# R-tistic

## Data Visualisation with ggplot2

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# ggplot2

## Key components

Every ggplot2 plot has three key components:

1. **data**
2. A set of **aesthetic mappings** between variables in the data and visual properties, and
3. At lest one layer which describes how to render each observation. Layers are usually created with a **geom** function.

taken from: Wickham, Hadley. “Getting Started with ggplot2.” In ggplot2, 11–31. Use R! Springer International Publishing, 2016. doi:10.1007/978-3-319-24277-4_2. **(link)**

# ggplot2

## Example

- type the code below into the console and hit ↵

```
ggplot(mpg, aes(x = displ, y = hwy)) +
  geom_point()
```

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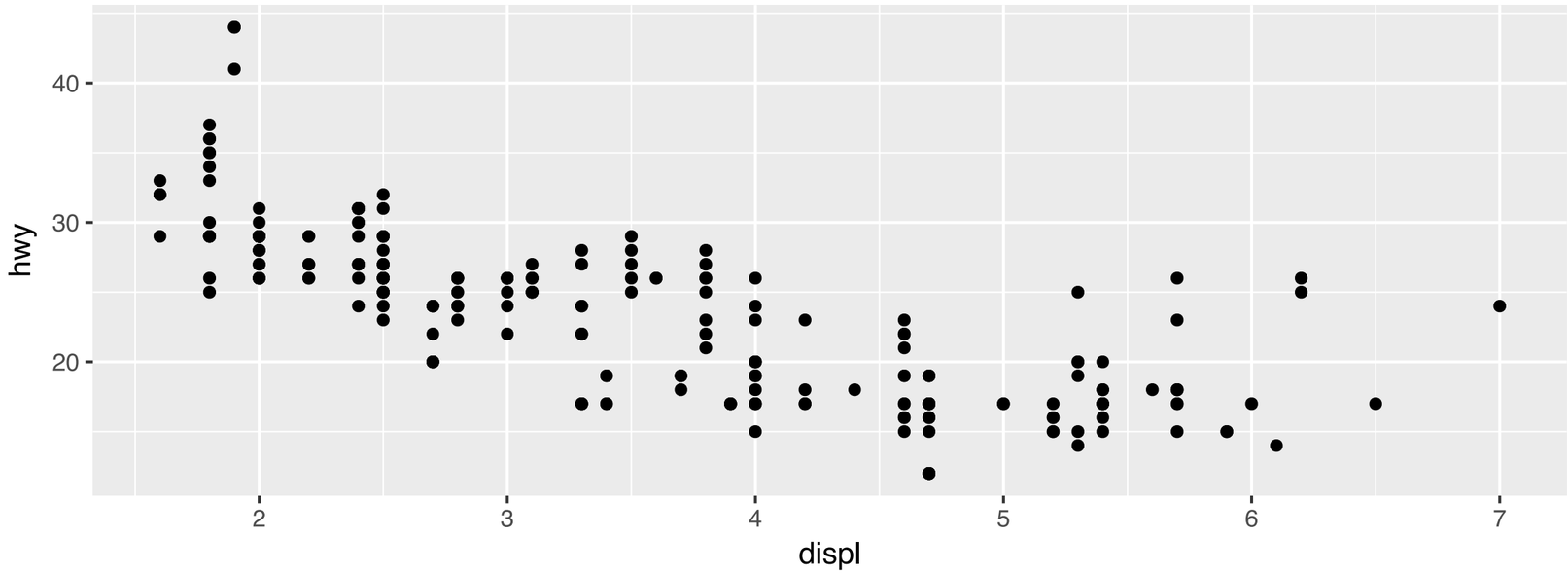

# ggplot2

## What does the function do?

# ggplot2

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1. Data: `mpg` dataset, which is build into ggplot2.
2. Aesthetic mapping: engine size mapped to x position, fuel economy to y position.
3. Layer: points.

# ggplot2

## What does the function do?

1. Data: `mpg` dataset, which is build into ggplot2.
2. Aesthetic mapping: engine size mapped to x position, fuel economy to y position.
3. Layer: points.

Also being referred to as a scatterplot.

taken from: Wickham, Hadley. “Getting Started with ggplot2.” In ggplot2, 11–31. Use R! Springer International Publishing, 2016. doi:10.1007/978-3-319-24277-4_2. **(link)**

# ggplot 2

## Exercises

- type the code below into the console and hit ↵

```
ggplot(gapminder, aes(country, lifeExp)) +
  geom_point()
```

