DATA VISUALIZATION IN R

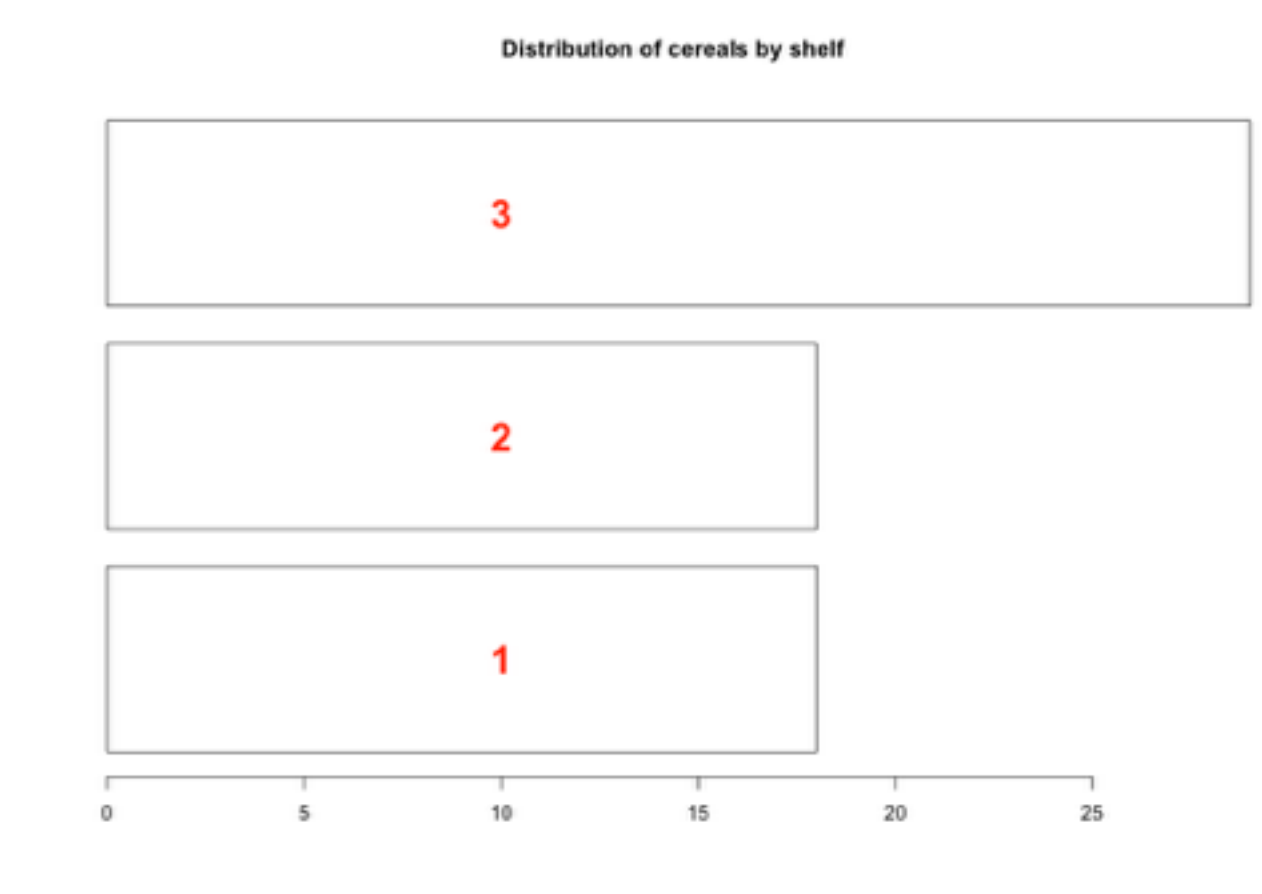
Creating and saving more complex plots

Side-effects and return values

- All R graphics functions are called for their side-effects
- They generate a plot
- Unlike most functions, they return nothing useful
- Exception: `barplot()` function

