

Best practices: bar plots

INTERMEDIATE DATA VISUALIZATION WITH GGPLOT2



Rick Scavetta

Founder, Scavetta Academy

In this chapter

- Common pitfalls in Data Viz
- Best way to represent data
 - For effective explanatory (communication), and
 - For effective exploratory (investigation) plots

Bar plots

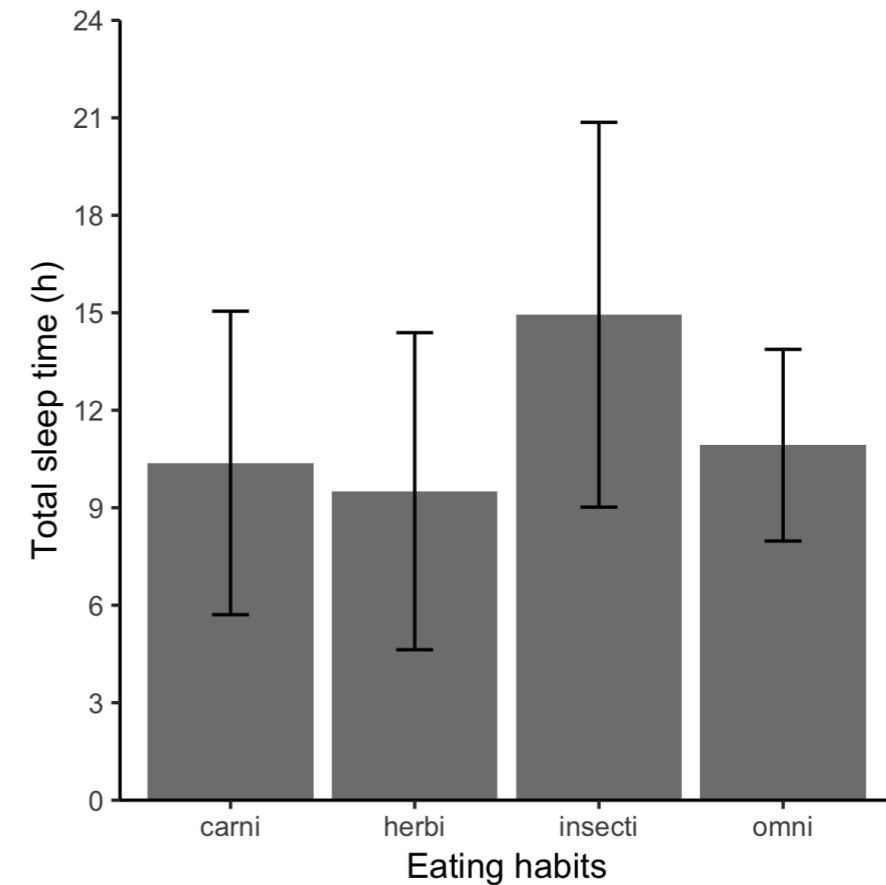
- Two types
 - Absolute values
 - Distributions

Mammalian sleep

```
Observations: 76
Variables: 3
$ vore <chr> "carni", "omni", "herbi", "omni", "herbi", "herbi", "carni", ...
$ total <dbl> 12.1, 17.0, 14.4, 14.9, 4.0, 14.4, 8.7, 10.1, 3.0, 5.3, 9.4, ...
$ rem <dbl> NA, 1.8, 2.4, 2.3, 0.7, 2.2, 1.4, 2.9, NA, 0.6, 0.8, 0.7, 1.5...
```

Dynamite plot

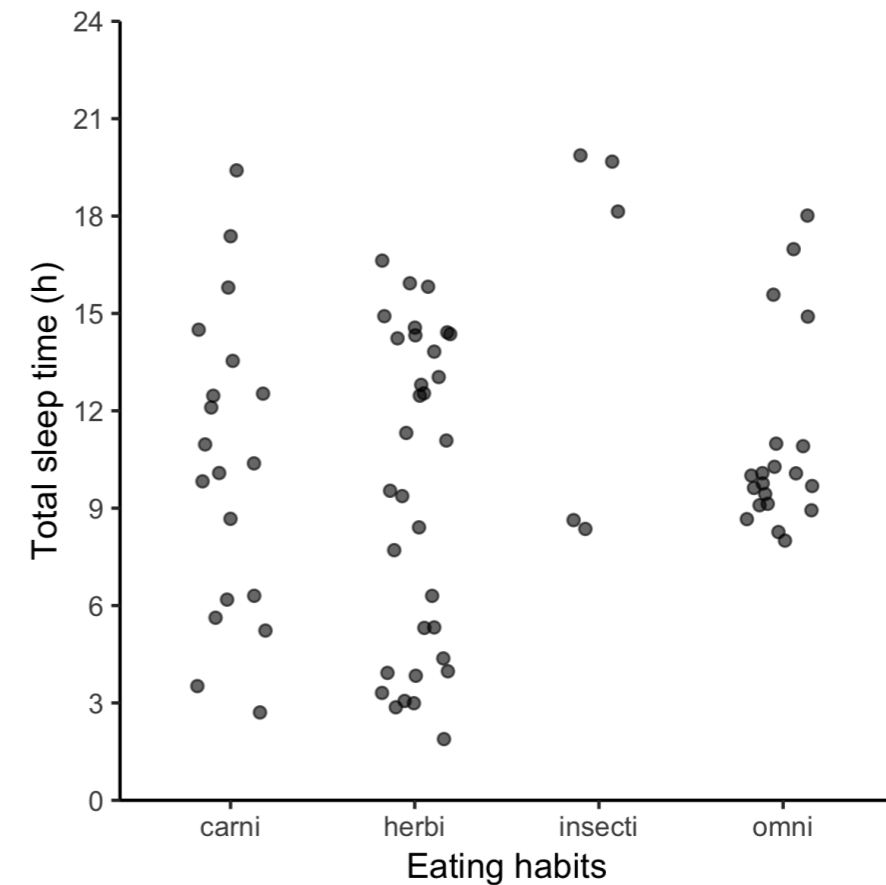
```
d <- ggplot(sleep, aes(vore, total)) +  
  # ...  
  
d +  
  stat_summary(fun = mean,  
              geom = "bar",  
              fill = "grey50") +  
  stat_summary(fun.data = mean_sdl,  
              fun.args = list(mult = 1),  
              geom = "errorbar",  
              width = 0.2)
```



Individual data points

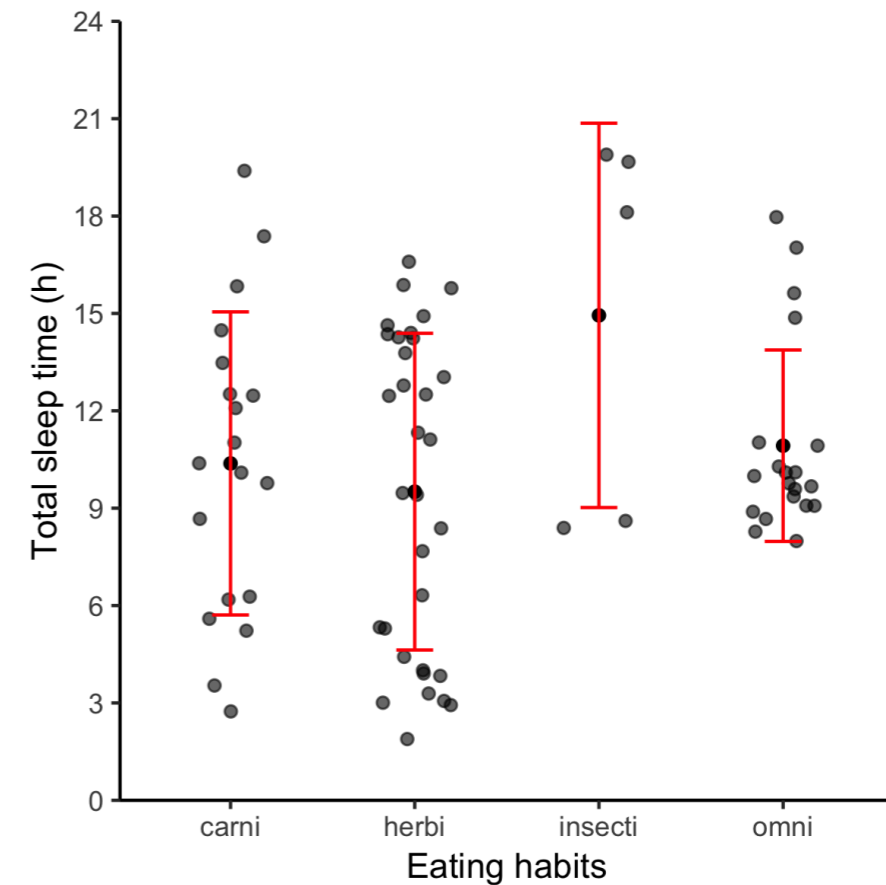
```
# position
posn_j <- position_jitter(width = 0.2)

# plot
d +
  geom_point(alpha = 0.6,
             position = posn_j)
```