# ggplot 2

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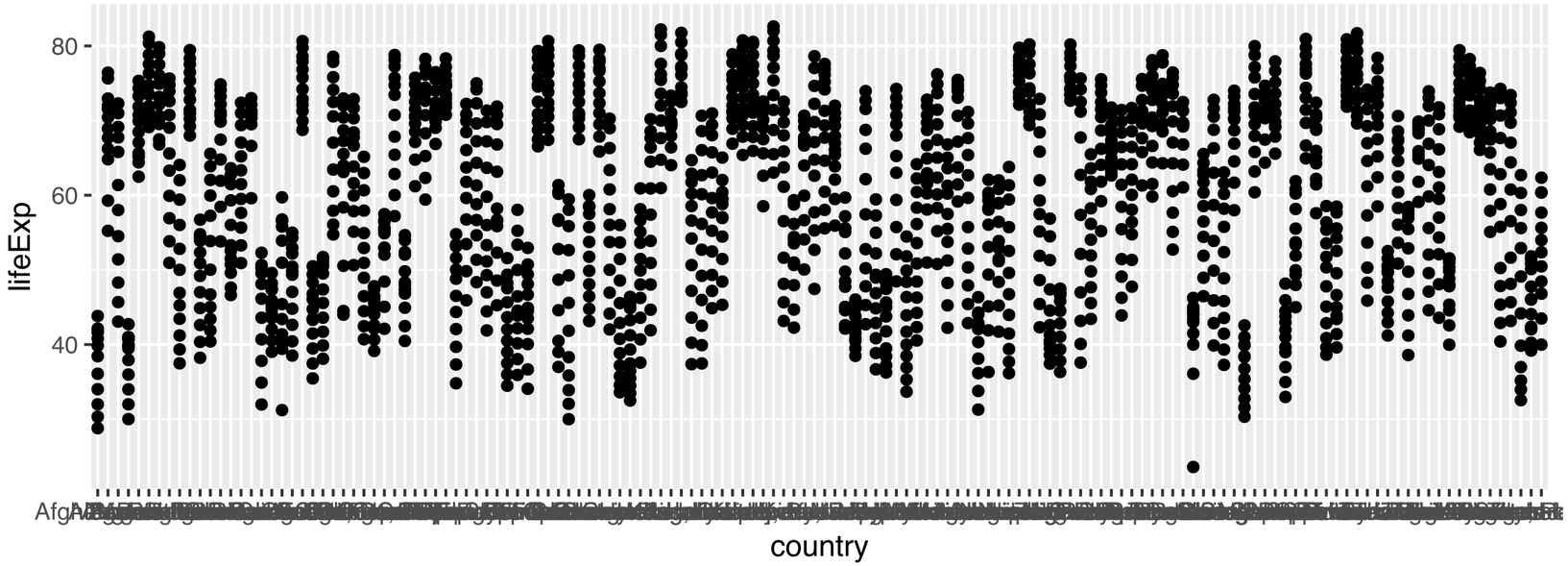
```

- what does the plot show?