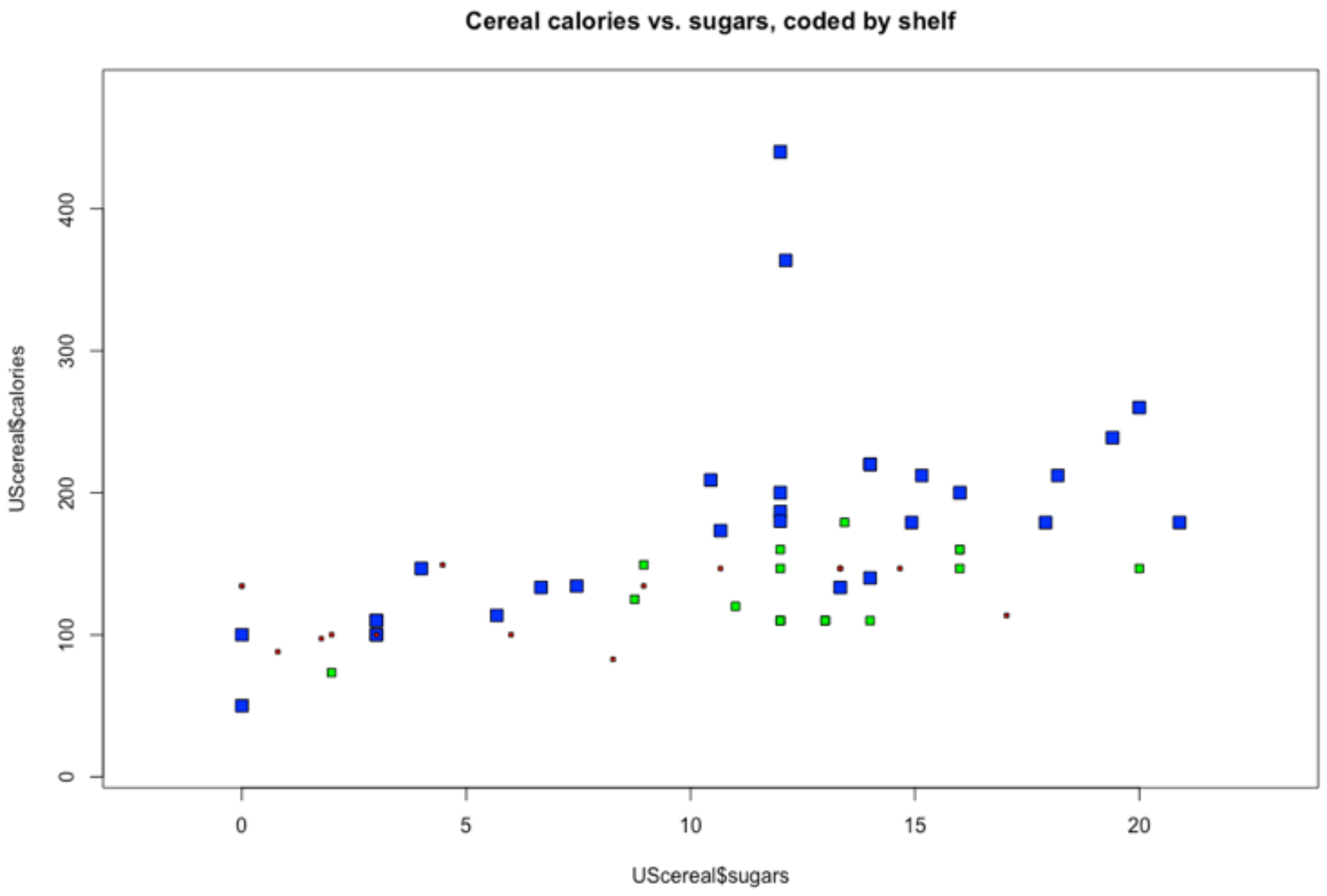
Side-effects and return values

```
> library(MASS)
> tbl <- table(UScereal$shelf)
> mids <- barplot(tbl, horiz = TRUE, col = "transparent",
                  names.arg = "")
> mids
     [,1]
[1,]  0.7
[2,]  1.9
[3,]  3.1
> text(10, mids, names(tbl), col = "red", font = 2, cex = 2)
> title("Distribution of cereals by shelf")
```



`symbols()` shows relations between 3 or more variables

```
> library(MASS)
> symbols(UScereal$sugars, UScereal$calories,
          squares = UScereal$shelf, inches = 0.1,
          bg = rainbow(3)[UScereal$shelf])
> title("Cereal calories vs. sugars, coded by shelf")
```



Saving plots as png files

```
# Divert graphics output to png file
> png("SavedGraphicsFile.png")

# Create the plot
> symbols(UScereal$sugars, UScereal$calories,
          squares = UScereal$shelf, inches = 0.1,
          bg = rainbow(3)[UScereal$shelf])

# Add the title
> title("Cereal calories vs. sugars, coded by shelf")
```

DATA VISUALIZATION IN R

Let’s practice!