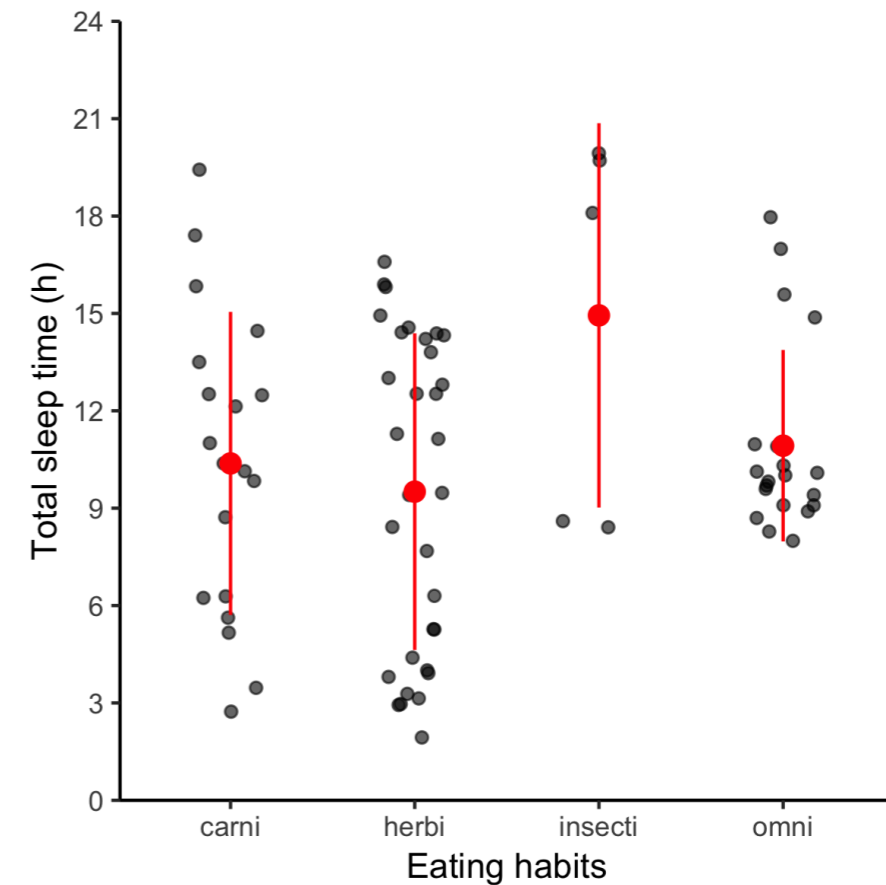
geom_errorbar()

```
d +  
  geom_point(...) +  
  stat_summary(fun = mean,  
              geom = "point",  
              fill = "red") +  
  stat_summary(fun.data = mean_sdl,  
              fun.args = list(mult = 1),  
              geom = "errorbar",  
              width = 0.2,  
              color = "red")
```



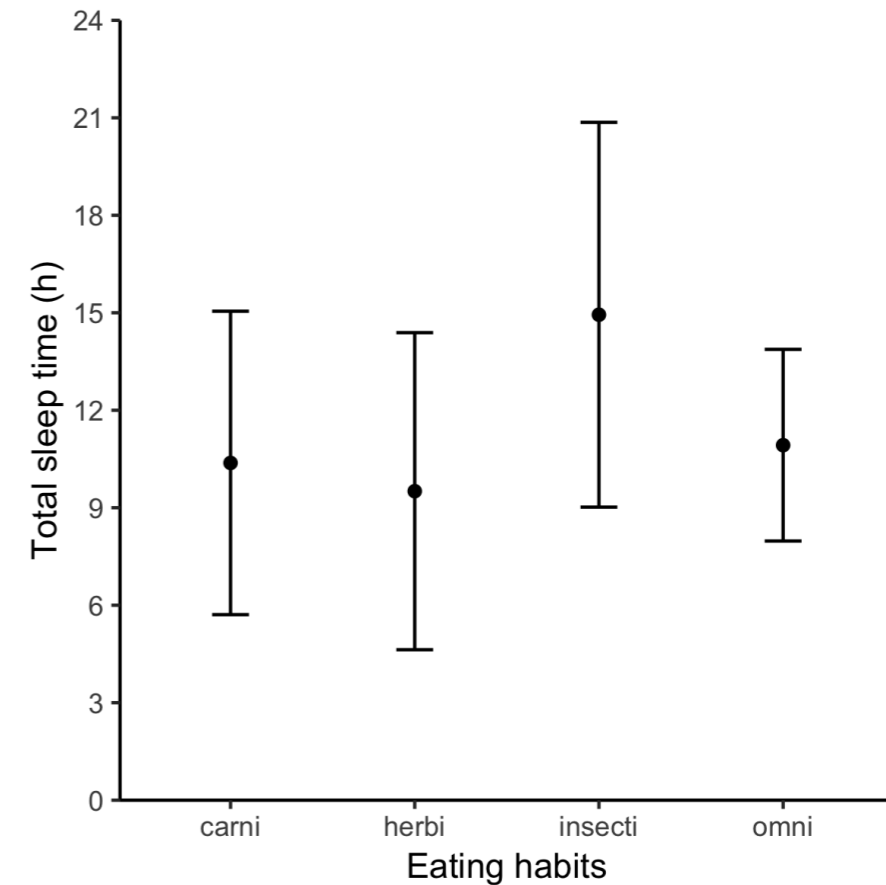
geom_pointrange()

```
d +  
  geom_point(...) +  
  stat_summary(fun.data = mean_sdl,  
              mult = 1,  
              width = 0.2,  
              color = "red")
```

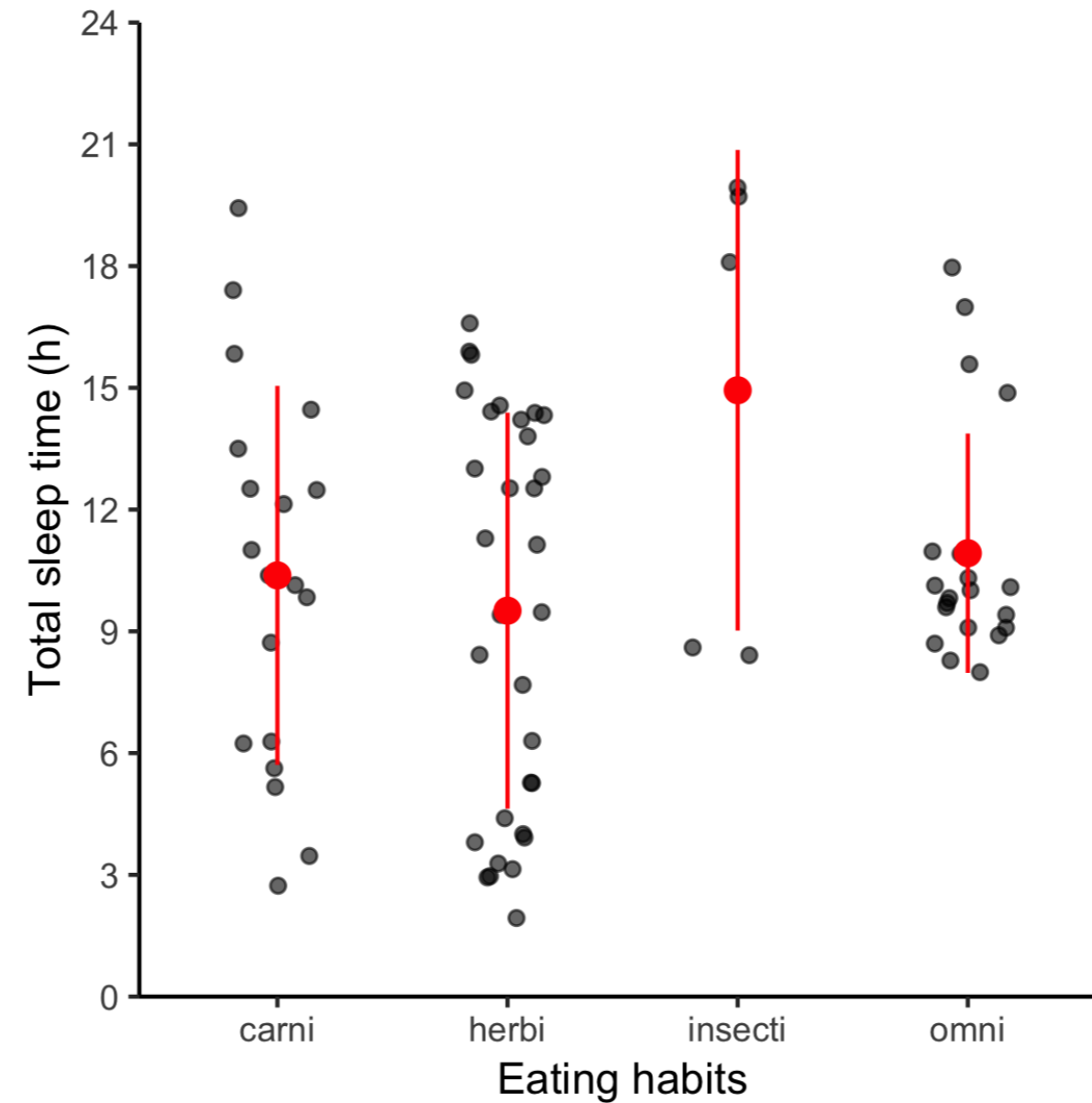


Without data points

```
d +
  stat_summary(fun = mean,
              geom = "point") +
  stat_summary(fun.data = mean_sdl,
              fun.args = list(mult = 1),
              geom = "errorbar",
              width = 0.2)
```



Bars are not necessary



Ready for exercises!

