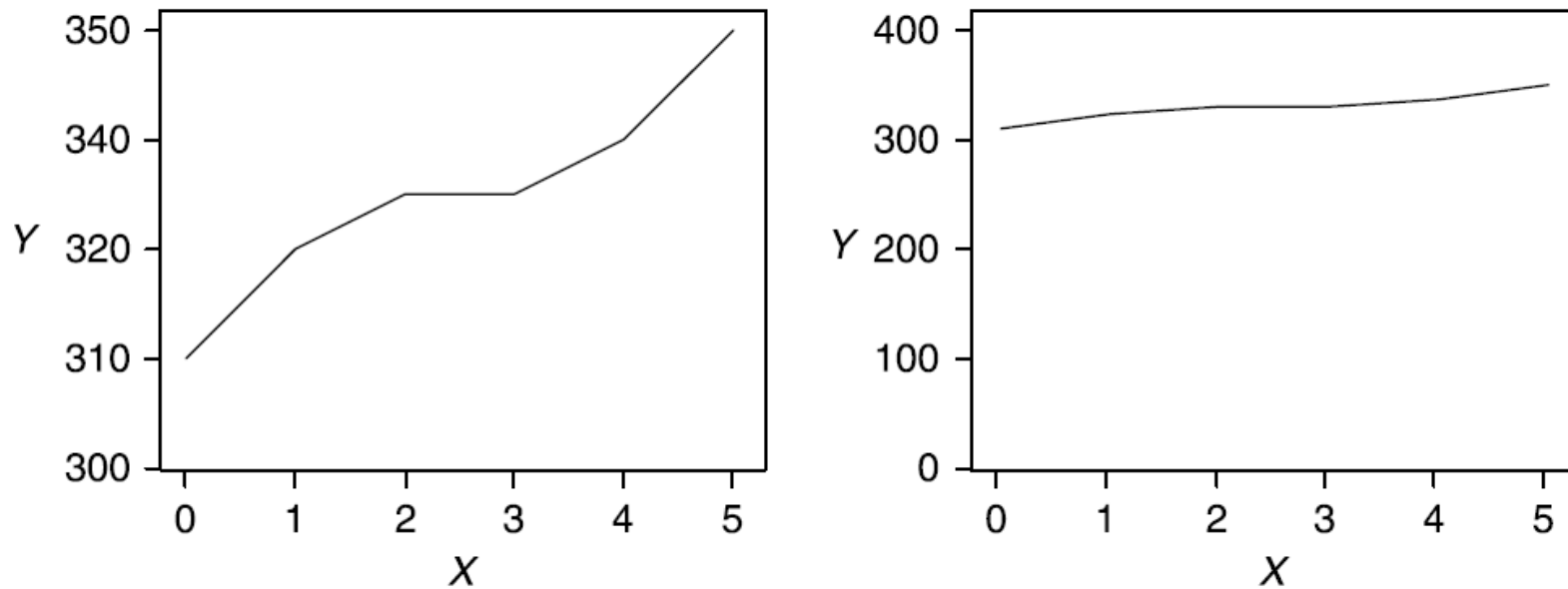
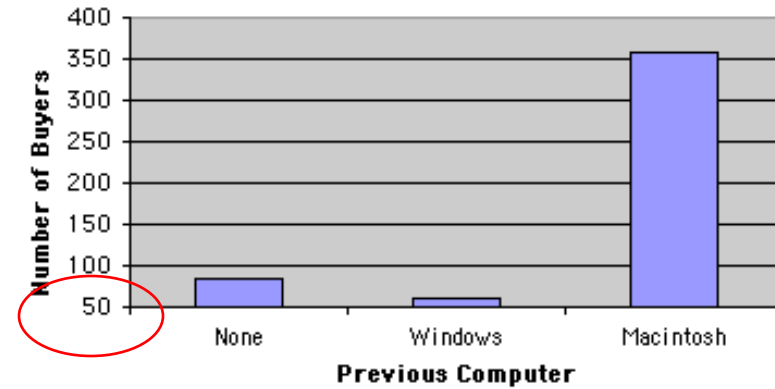
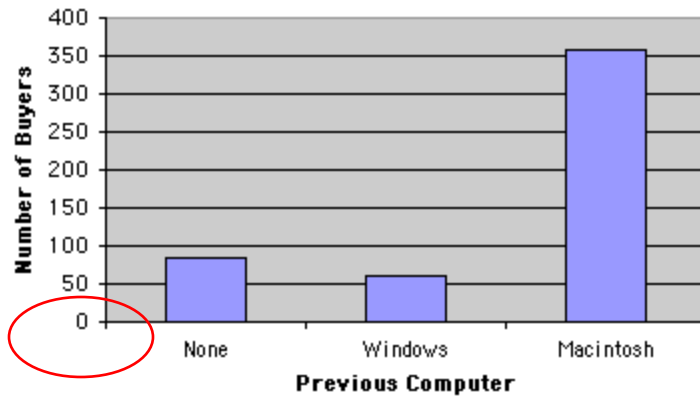