# ggplot 2

## Exercises

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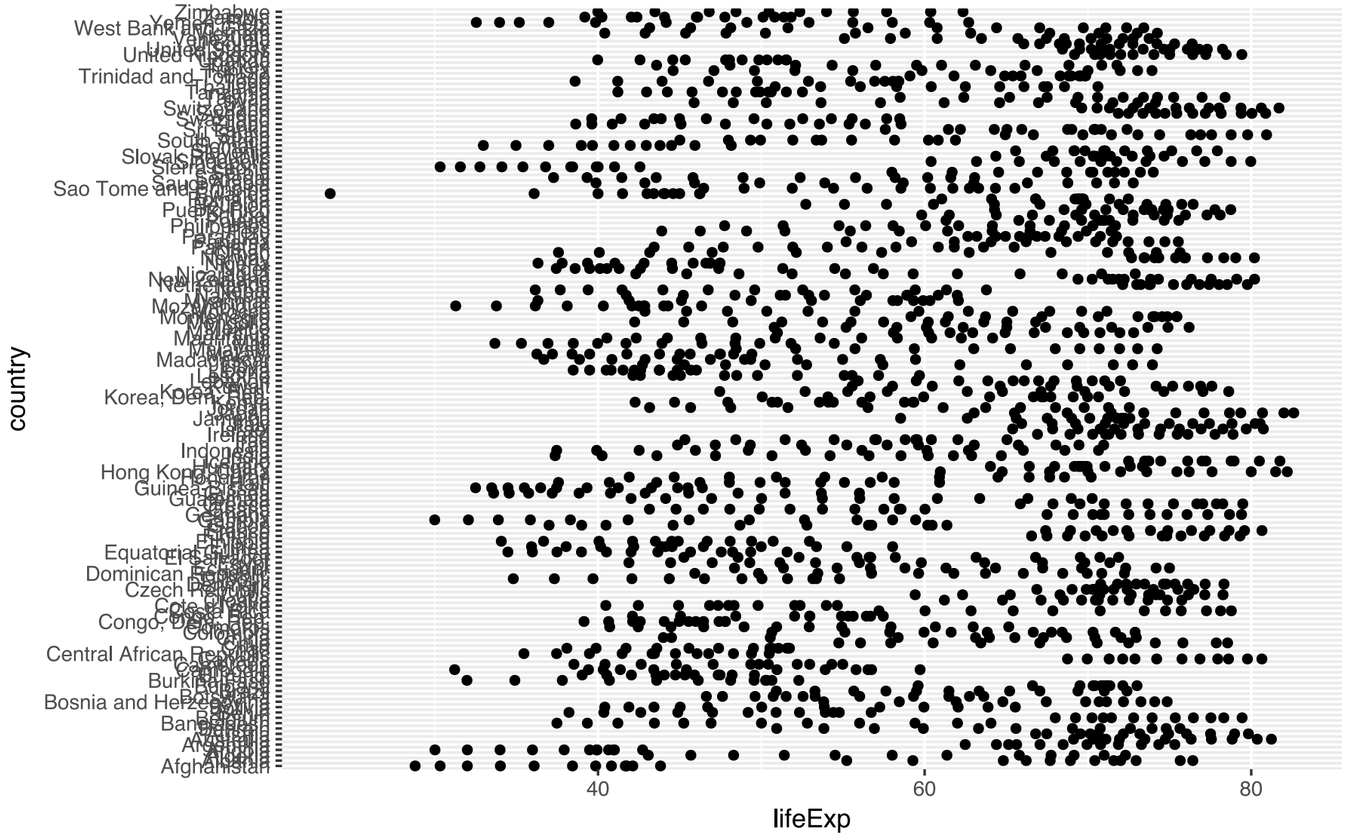
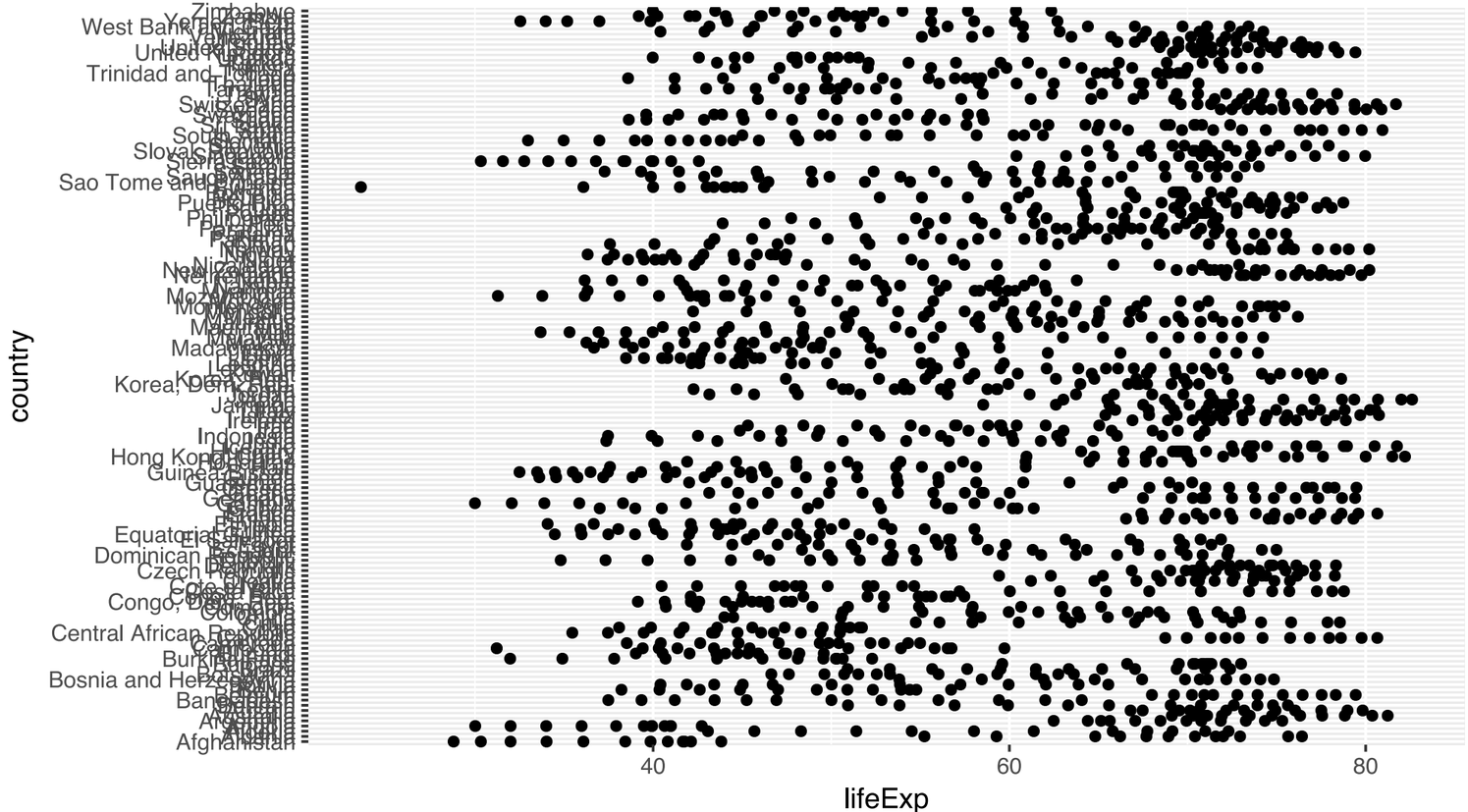


# ggplot 2

## Exercises