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Heatmaps use case scenario

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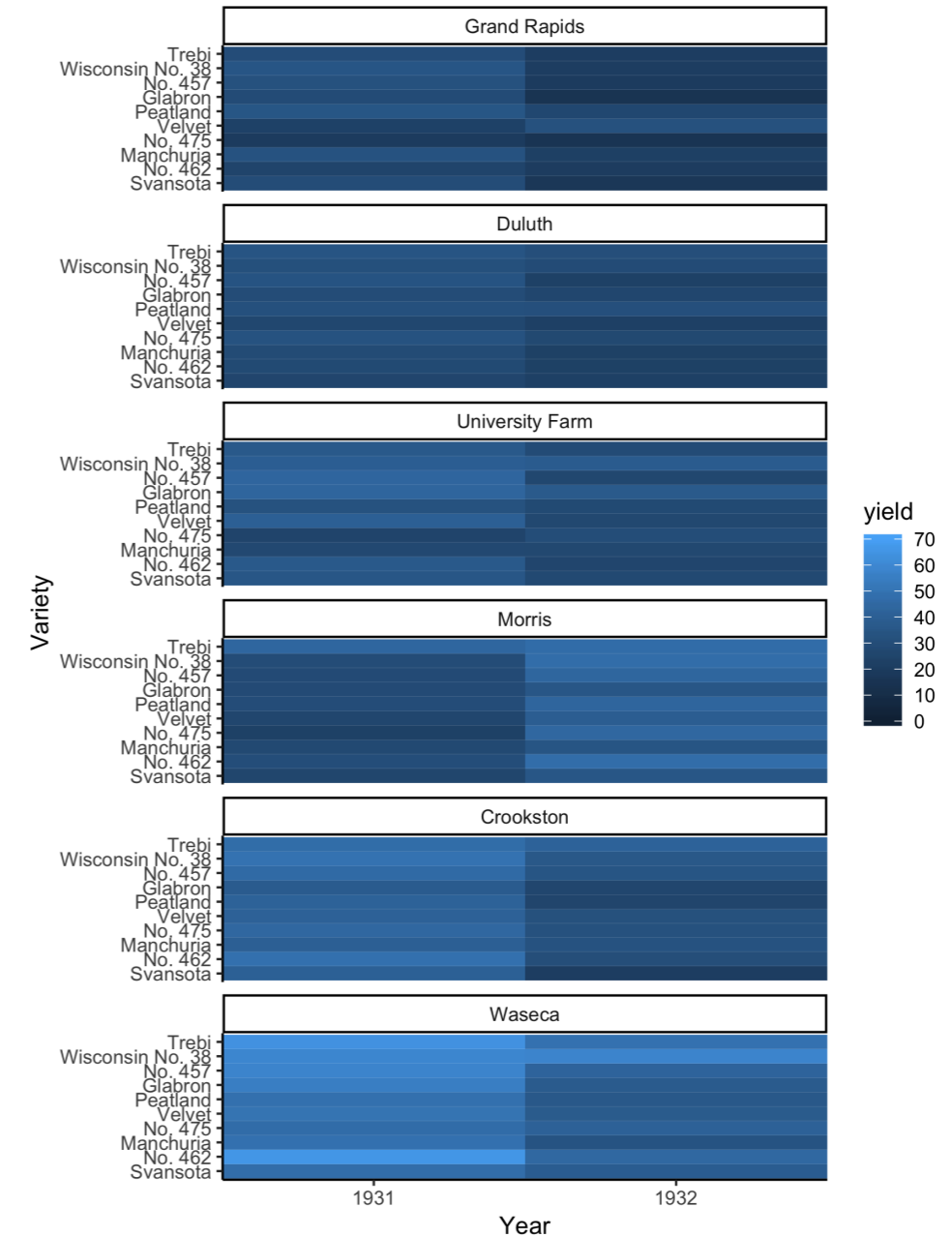
The barley dataset

```
head(barley, 9)
```

```
   yield  variety year      site
1 27.00000 Manchuria 1931 University Farm
2 48.86667 Manchuria 1931      Waseca
3 27.43334 Manchuria 1931      Morris
4 39.93333 Manchuria 1931      Crookston
5 32.96667 Manchuria 1931      Grand Rapids
6 28.96667 Manchuria 1931      Duluth
7 43.06666  Glabron 1931 University Farm
8 55.20000  Glabron 1931      Waseca
9 28.76667  Glabron 1931      Morris
```

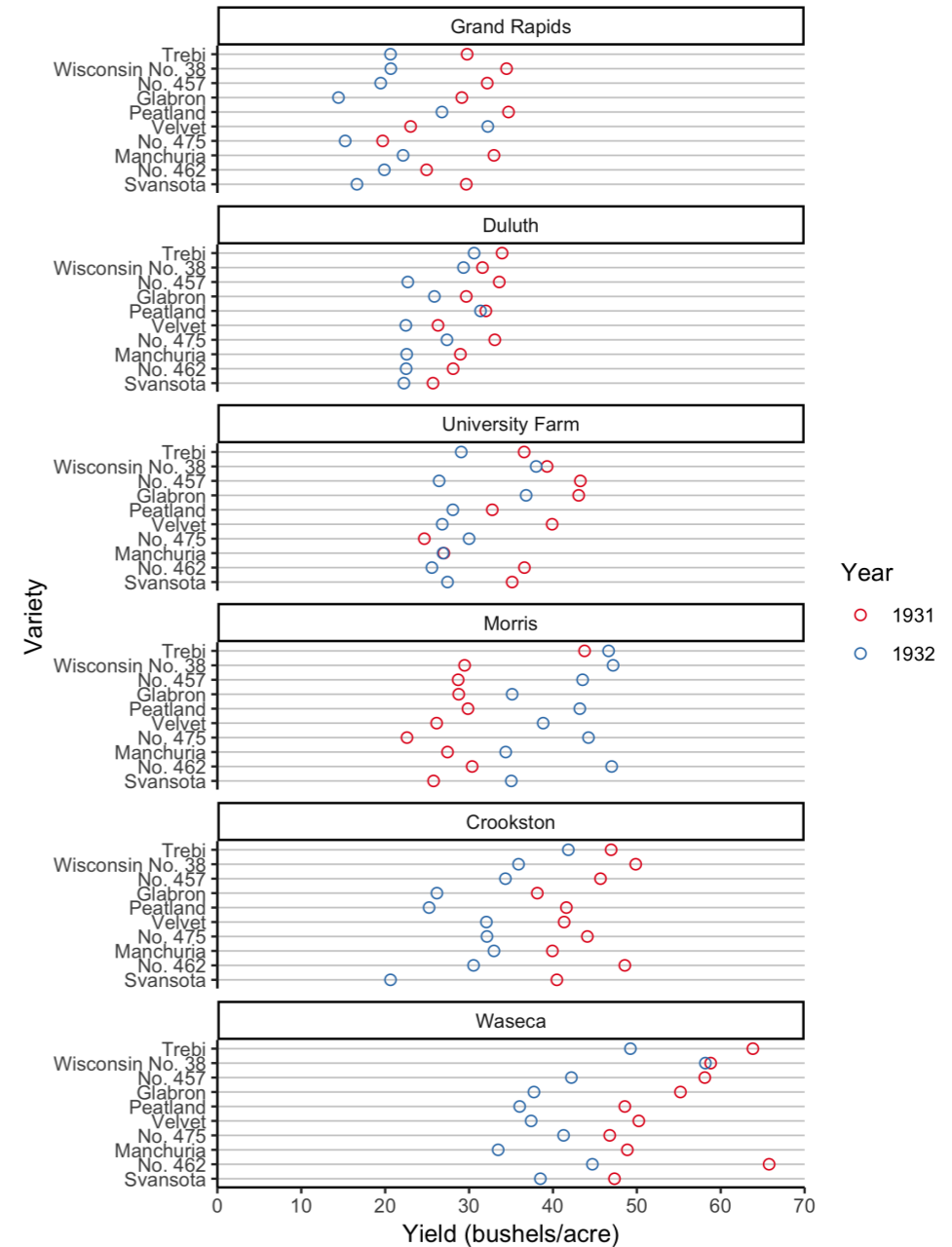
A basic heat map

```
ggplot(barley, aes(year, variety,
                    fill = yield)) +
  geom_tile() +
  facet_wrap(vars(site), ncol = 1) +
  ...
```