Figure 2.6 Increasing the range of a scale may hide important detail  
(Myatt & Johnson, 2009)



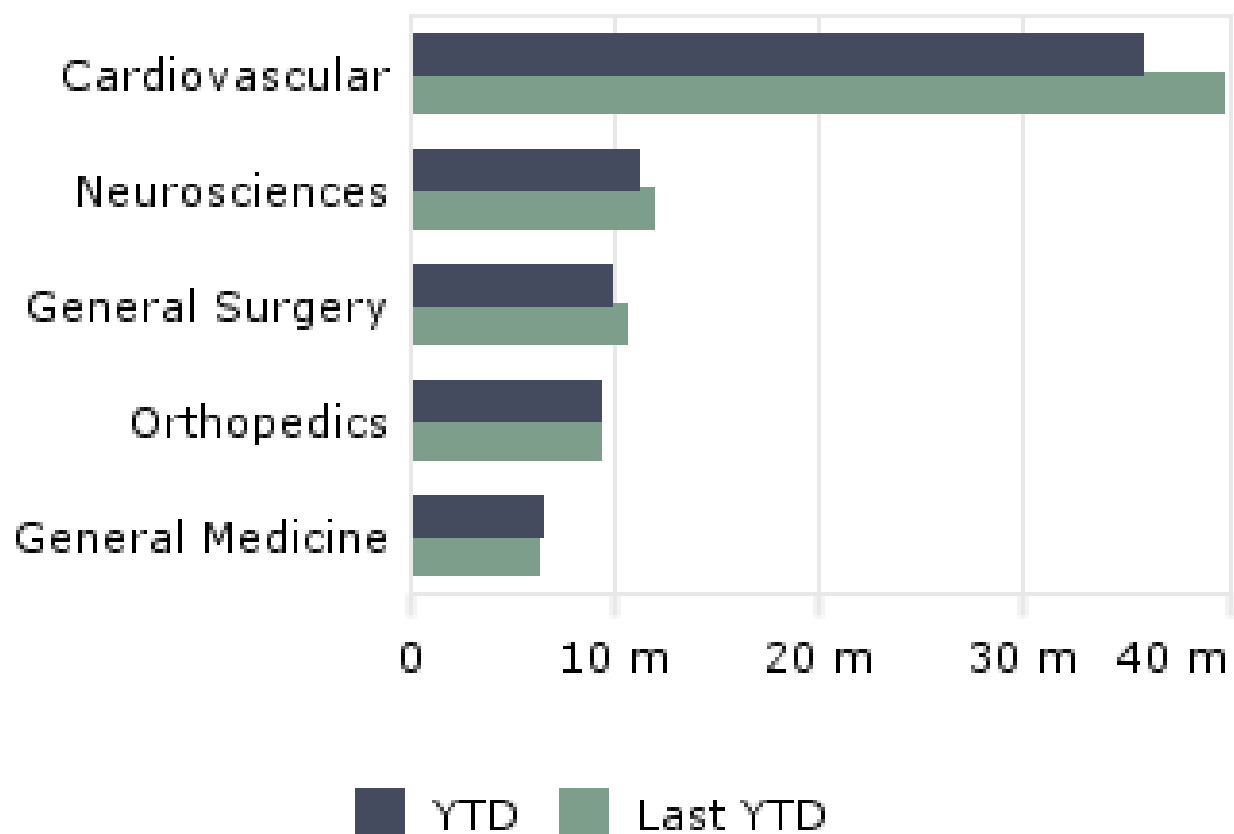
## Data Distortion via Improper Scaling





## Barely Visible