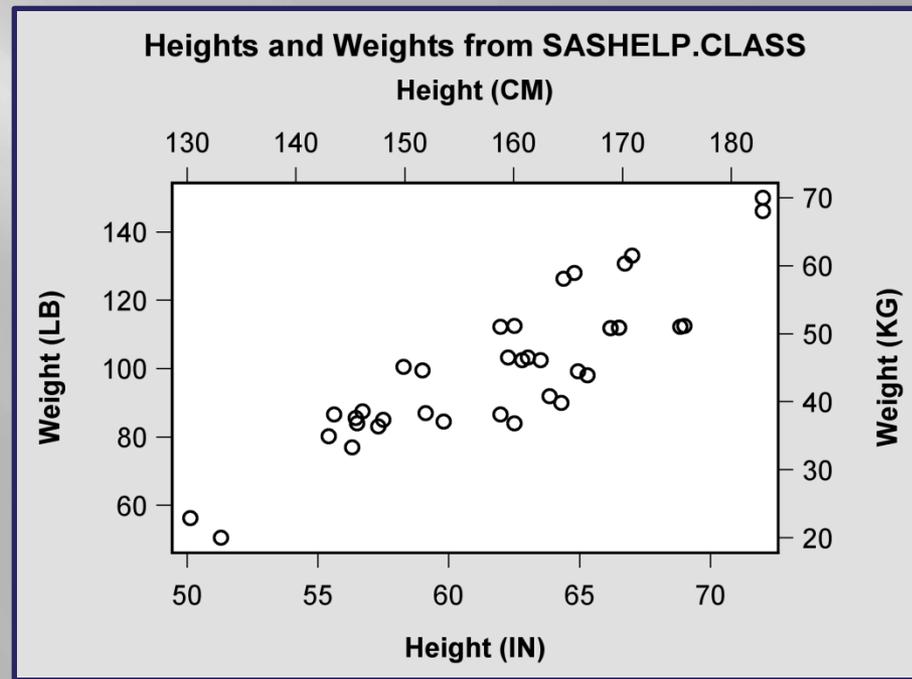
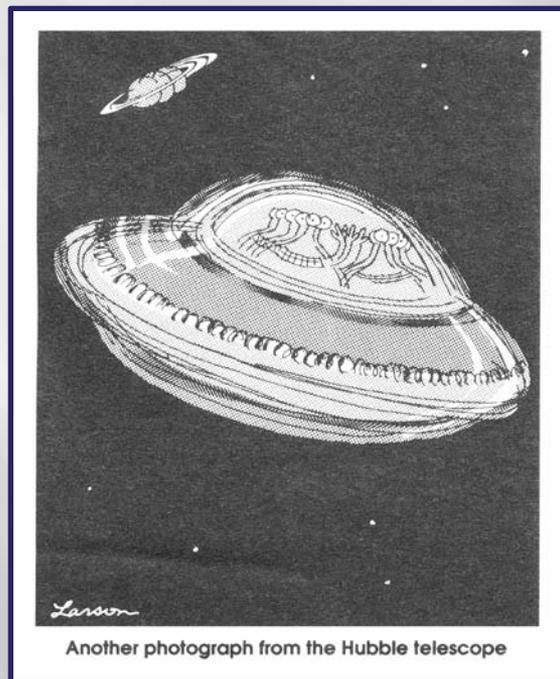