```
ggplot(gapminder, aes(x = country, y = lifeExp)) +
  geom_point() +
  coord_flip()
```



# ggplot 2

## Exercises: Make a scatterplot

1. Data: `diamonds` dataset, which is build into ggplot2.
2. Aesthetic mapping: carat mapped to x position, price mapped to y position.
3. Layer: points.

# ggplot 2

## Exercises: Make a scatterplot

1. Data: `diamonds` dataset, which is build into ggplot2.
2. Aesthetic mapping: carat mapped to x position, price mapped to y position.
3. Layer: points.

```
ggplot(diamonds, aes(x = carat, y = price)) +
  geom_point()
```

# ggplot 2

## Exercises: Make a scatterplot

# ggplot 2

## Aesthetic Attributes

- add colour, shape or size to `aes()`

```
ggplot(mpg, aes(x = displ, y = cty, colour = class)) +
  geom_point()
```

# ggplot 2

## Aesthetic Attributes

- add colour, shape or size to `aes()`

```
ggplot(mpg, aes(x = displ, y = cty, colour = class)) +
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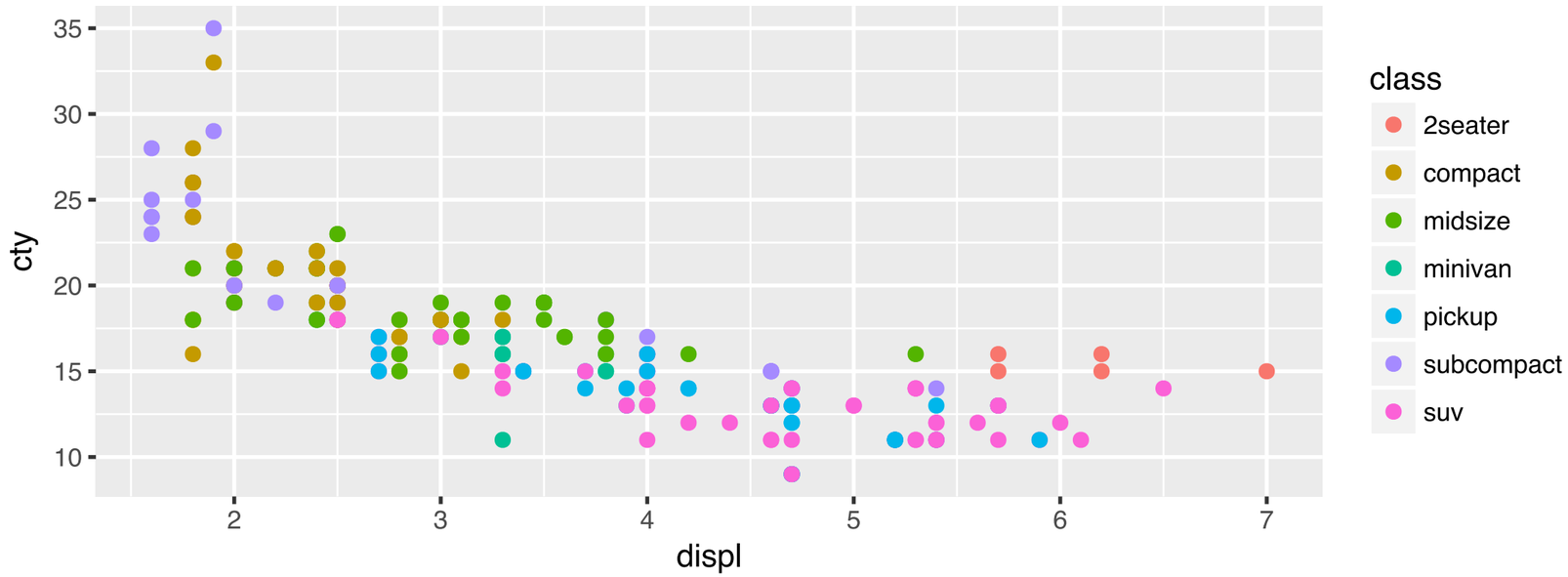


# ggplot 2

## Aesthetic Attributes

- map shape instead of colour
- then map size instead of colour
- what happens?

```
ggplot(mpg, aes(x = displ, y = cty, shape = class)) +
  geom_point()
```

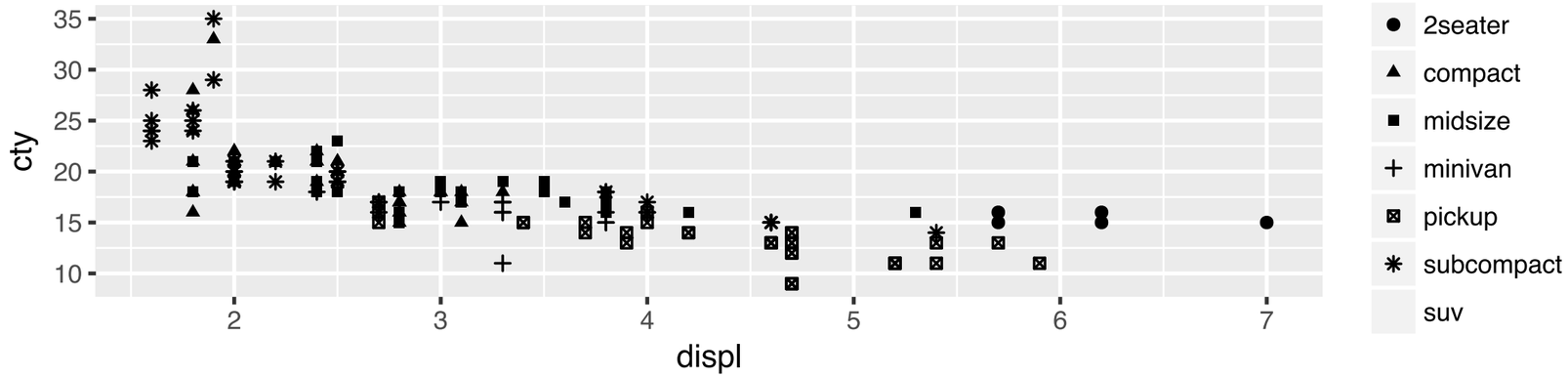
# ggplot 2

## Warnings

```
ggplot(mpg, aes(x = displ, y = cty, shape = class)) +
  geom_point()
```

```
## Warning: The shape palette can deal with a maximum of 6
## because more than 6 becomes difficult to discriminate; y
## Consider specifying shapes manually if you must have the
```

```
## Warning: Removed 62 rows containing missing values (geom
```