Gridlines

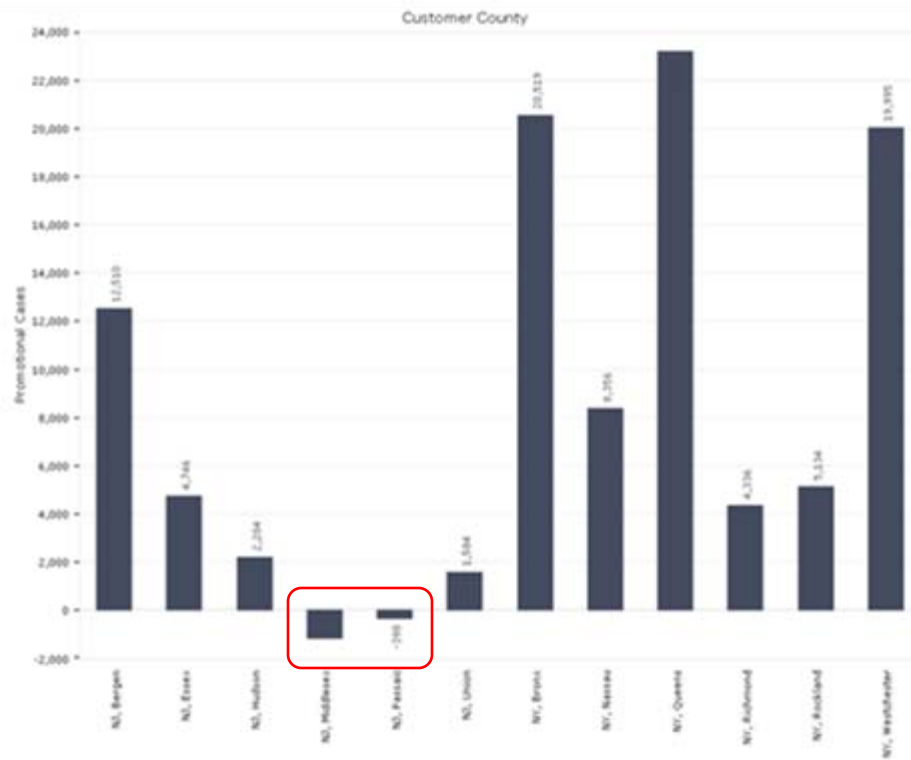
### Gross Margin by Hospital Service





# METHODOLOGY FOR GRAPH SELECTION

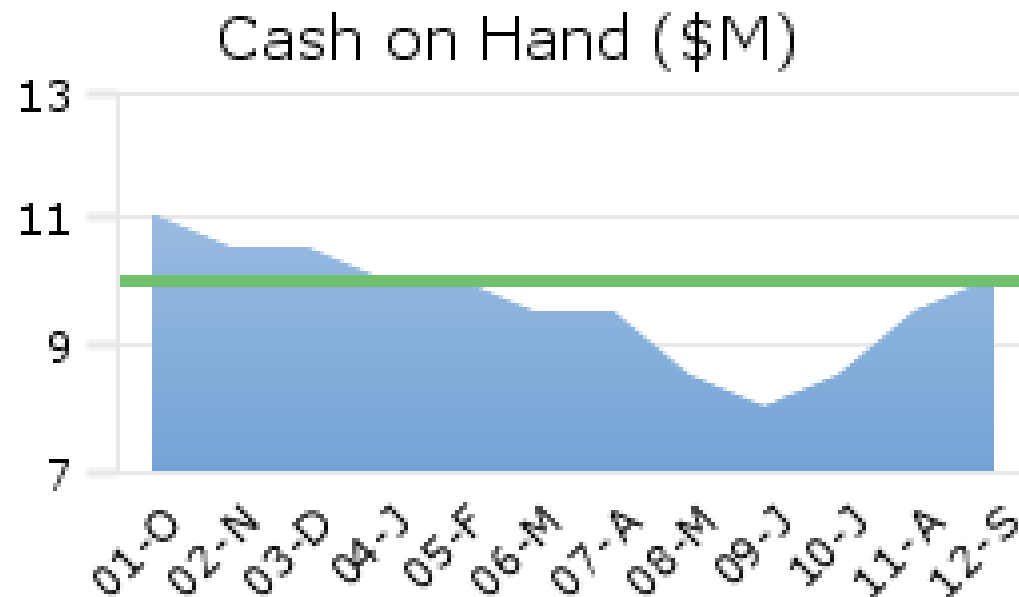
## Graph Orientation can Highlight