Aligning Parallel Axes in SAS® GTL

Perry Watts

Stakana Analytics

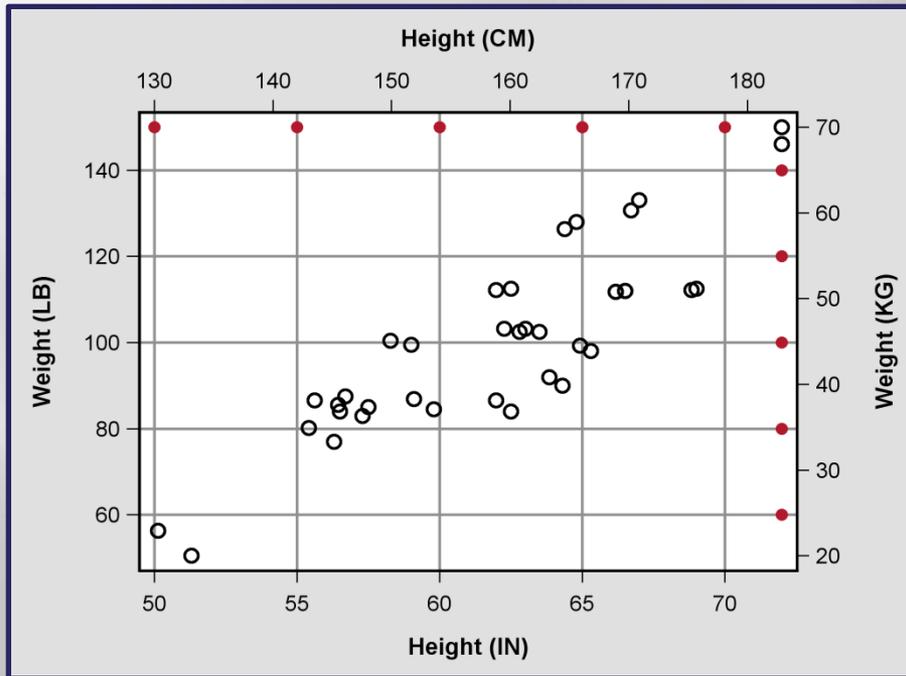
pwatts@stakana.com



What do these Images have in Common?
They are Both out of Focus.

Introduction

- While the Hubble telescope's focus problem was caused by an incorrectly ground mirror, we see double again with scatter plots from SASHELP.CLASS. The opposing axes for heights and weights are out of alignment.
- Unfortunately, Graph Template Language (GTL) does not have an **Align=True | False** axis option.