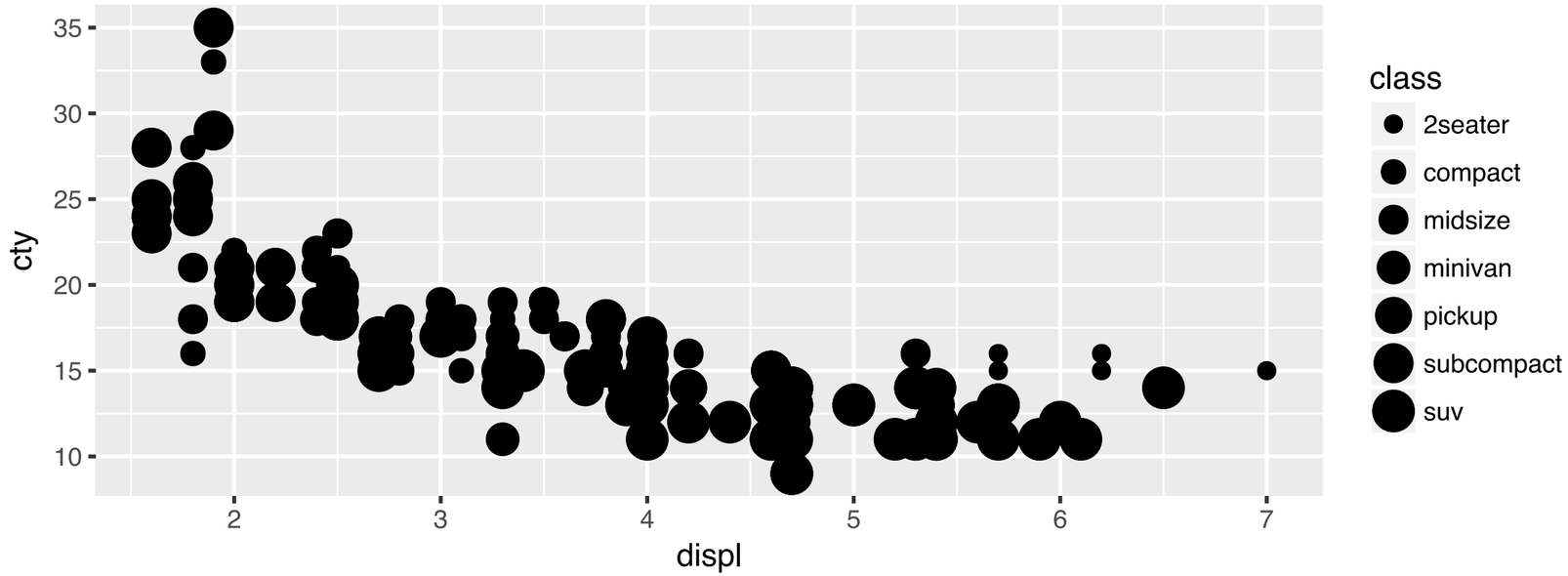


# ggplot 2

## Warnings

```
ggplot(mpg, aes(x = displ, y = cty, size = class)) +
  geom_point()
```

```
## Warning: Using size for a discrete variable is not advis
```



# Variables

## Discrete, continous and categorical

- colour and shape work well with categorical variables
- size works well for continous variables
- ...