DATA VISUALIZATION IN R

Using color effectively

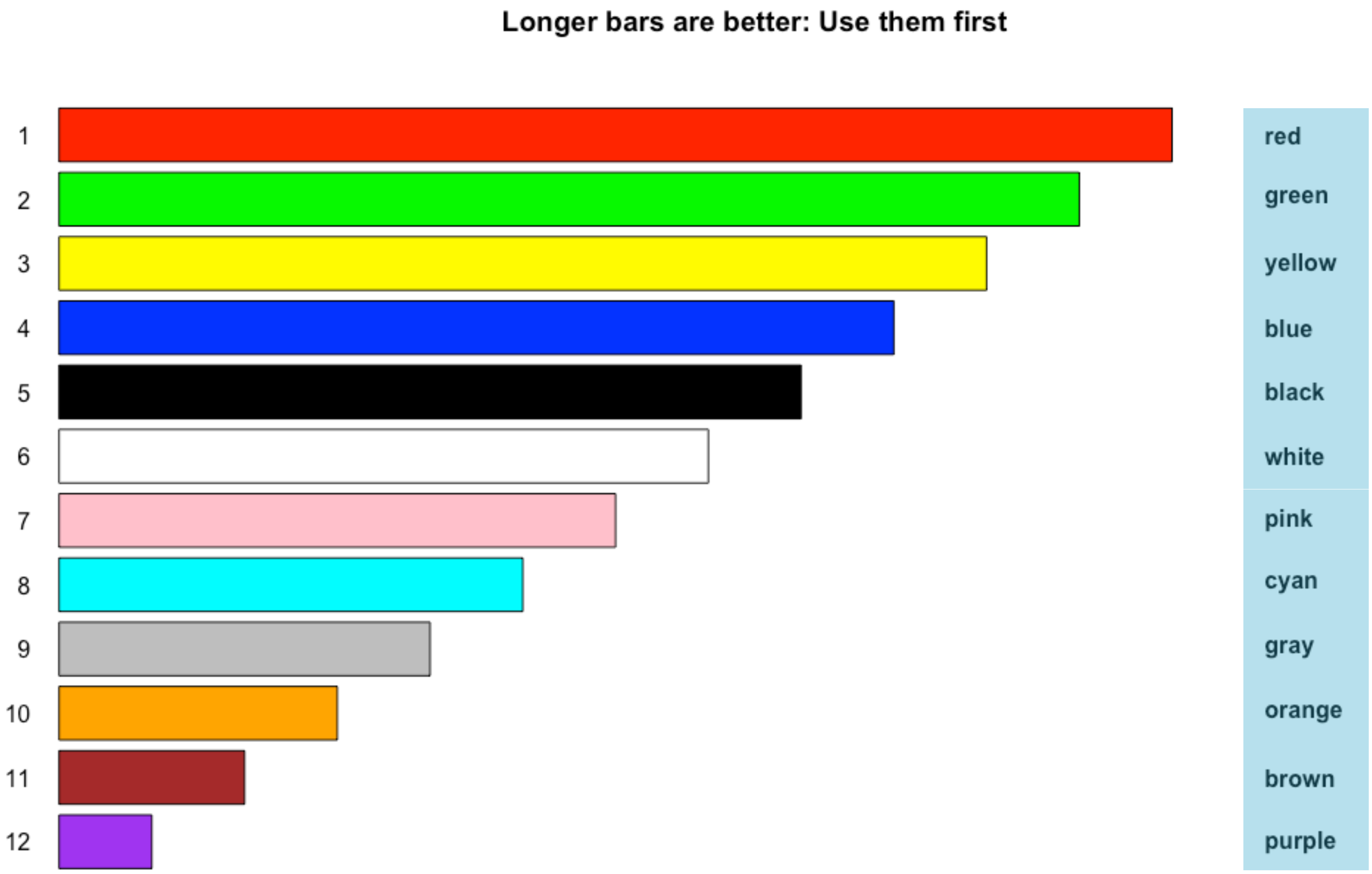
Limitations of color

- Color-blindness: not everyone can see colors
- Black-and-white reproduction loses *all* color-coded details
- Can be overused and lose usefulness

Iliinsky & Steele's recommended colors

- "Ideally, about six ..."
- "... hopefully no more than 12 ..."
- "... and absolutely no more than 20"

Iliinsky & Steele's recommended colors



Let’s practice!