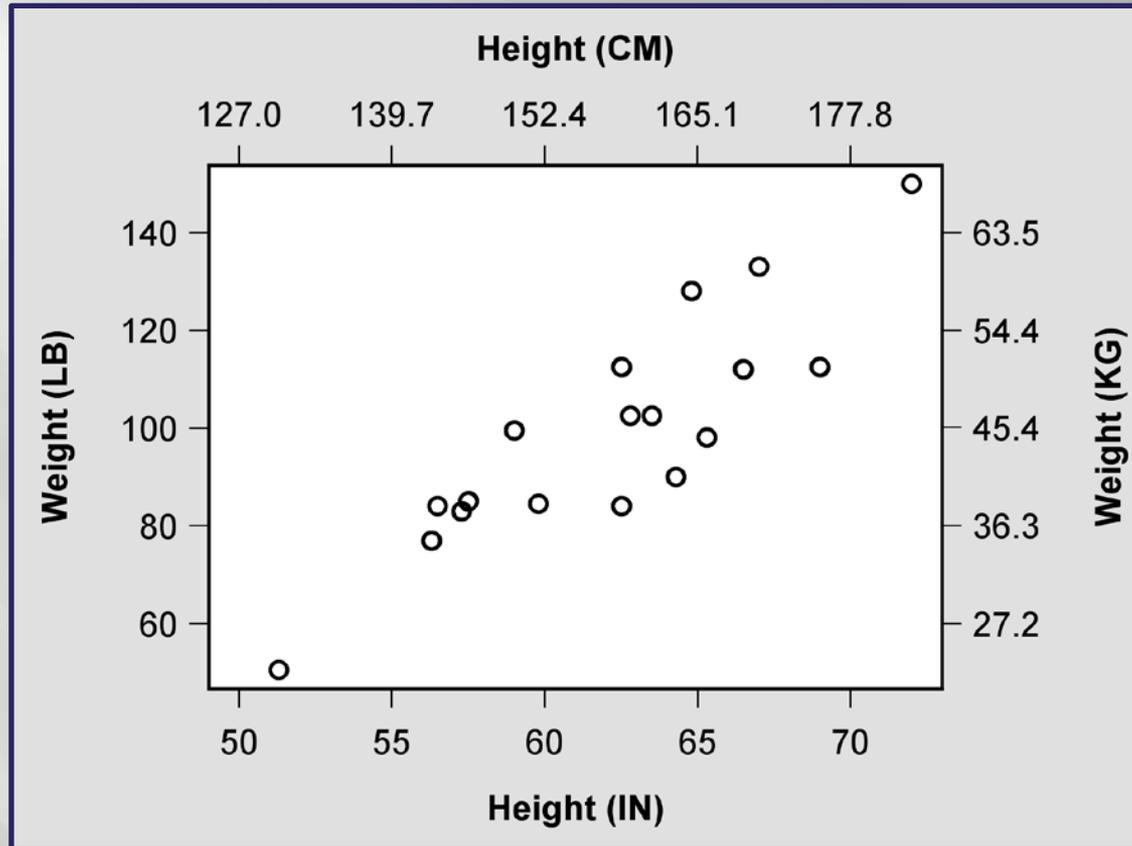
Look at the unaligned gridlines

- Instead defaults for two overlaid scatter plots are calculated independently in separate plotting statements:

```
layout overlay/ ...;  
  scatterplot x=Height y=Weight/  
             xaxis=X yaxis=Y;  
  scatterplot x=HeightCM  
             y=WeightKG /  
             xaxis=X2 yaxis=Y2;  
endlayout;
```

- Using parallel axes is a good idea here. Only the USA, Myanmar and Liberia use the English System.

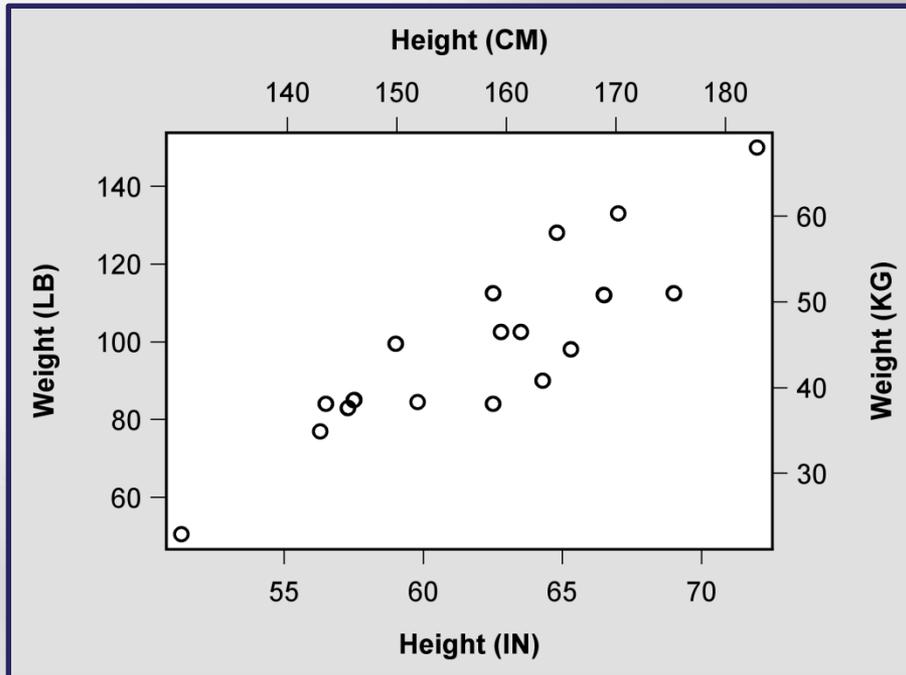
Aligning Axes for Heights and Weights: Fix #1