# ggplot 2

## Exercise

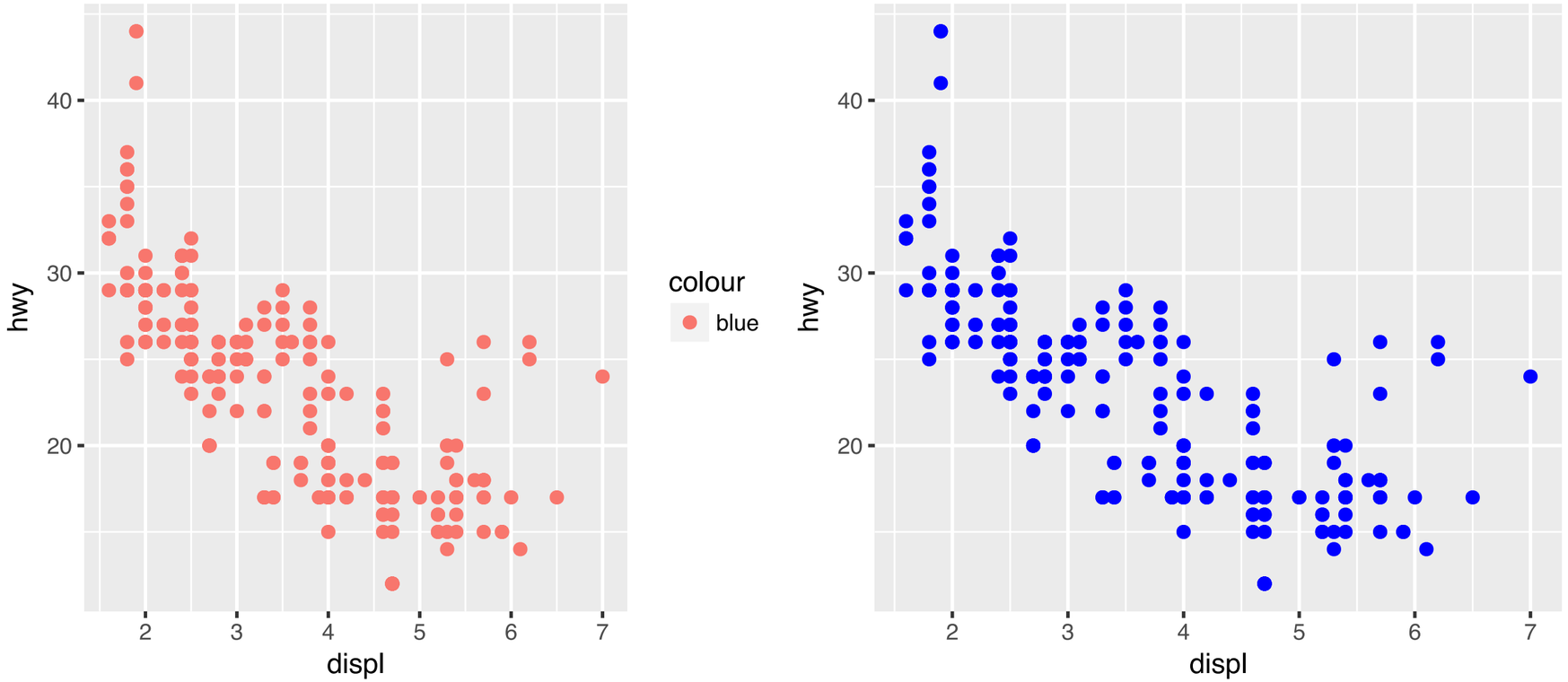
- type the code below into the console and hit ↵
- compare the two plots

```
ggplot(mpg, aes(x = displ, y = hwy)) +
  geom_point(aes(colour = blue))

ggplot(mpg, aes(x = displ, y = hwy)) +
  geom_point(colour = blue)
```

# ggplot 2

## Exercise



# ggplot 2

## Facetting

- another technique to display additional categorical variables on a plot
- type the code below into the console and hit ↵

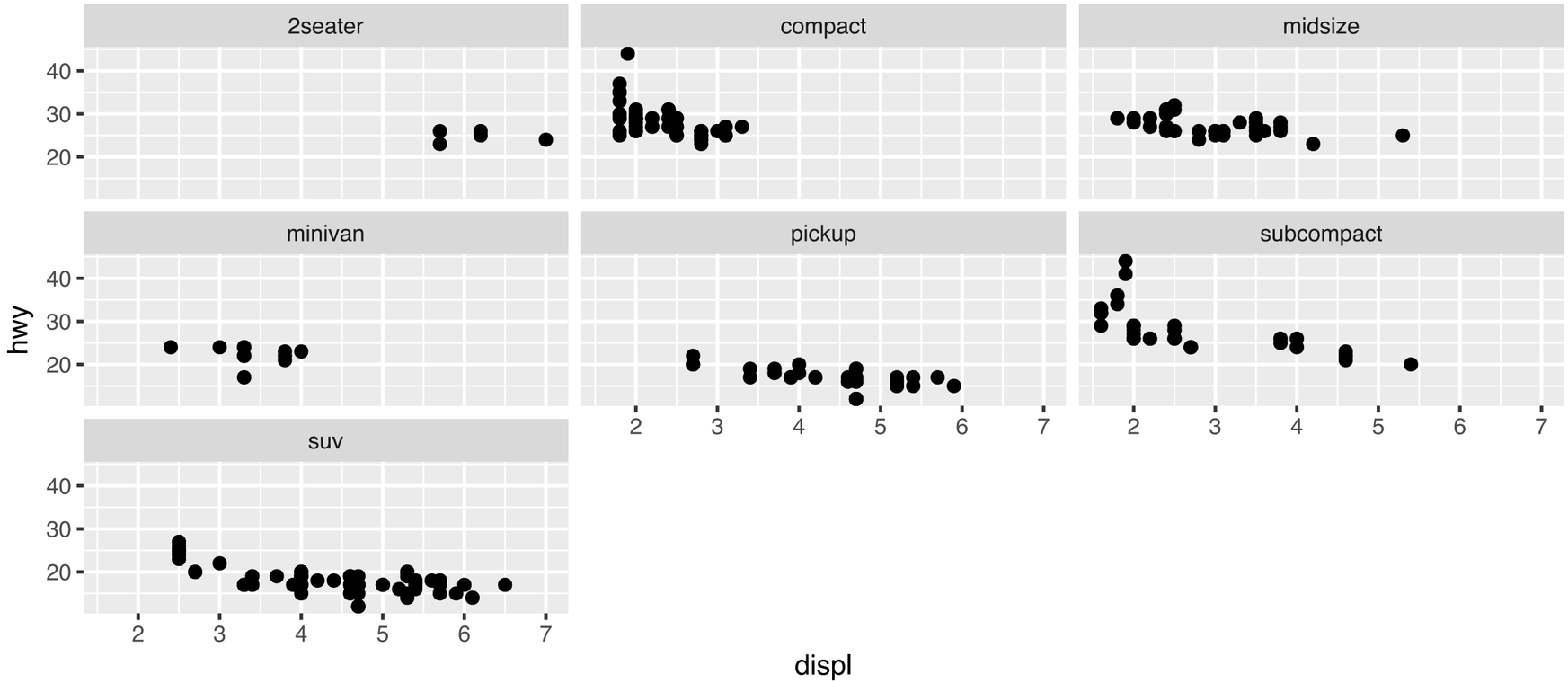
```
ggplot(mpg, aes(x = displ, y = hwy)) +
  geom_point() +
  facet_wrap(~class)
```

- what can you see?