Outliers





## Displaying Goals in Graphs

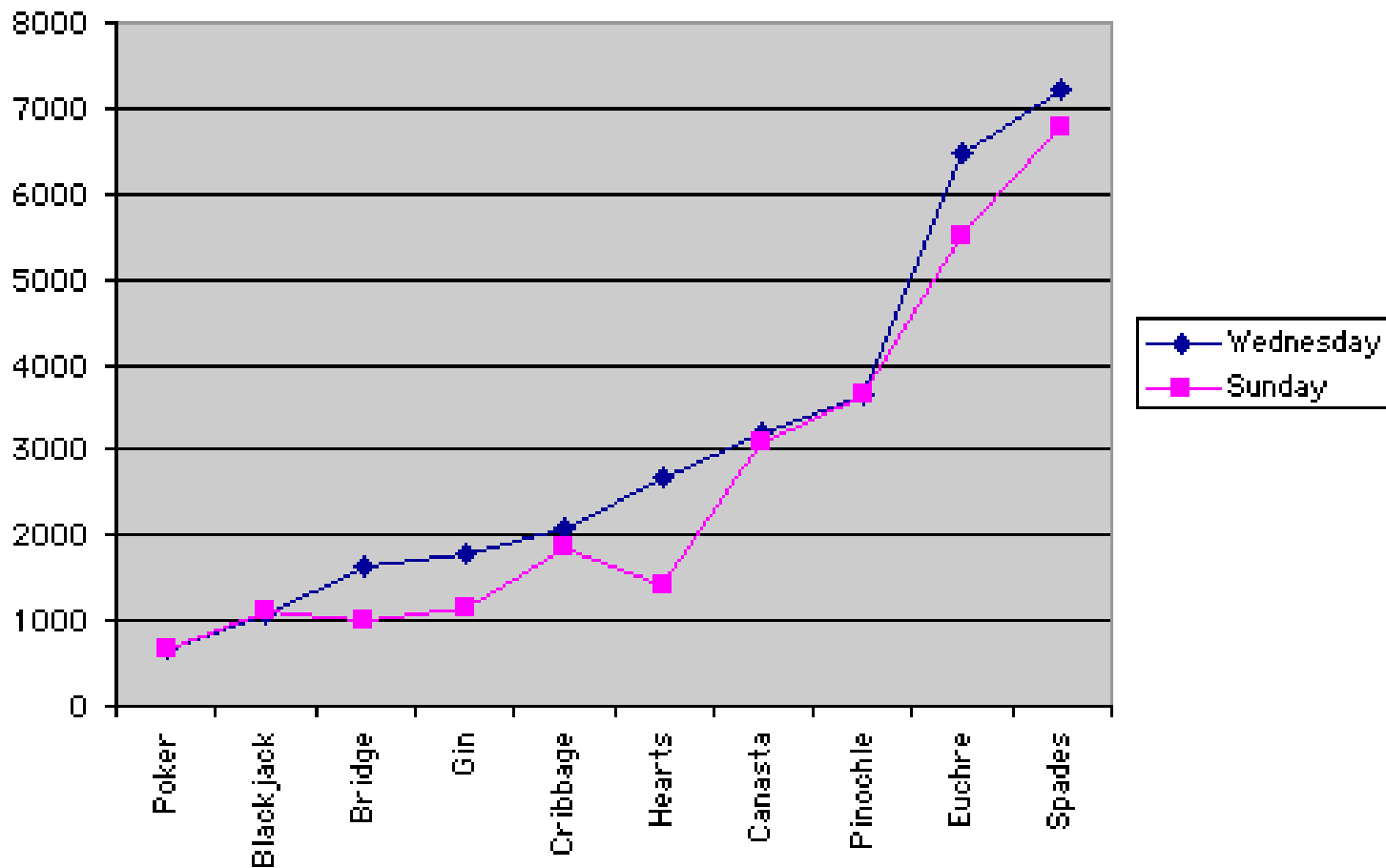
- Dashboard designer can superimpose goals or statistics such as mean or median
- Provides important context to graph