DATA VISUALIZATION IN R

Other graphics systems in R

Why base R?

- Flexible
- Good for exploratory analysis
- Easy to learn

The grid graphics system

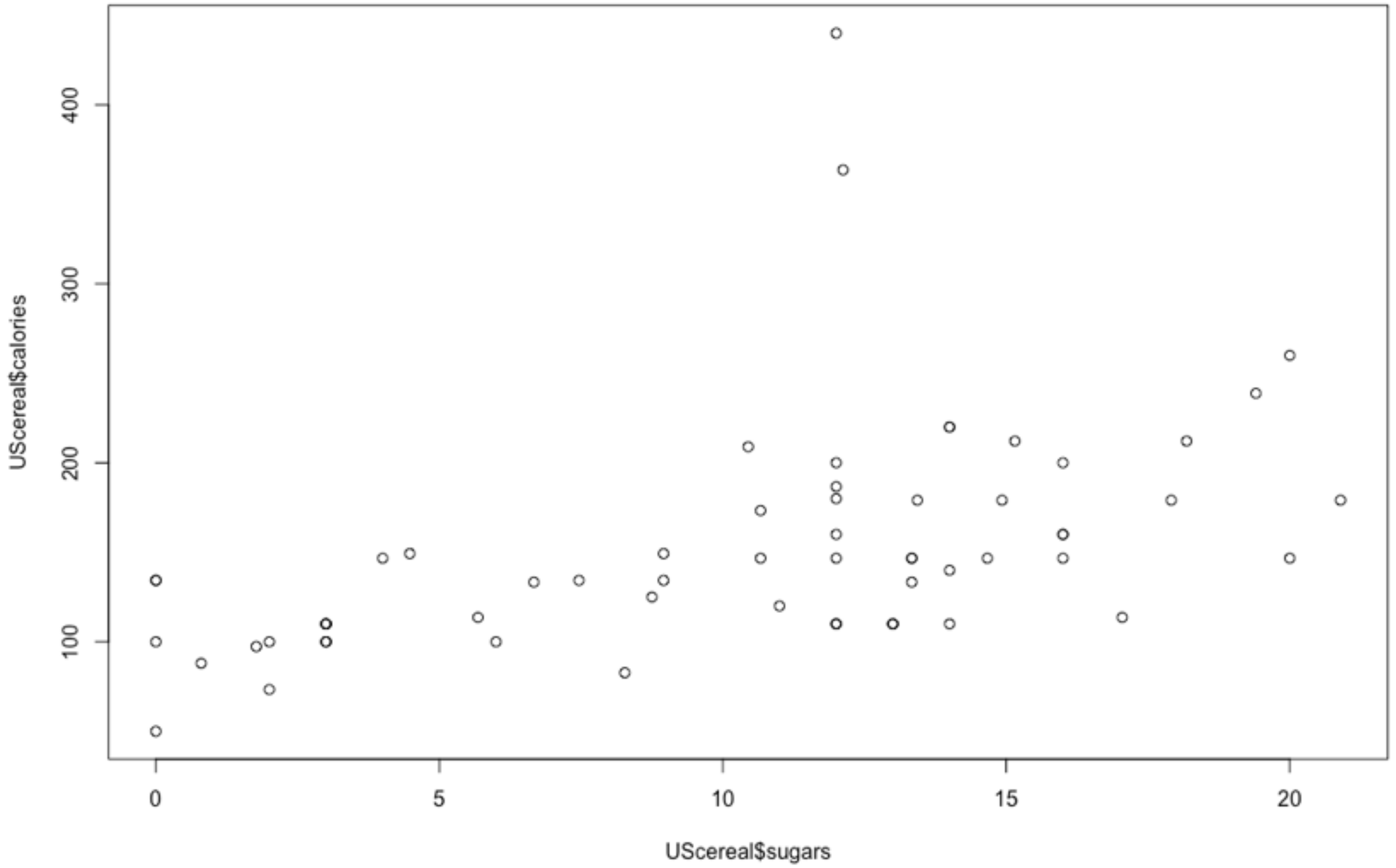
- Based on the `grid` package
- Greater control over low-level graphical details
- More flexible than base graphics
- Comes at cost of steep learning curve