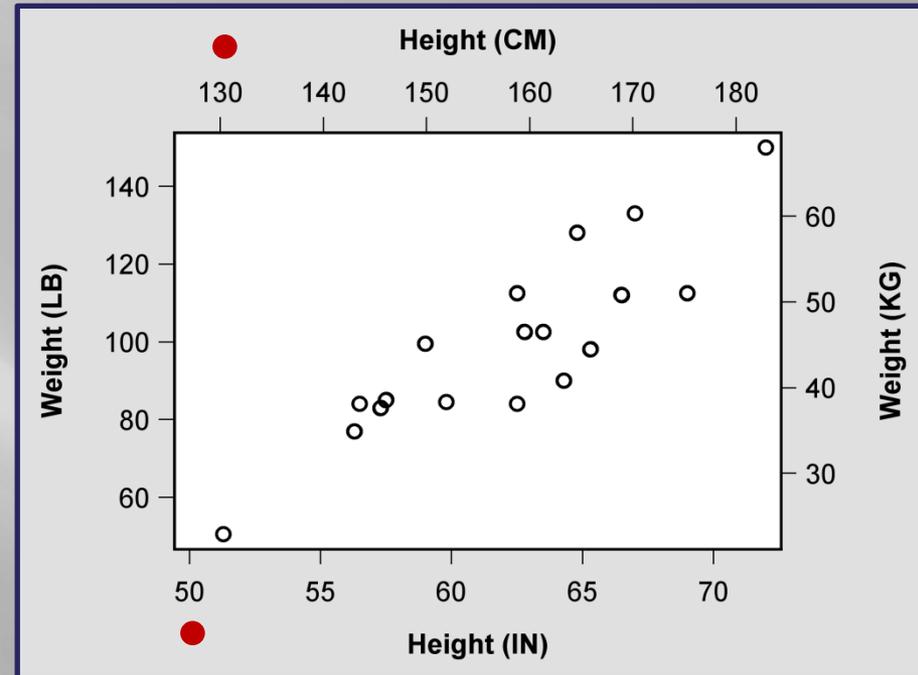
- Fix #1 is less than optimal. It is obvious that the fractional *centimeters* and *kilograms* are derived from integer *inches* and *pounds*.
- Also each tick value for the metric version of heights and weights in this graph must be individually calculated and plotted with the `TICKVALUELIST` sub-option in GTL. Therefore Fix #1 can't be automated.

Aligning Heights and Weights: Fixes #2, #3

Fix #2

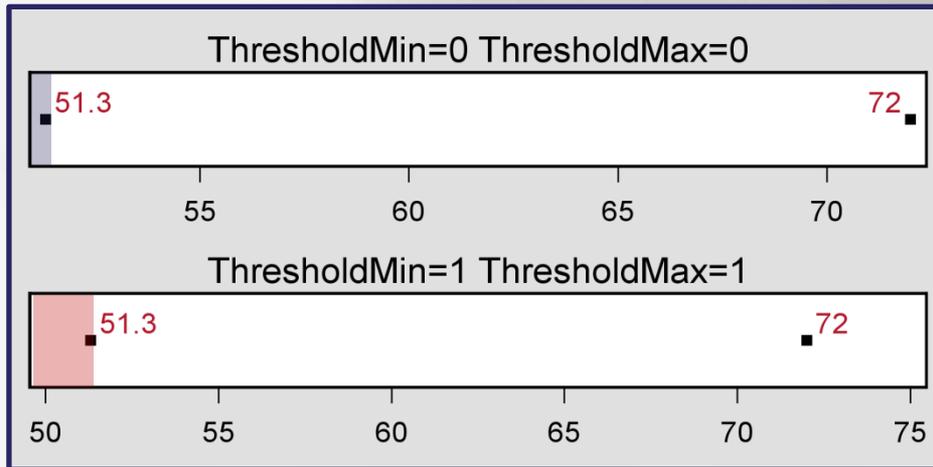


Fix #3

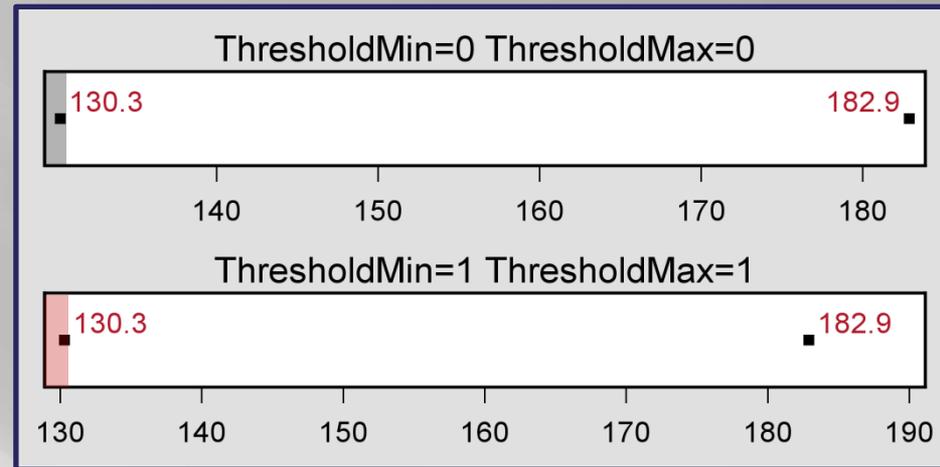


- All four axes contain whole numbers that are easy to read and compare.
- **Fix #2** can be automated since only `thresholdMin` and `thresholdMax` have to be set to **zero**.
- **Fix #3** is an improvement over **Fix #2**, but now customization is required with new minimum HEIGHT values along the `x` and `x2` axes.