# ggplot 2

## Facetting

- what can you see?



# ggplot 2

## Plot Geoms

- geom_smooth
- geom_boxplot
- geom_histogram
- geom_bar
- geom_path
- geom_line

# ggplot 2

## geom_smooth()

Make a scatterplot using the `mpg` dataset with the aesthetic mappings engine size and fuel economy position. Then add a smoother.

# ggplot 2

## geom_smooth()

Make a scatterplot using the `mpg` dataset with the aesthetic mappings engine size and fuel economy position. Then add a smoother.

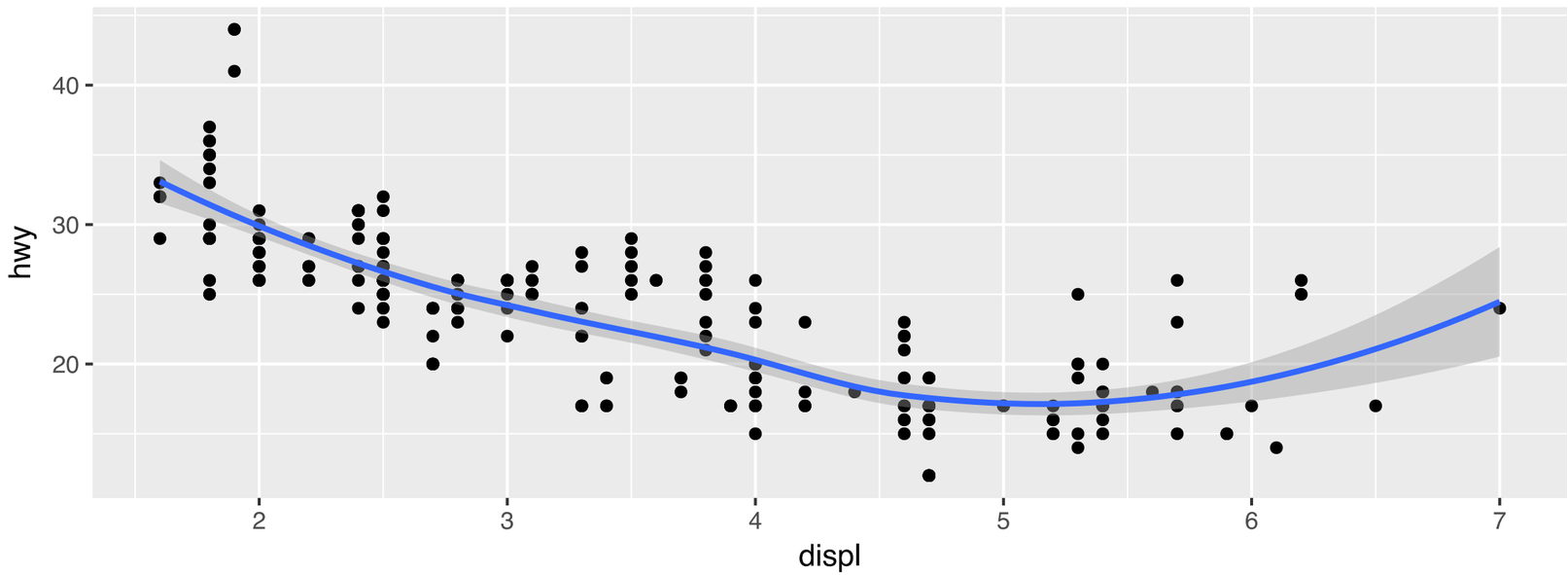
```
ggplot(mpg, aes(x = displ, y = hwy)) +
  geom_point() +
  geom_smooth()
```

# ggplot 2

## geom_smooth()

Make a scatterplot using the `mpg` dataset with the aesthetic mappings engine size and fuel economy position. Then add a smoother.