A simple scatterplot in grid

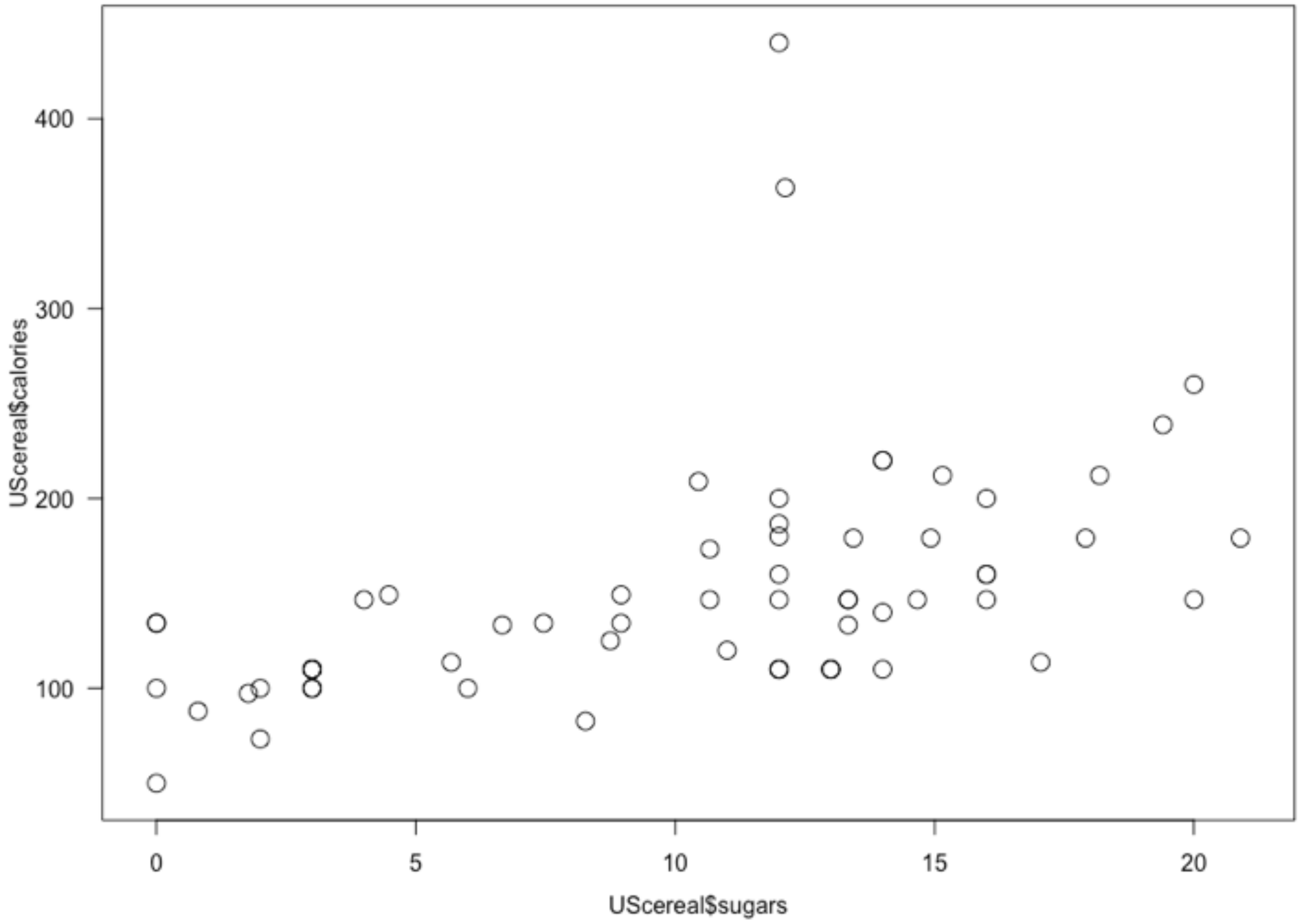
```
# Get the data and load the grid package
> library(MASS)
> x <- UScereal$sugars
> y <- UScereal$calories
> library(grid)

# This is the grid code required to generate the plot
> pushViewport(plotViewport())
> pushViewport(dataViewport(x, y))
> grid.rect()
> grid.xaxis()
> grid.yaxis()
> grid.points(x, y)
> grid.text("UScereal$calories", x = unit(-3, "lines"), rot = 90)
> grid.text("UScereal$sugars", y = unit(-3, "lines"), rot = 0)
> popViewport(2)
```