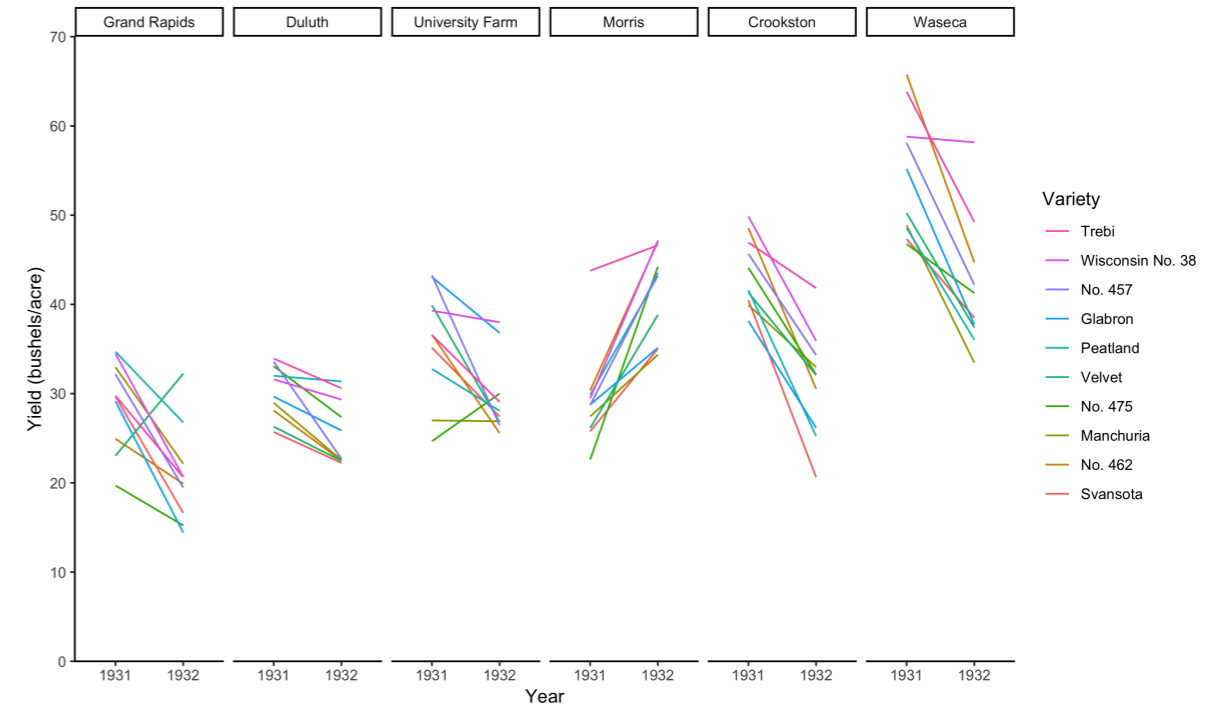
A dot plot

```
ggplot(barley, aes(yield, variety,
                   color = year)) +
  geom_point(...) +
  facet_wrap(vars(site), ncol = 1) +
  ...
```



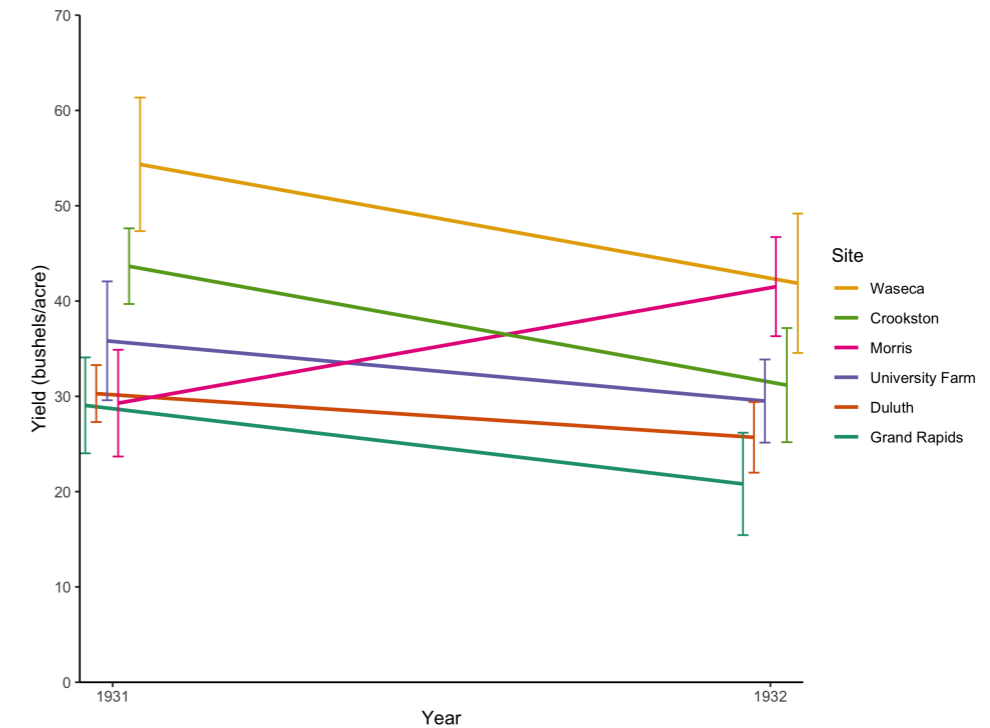
As a time series

```
ggplot(barley, aes(year, yield,  
                  group = variety,  
                  color = variety)) +  
  geom_line() +  
  facet_wrap(vars(site), nrow = 1) +  
  ...
```



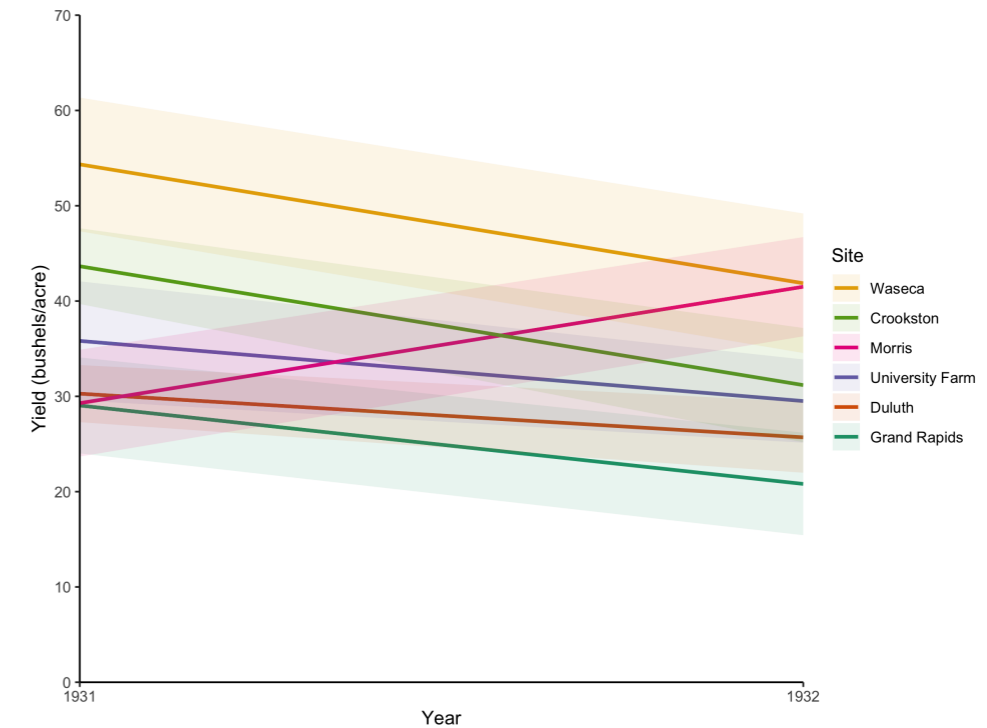
Using dodged error bars

```
ggplot(barley, aes(x = year, y = yield,  
                  group = site,  
                  color = site)) +  
  stat_summary(fun = mean,  
              geom = "line", ...) +  
  stat_summary(fun.data = mean_sdl,  
              geom = "errorbar", ...) +  
  ...
```



Using ribbons for error

```
ggplot(barley, aes(x = year, y = yield,
                  group = site,
                  color = site)) +
  stat_summary(fun = mean,
              geom = "line", ...) +
  stat_summary(fun.data = mean_sdl,
              geom = "ribbon", ...) +
  ...
```



Coding Time!