How THRESHOLDMIN and THRESHOLDMAX Work



Height (Inches)

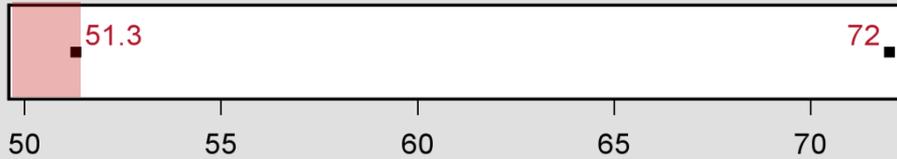


Height (Centimeters)

- **ThresholdMin** and **ThresholdMax** control the insertion of tick values along an axis. If **thresholdMin=0** and **thresholdMax=0**, tick values are enclosed by data minimums and maximums. Parallel axes are **aligned** with value translations.
- However, when **thresholdMin=1** and **thresholdMax=1**, a reversal occurs; data minimums and maximums are enclosed by independently assigned tick values. Now the distance between minimum tick and initial data value is no longer fixed. **Alignment is destroyed.**
- The default settings at **thresholdMin=0.3** and **thresholdMax=0.3** are unpredictable.

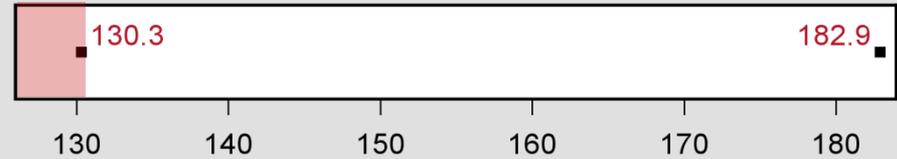
Add VIEWMIN for Fix #3

ThresholdMin=0 ThresholdMax=0 ViewMin=50



Height (Inches)

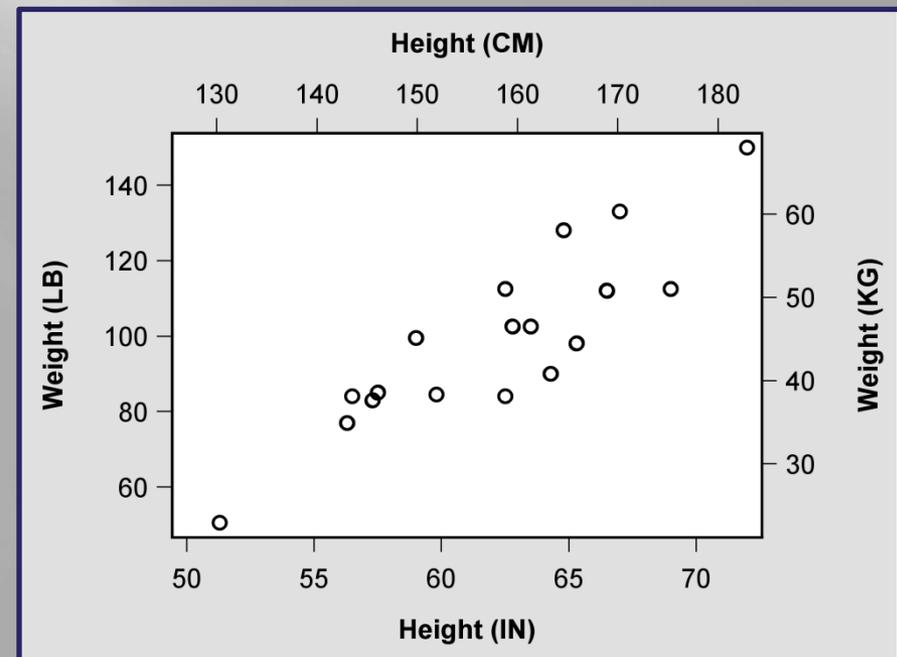
ThresholdMin=0 ThresholdMax=0 ViewMin=127