Base R graphics



grid graphics

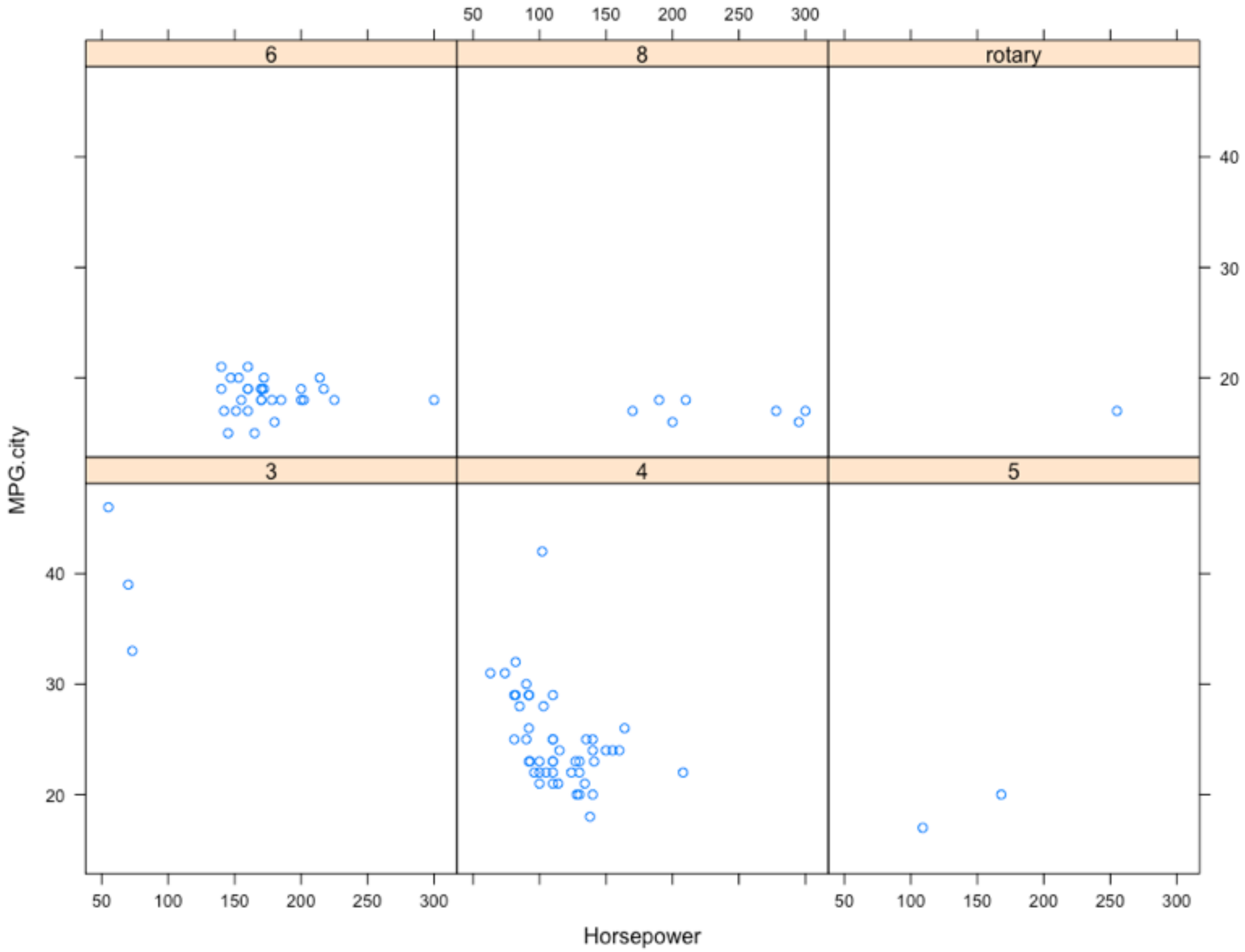


The `lattice` graphics system

- Built on `grid` graphics
- Very good for *conditional* graphs

How does mileage vs. horsepower depend on cylinders?

```
> library(MASS)
> library(lattice)
> xyplot(MPG.city ~ Horsepower | Cylinders, data = Cars93)
```



The `ggplot2` graphics package

- Very popular graphics package based on grid graphics
- The basis for other DataCamp courses
- Allows us to build complex plots in stages