INTERMEDIATE DATA VISUALIZATION WITH GGPLOT2

When good data makes bad plots

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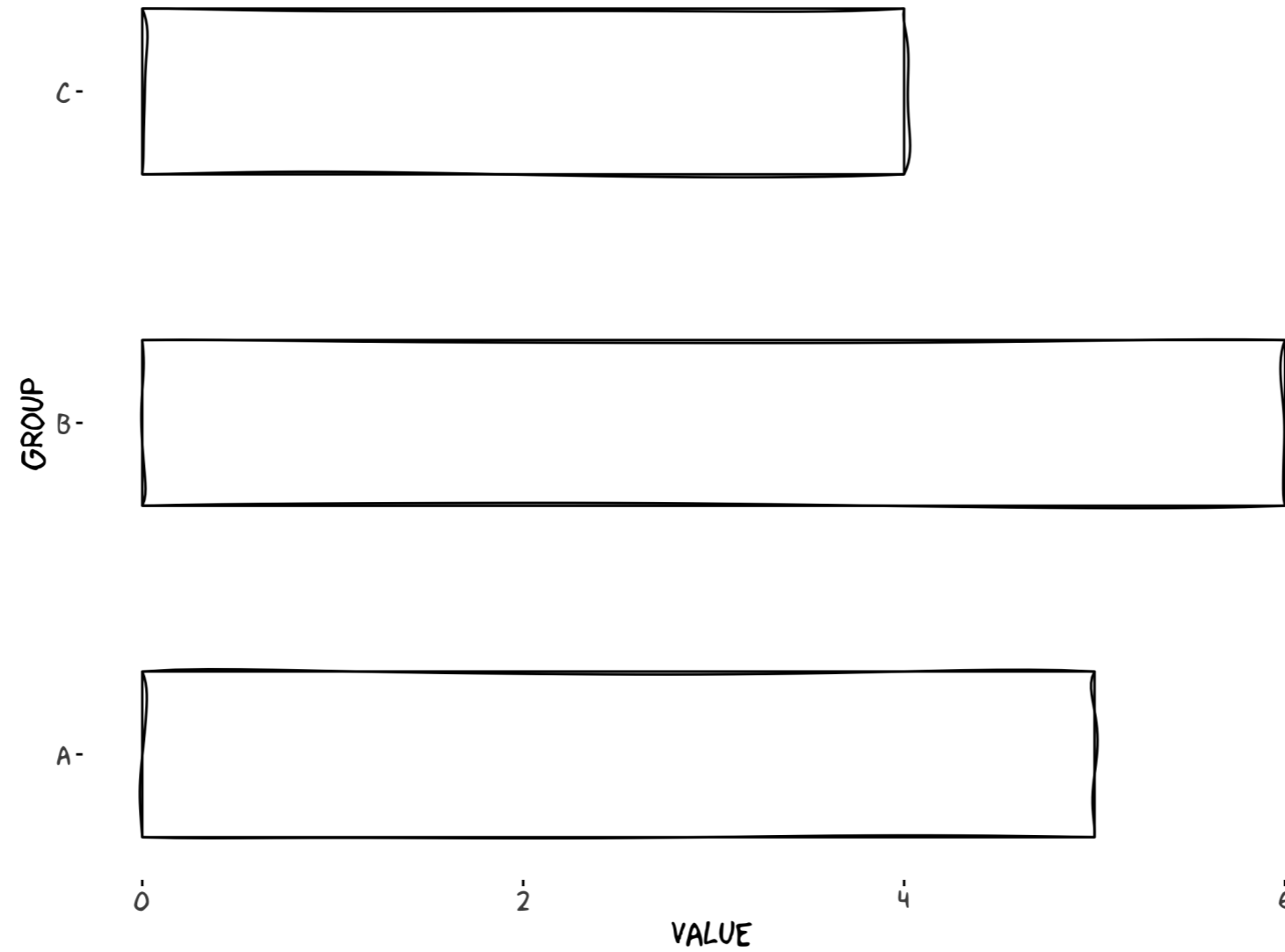
Bad plots: style

- Color
 - Not color-blind-friendly (e.g. primarily red and green)
 - Wrong palette for data type (remember sequential, qualitative and divergent)
 - Indistinguishable groups (i.e. colors are too similar)
 - Ugly (high saturation primary colors)
- Text
 - Illegible (e.g. too small, poor resolution)
 - Non-descriptive (e.g. "length" -- of what? which units?)
 - Missing
 - Inappropriate (e.g. comic sans)

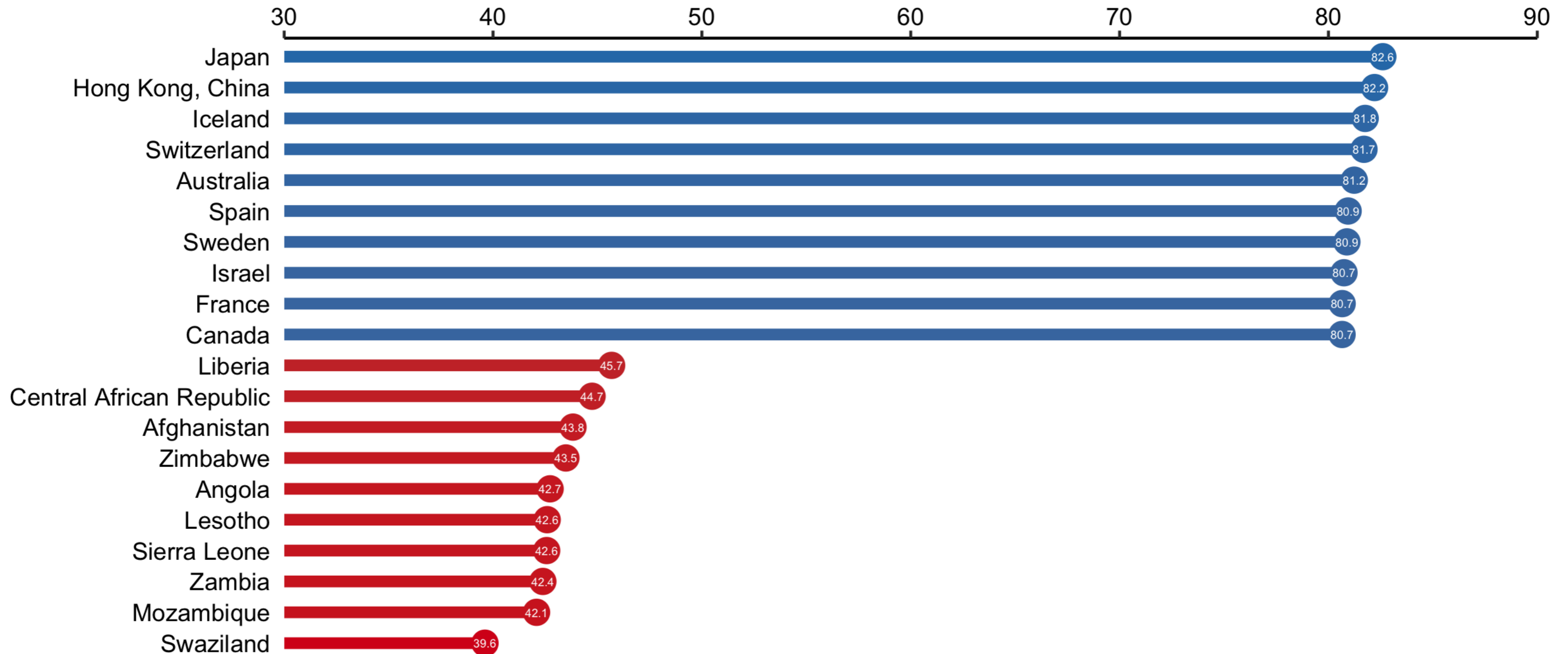
Bad plots: structure and content

- Information content
 - Too much information (TMI)
 - Too little information (TLI)
 - No clear message or purpose
- Axes
 - Poor aspect ratio
 - Suppression of the origin
 - Broken x or y axes
 - Common, but unaligned scales
 - Wrong or no transformation
- Statistics
 - Visualization doesn't match actual statistics
- Geometries
 - Wrong plot type
 - Wrong orientation
- Non-data Ink
 - Inappropriate use
- 3D plots
 - Perceptual problems
 - Useless 3rd axis