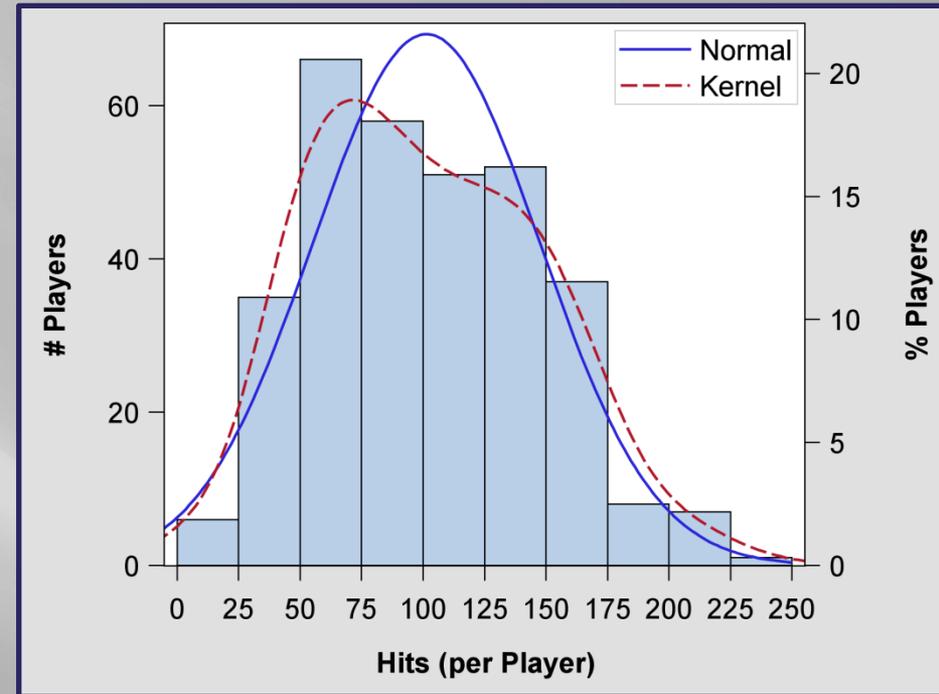
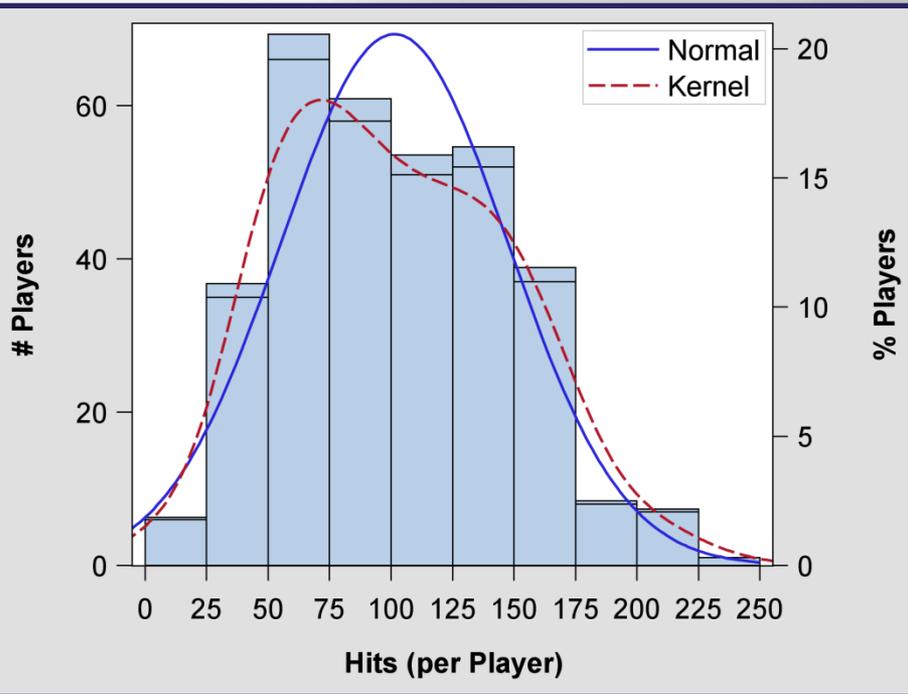
Height (Centimeters)