## Inappropriate Line Graph

- X-axis contains qualitative variables:





## Objective #4

- Discover which graph types are supported in each Diver Solution component



## Graphing in The Diver Solution

### Graphics



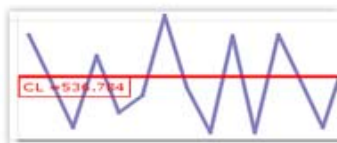
Basic Plots



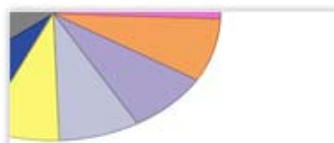
Calendar Plots



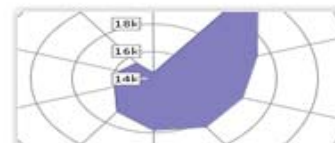
Cross Plots



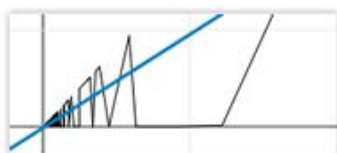
Control Charts



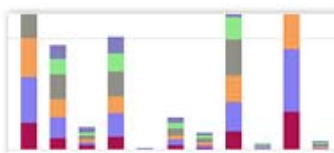
Pie Charts



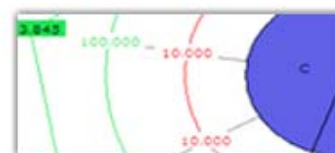
Radar Graphs



Scatter Plots



Stack Plots



Spider Diagram



Diver Solution includes a comprehensive graphics library with 38 individual graphic types (in addition to dashboard indicators and measure portlets). Users can choose from this library to display data in the most appropriate and visually pleasing way.





## Additional Diver Graphs

- Calendar Plots
- Cross Plots
- Control Charts
- Maps
- Pie Plots
- Radar Graphs
- Scatter Plots
- Stack Plots



## DivePort Graphs

- All graph types supported, but maps are static, not interactive



## Graphs supported in NetDiver

<b>Graphic Type</b>	<b># of Dimensions</b>	<b># of Summaries</b>	<b>Comments</b>
Basic Plot	1	Up to 8	Use Flip Axes if the Dimension has a large number of values.
Cross	2	1	Limited to 4 values of the Dimension inside the plot.
Stack	2	1	The stacked Dimension should have a small number of values.
Pie	1	1	Dimension should have a limited number of values since only 15 will display.
Scatter	1	2	Use to show relationship between two Summaries on a selected Dimension.



## Great Books on Data Visualization

- E.R. Tufte (1983), *The Visual Display of Quantitative Information*.
- G.J. Myatt & W.P. Johnson (2009), *Making Sense of Data*.
- Chun-hou Chen (2008), *Handbook of Data Visualization*.