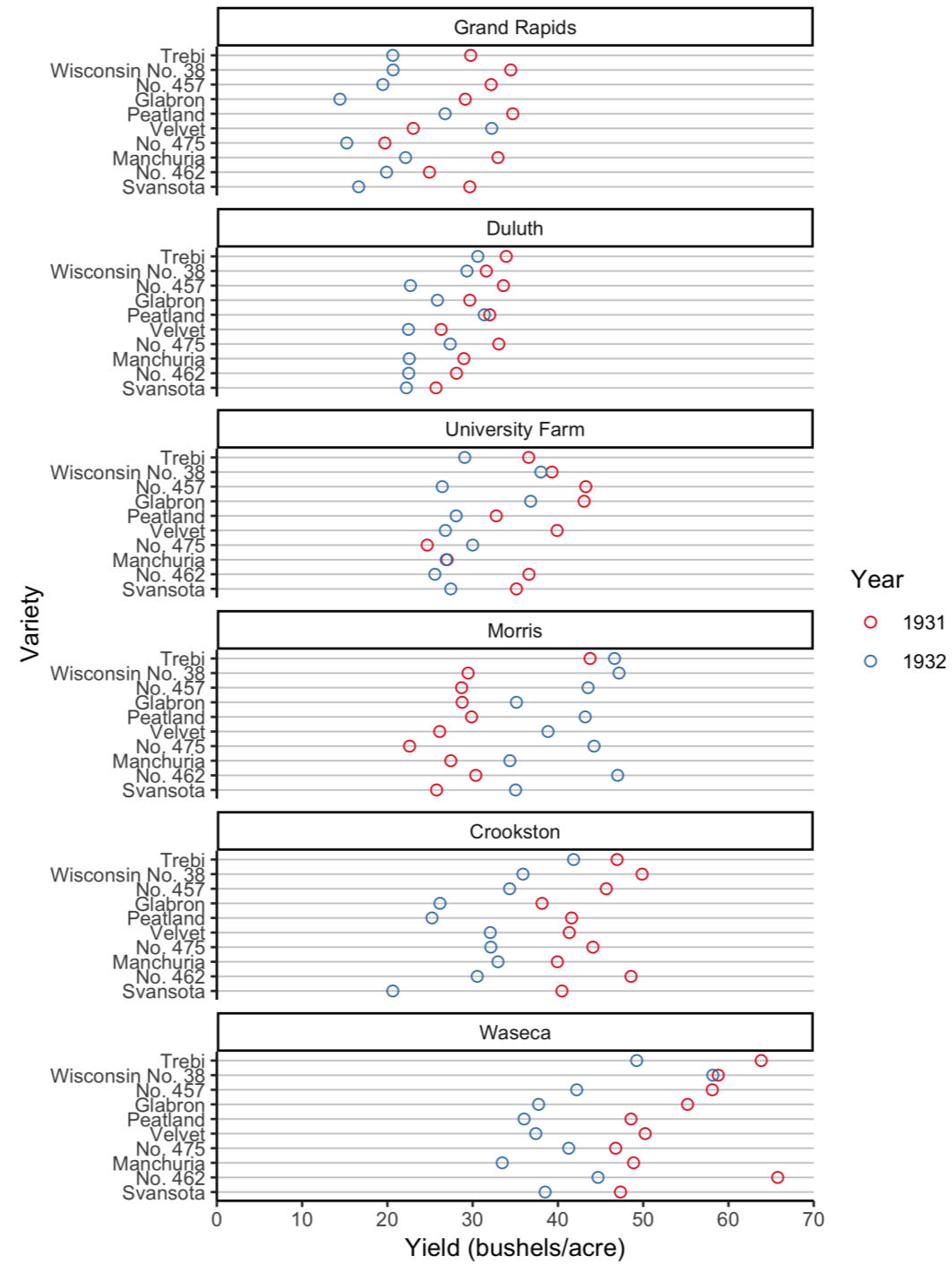
Wrong orientation



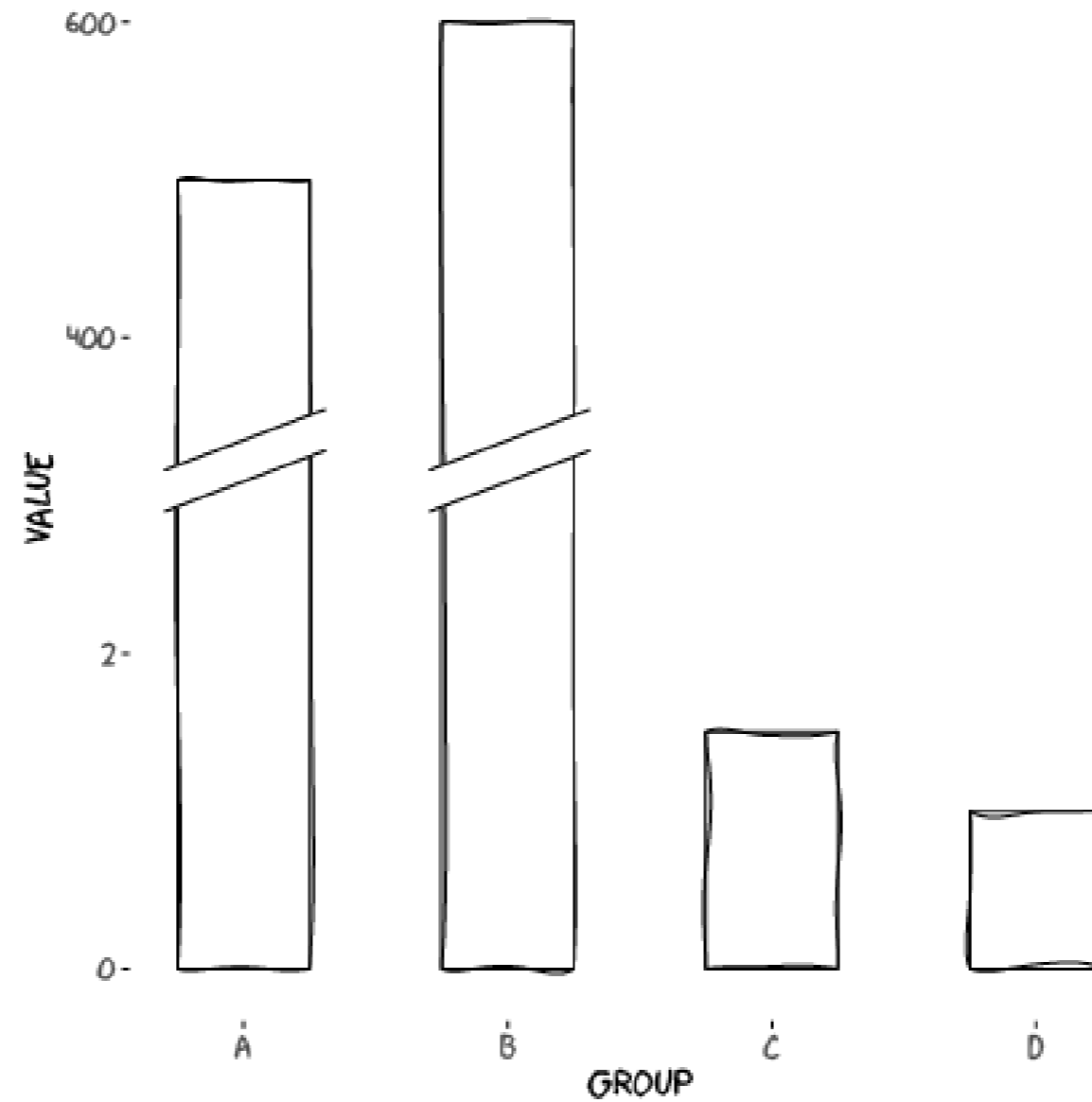
Highest and lowest life expectancies, 2007