By default `viewMin` and `viewMax` are set to data minimum and maximum values. However, `viewMin` here is lowered to **50 inches** and to the equivalent **127 centimeters**. Now left-most aligned tick values can be added to the plot.

```
layout overlay/ ...
  Xaxisopts=(linearopts=
    (viewmin=50
     thresholdMin=0
     thresholdMax=0))
  X2axisopts=(linearopts=
    (viewmin=127
     thresholdMin=0
     thresholdMax=0 ...));
  ...;
endlayout;
```



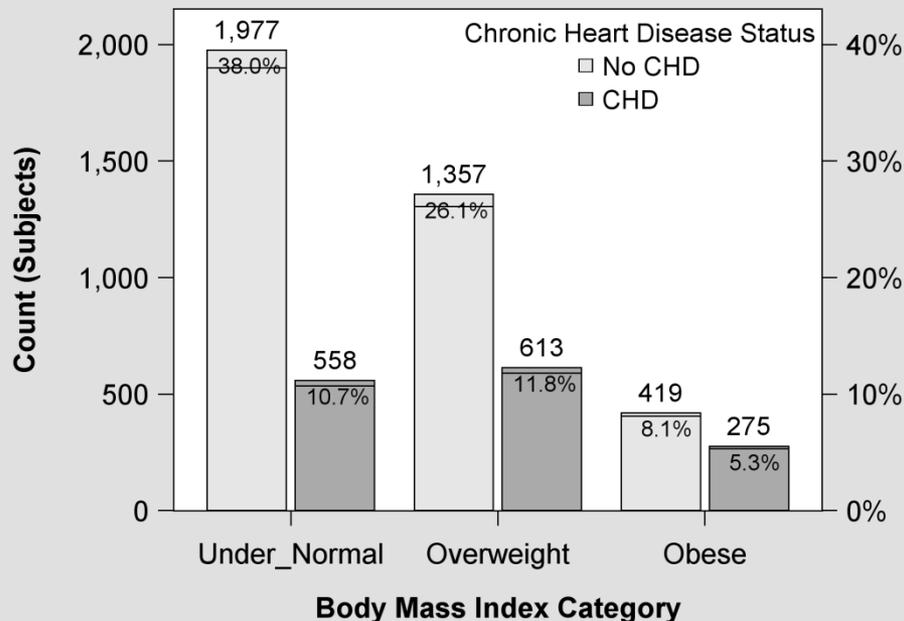
Additional Applications: Histogram of Baseball Data



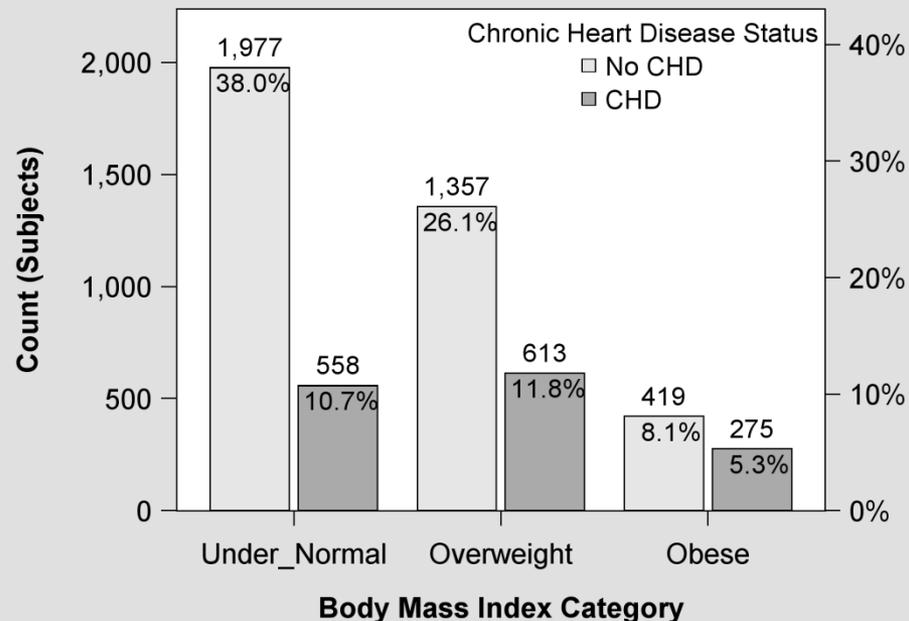
- Different bin heights in the first histogram reflect the presence of unaligned axes in the graph. `ThresholdMin=0` and `ThresholdMax=0` almost solves the problem.
- However, `viewMax` is also required. It is obtained from an object data set that supplies the **apex** of the **normal curve**, the highest point on the graph. With a correct count for the apex, an equivalent percent can be calculated thereby bringing the graph back into alignment.