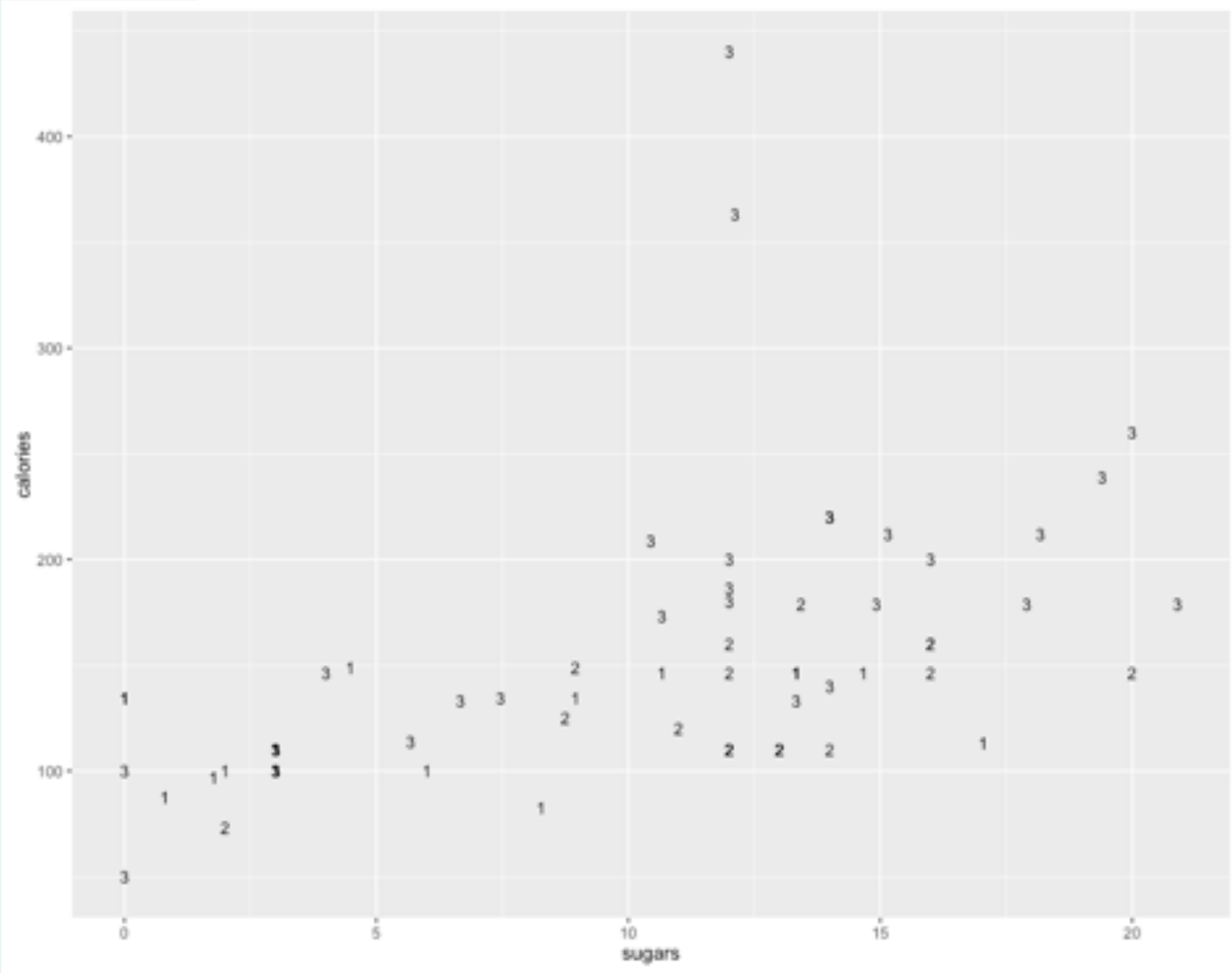
Example with ggplot2

```
# Sets up plot, but does not display it
> basePlot <- ggplot(UScereal, aes(x = sugars, y = calories))

# First, look at a simple scatterplot
> basePlot + geom_point()

# Next, make point shapes depend on shelf variable
> basePlot + geom_point(shape = as.character(UScereal$shelf))

# Make the points bigger, easier to see
> basePlot + geom_point(shape = as.character(UScereal$shelf),
                        size = 3)
```



Let’s practice!