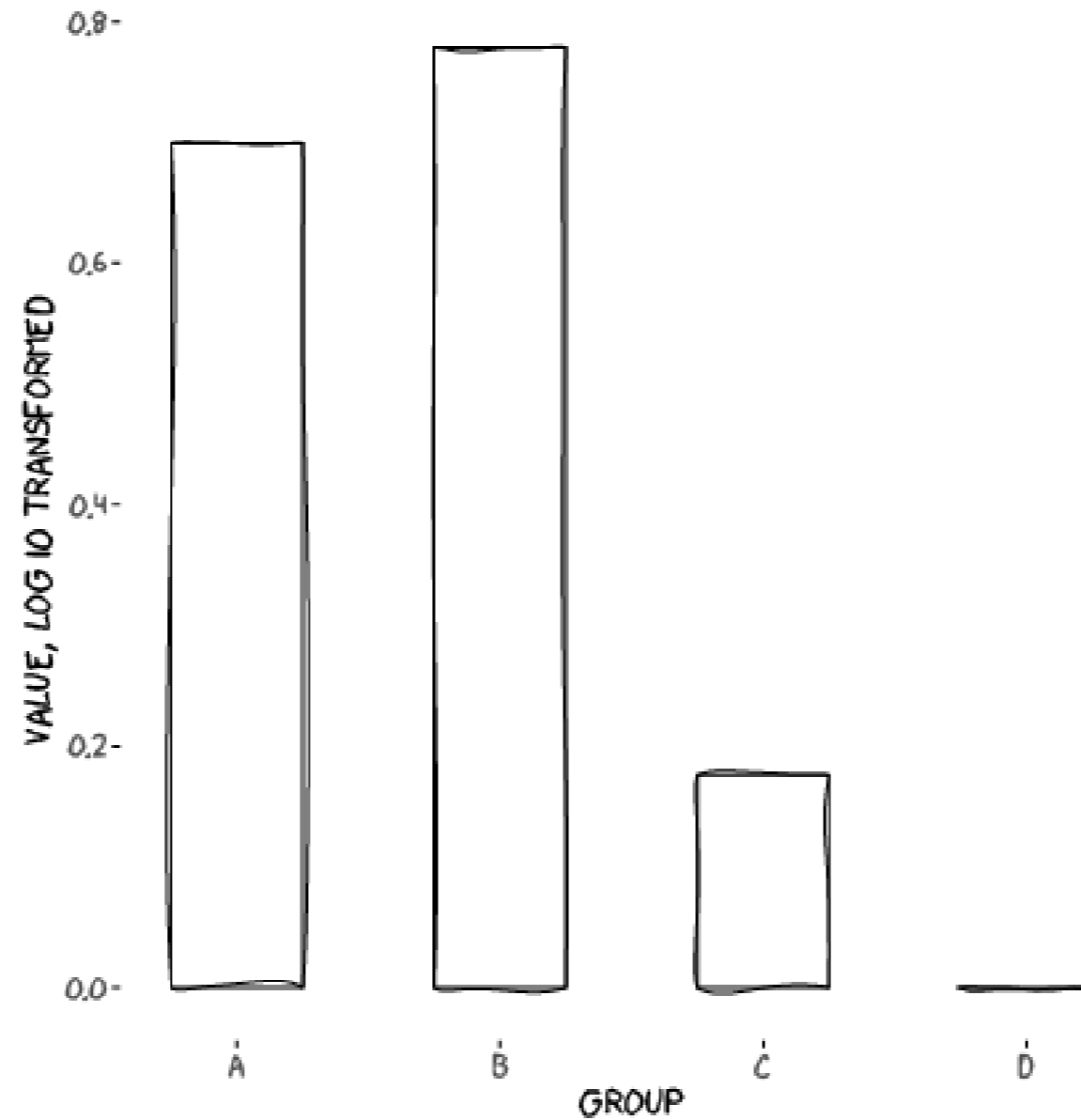
Source: gapminder



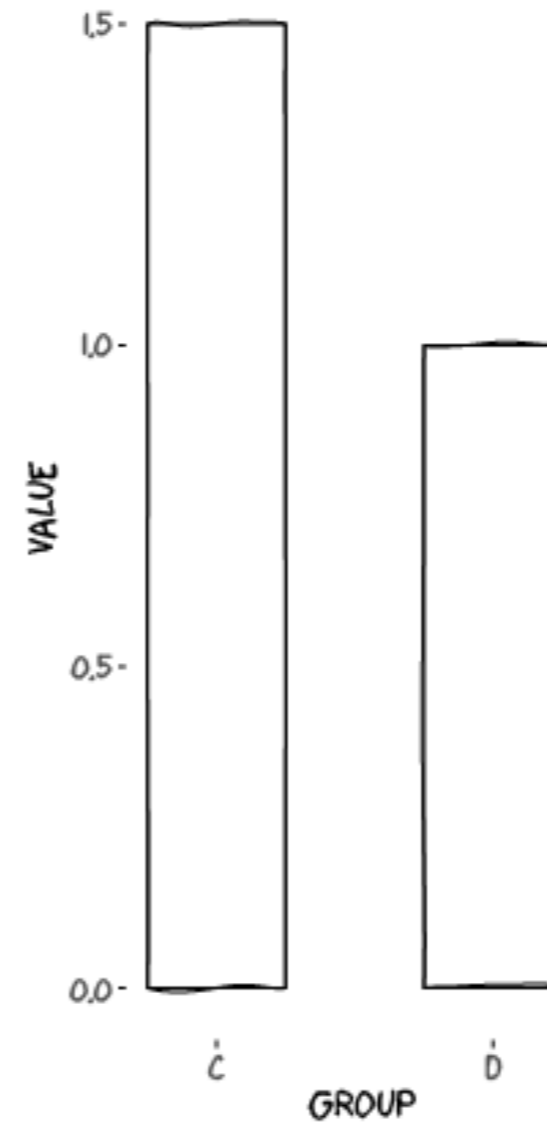
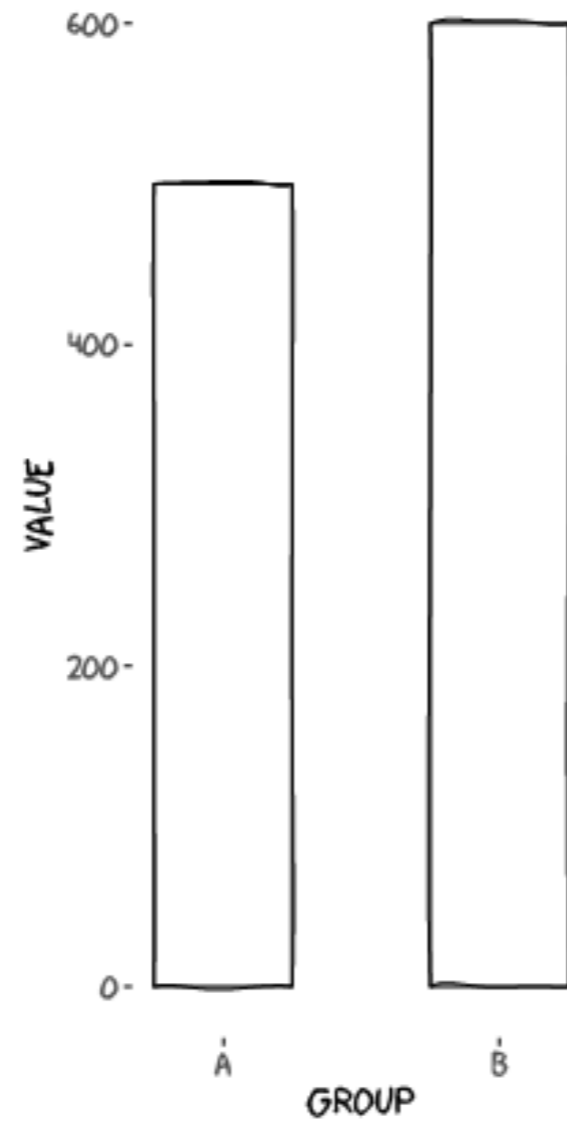
Broken y-axes



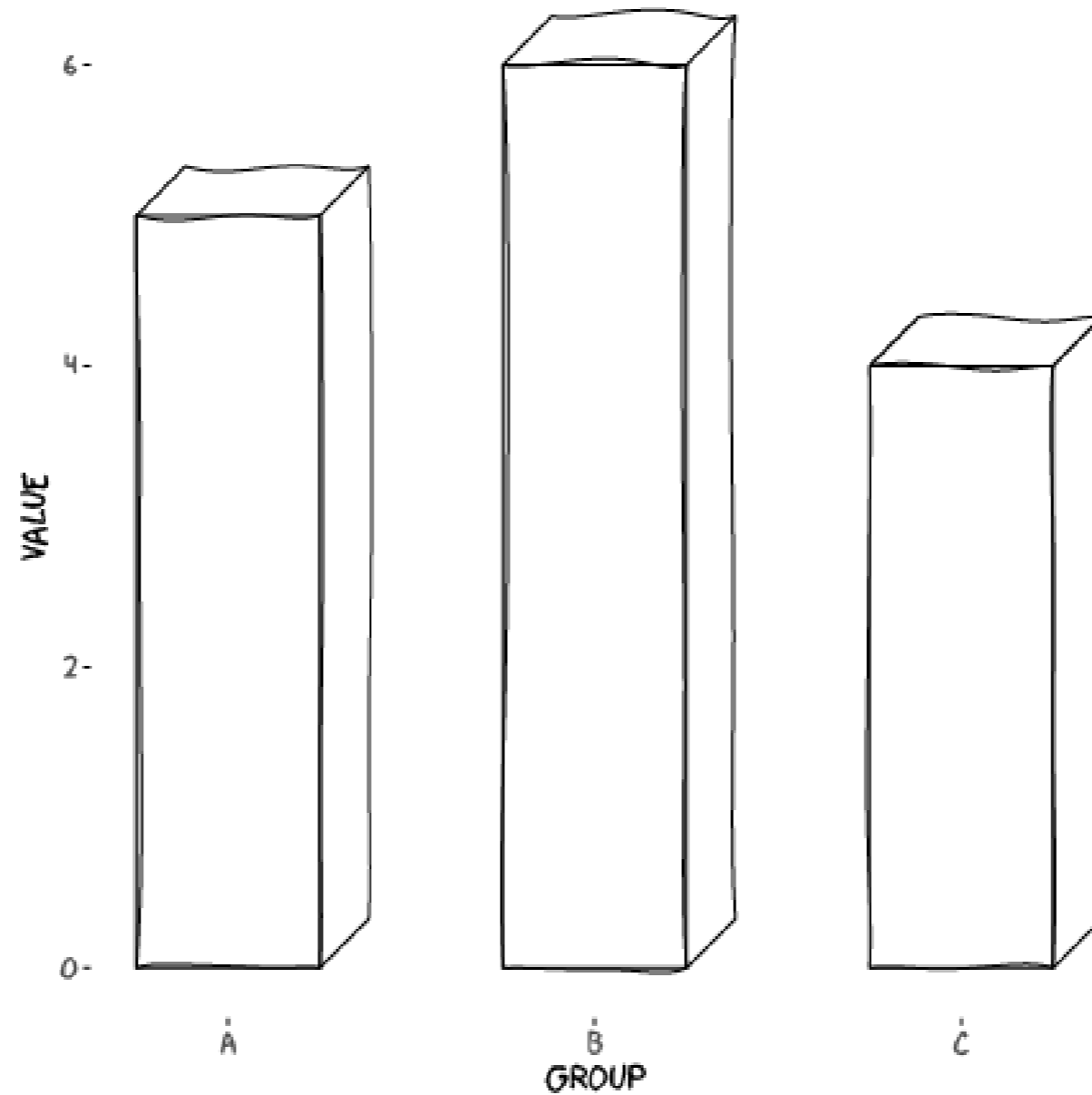
Broken y-axes, replace with transformed data