Additional Applications: Bar Chart of SASHELP.Heart

CHD Status within BMI Category for All Subjects in SASHELP.Heart

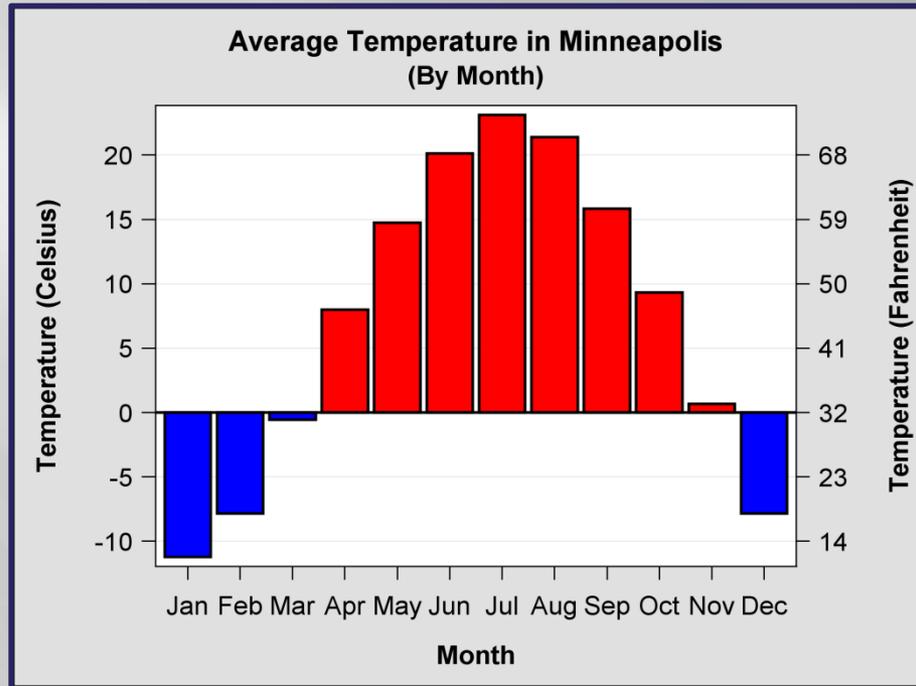


CHD Status within BMI Category for All Subjects in SASHELP.Heart



This time bar heights from the two BARChart statements are staggered in the left-side chart with percent labels being crossed out. The solution is simpler than it was for the histogram in that there is no need to create an object data set. Instead, set `viewmax` to **40** in the **Y2** axis and to $0.40 \times 5,199$ subjects = **2079.6** in the **Y** axis to correct the problem.

Additional Applications: Vector plot for Weather Chart



- The two axes in this graph are brought into alignment by applying a solution similar to "Fix#1" shown earlier. Translations are made for every tick value from Celsius to Fahrenheit. Fortunately the translation results in whole numbers for both axes. An increase of 5° in Celsius results in a 9° increase in Fahrenheit after 32° is added.
- A `barchart` statement cannot be used for the Fahrenheit axis, so two `vectorplot` statements are used for the bars. The black outline is created with a `barchart` statement that relies exclusively on Celsius coordinates. 9

Conclusion

While the presence of aligned parallel axes enhances a graph, the failure to define systems of measurement during project design and implementation can have disastrous consequences. Often cited is the Mars Climate Orbiter space probe that went silent in 1999. What happened? Lockheed Martin used English units of measurement whereas the NASA JPL team used the more conventional metric system to calculate key coordinates.

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