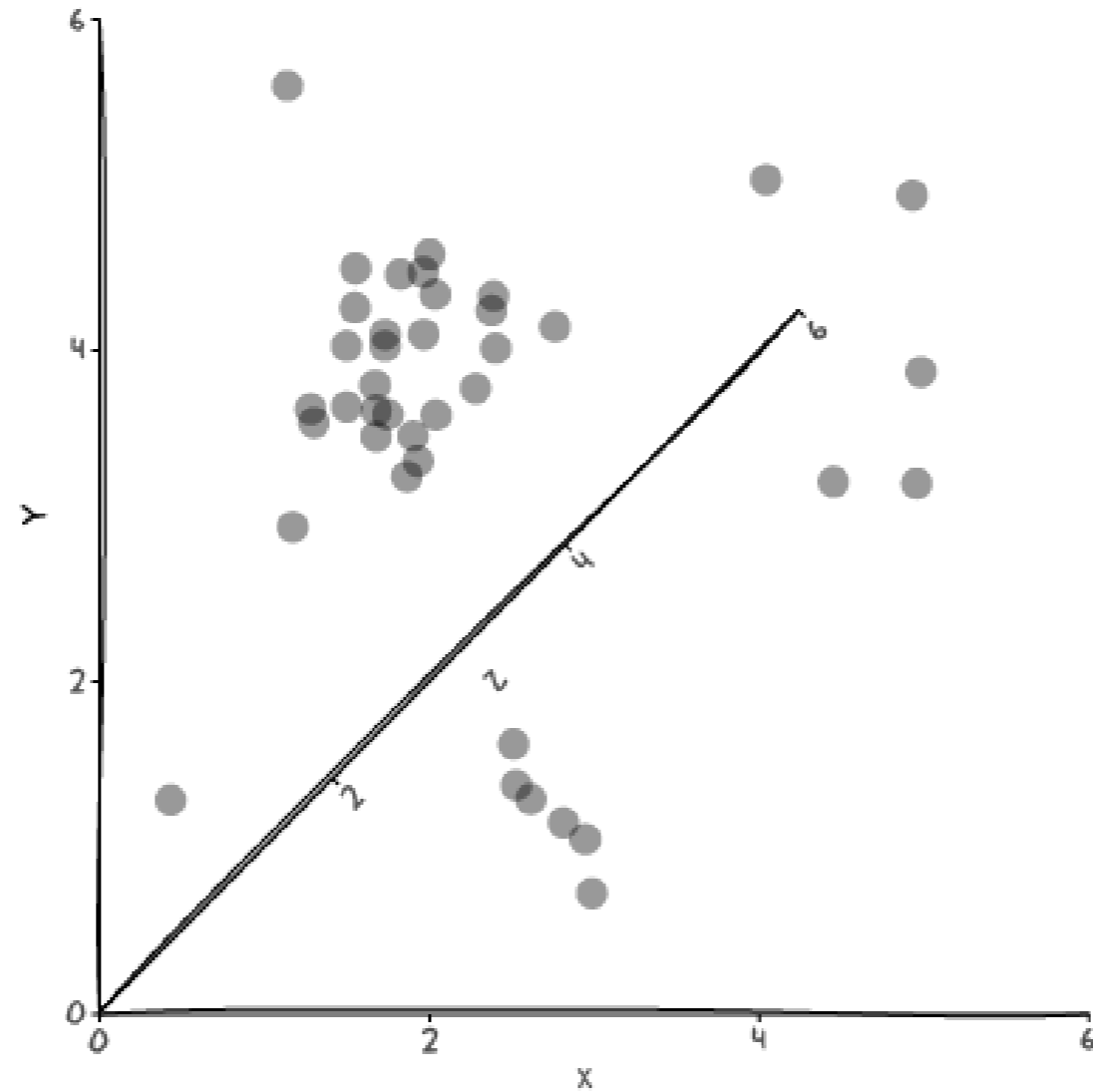
Broken y-axes, use facets



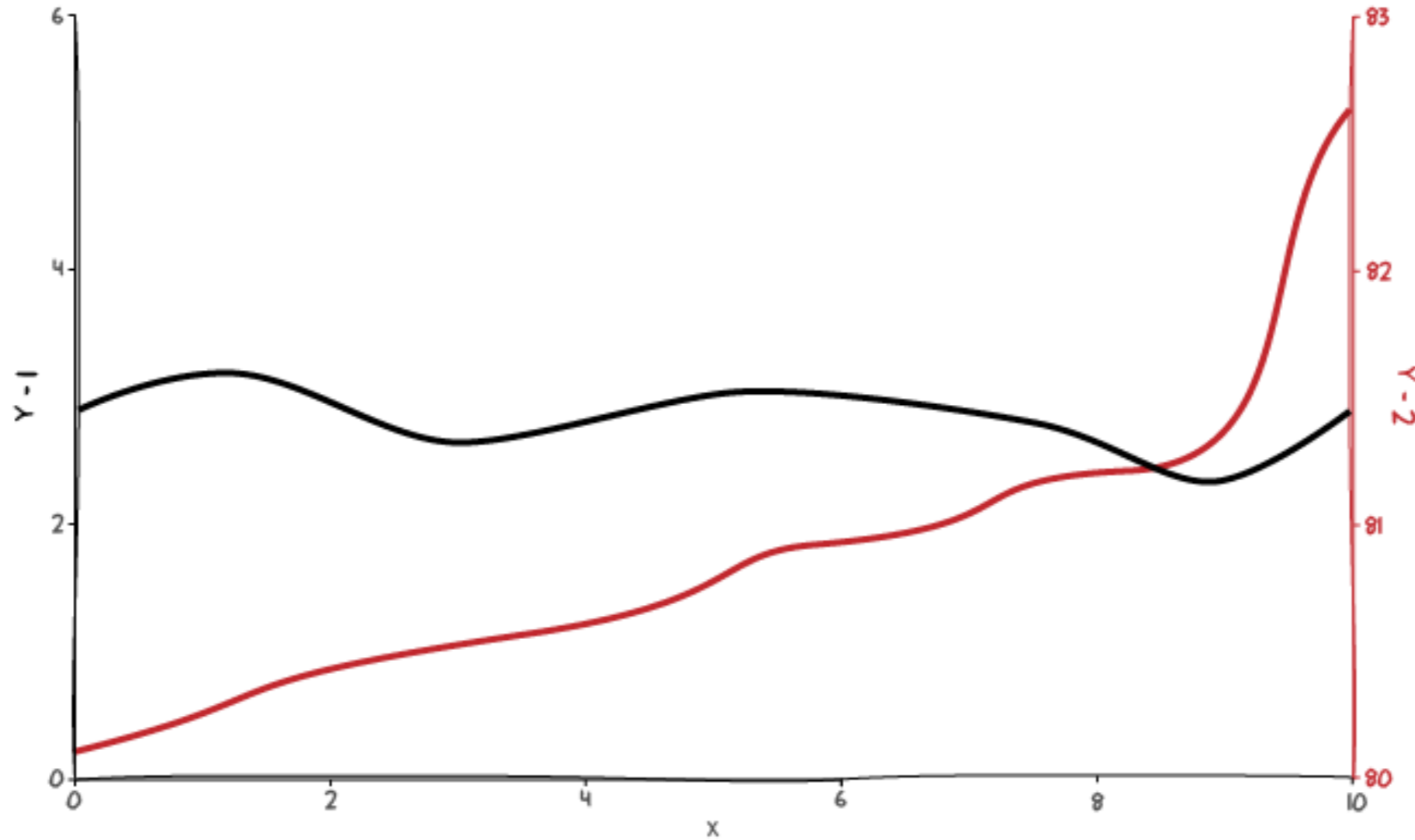
3D plots, without data on the 3rd axis



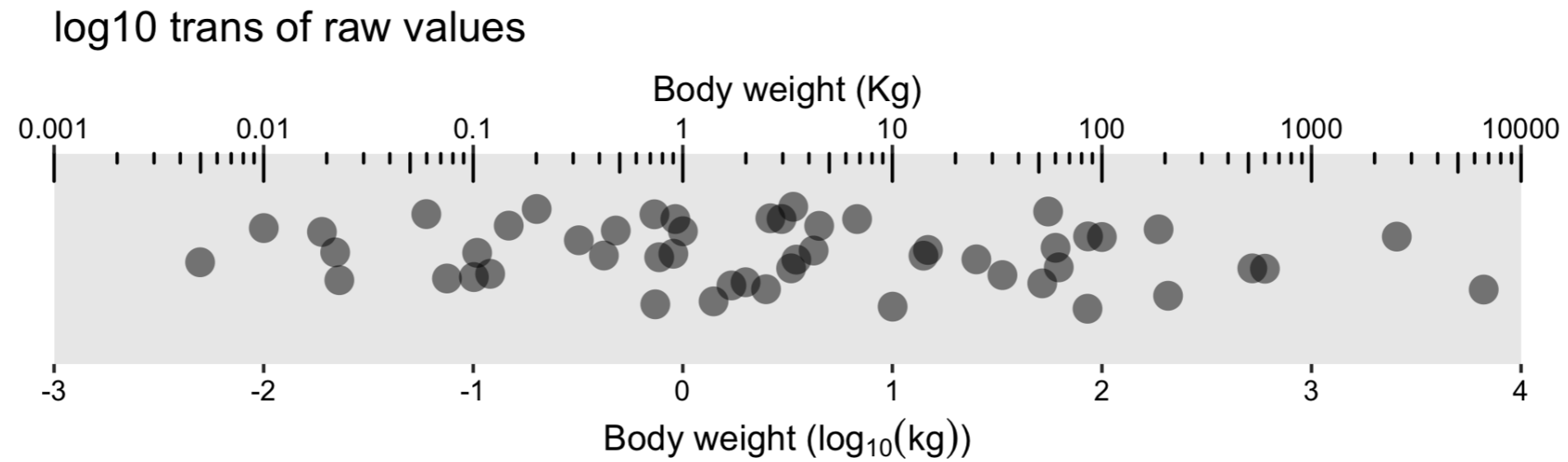
3D plots, with data on the 3rd axis



Double y-axes



Double y-axis for transformations



Guidelines not rules

- Use your common sense:
 - Is there anything on my plot that obscure a clear reading of the data or the take-home message?

Let's practice!

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