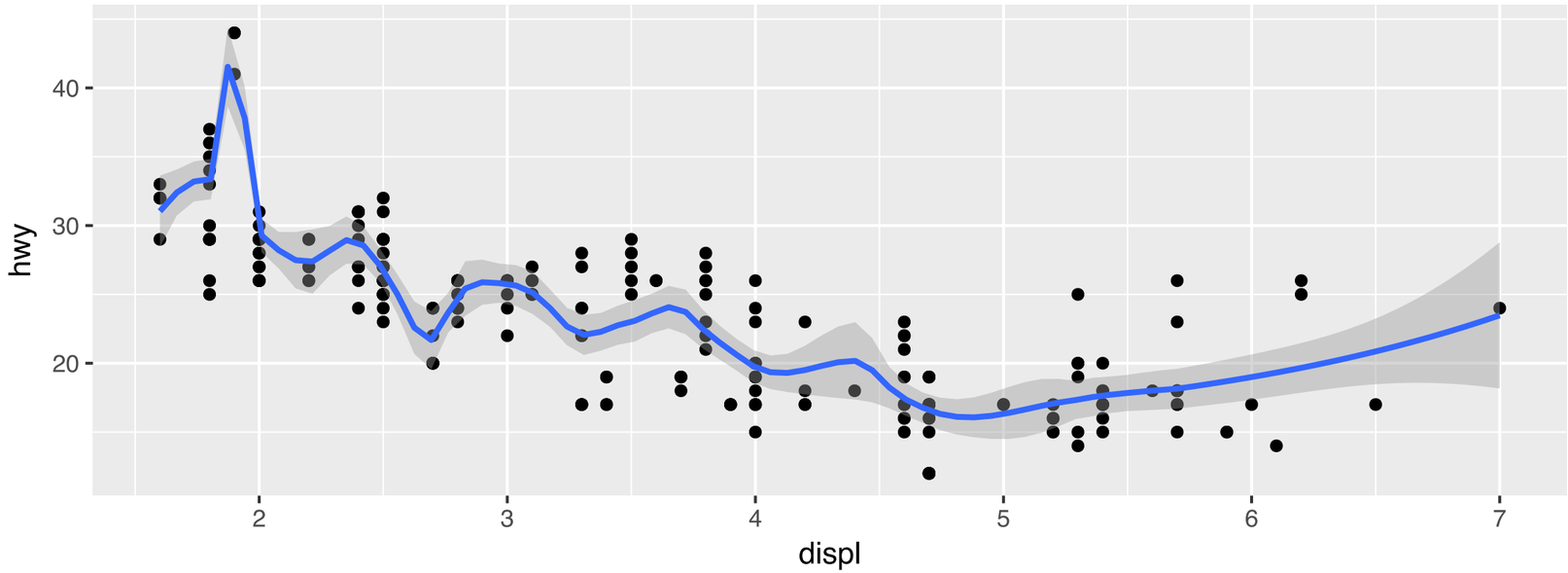
```
ggplot(mpg, aes(x = displ, y = hwy)) +
  geom_point() +
  geom_smooth()
```



# ggplot 2

## geom_smooth() span

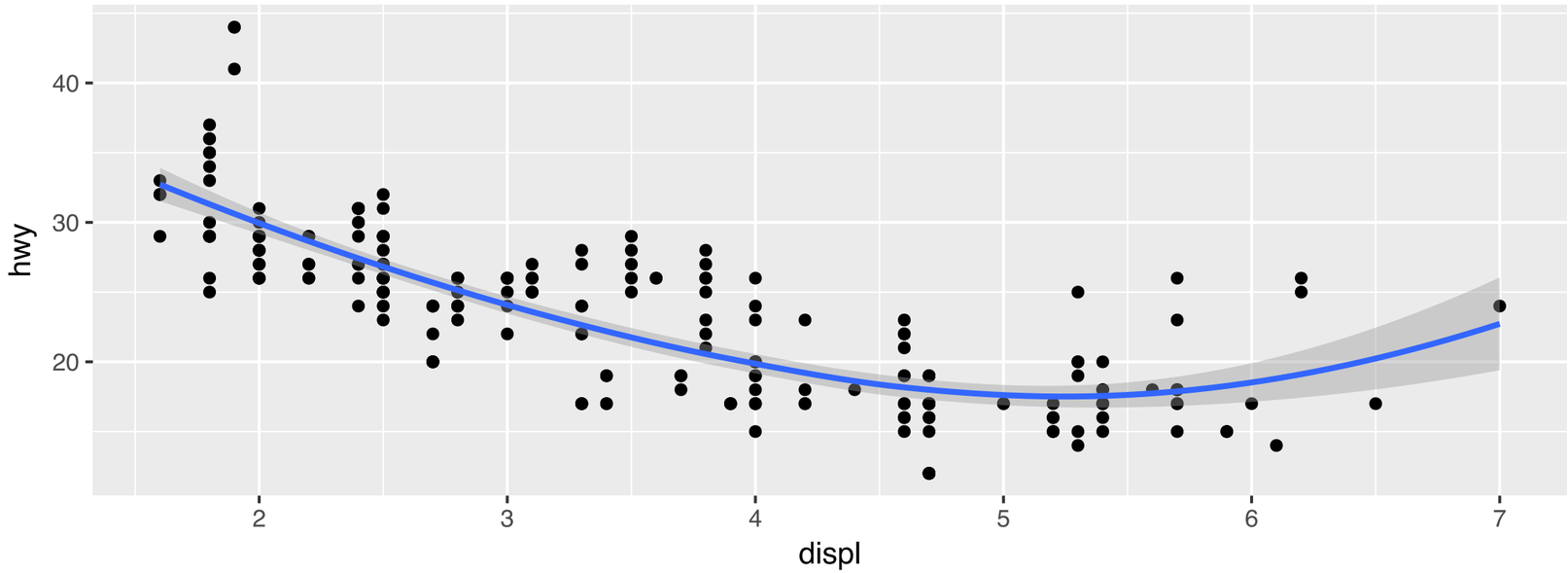
```
ggplot(mpg, aes(x = displ, y = hwy)) +
  geom_point() +
  geom_smooth(span = 0.2)
```



# ggplot 2

## geom_smooth() span

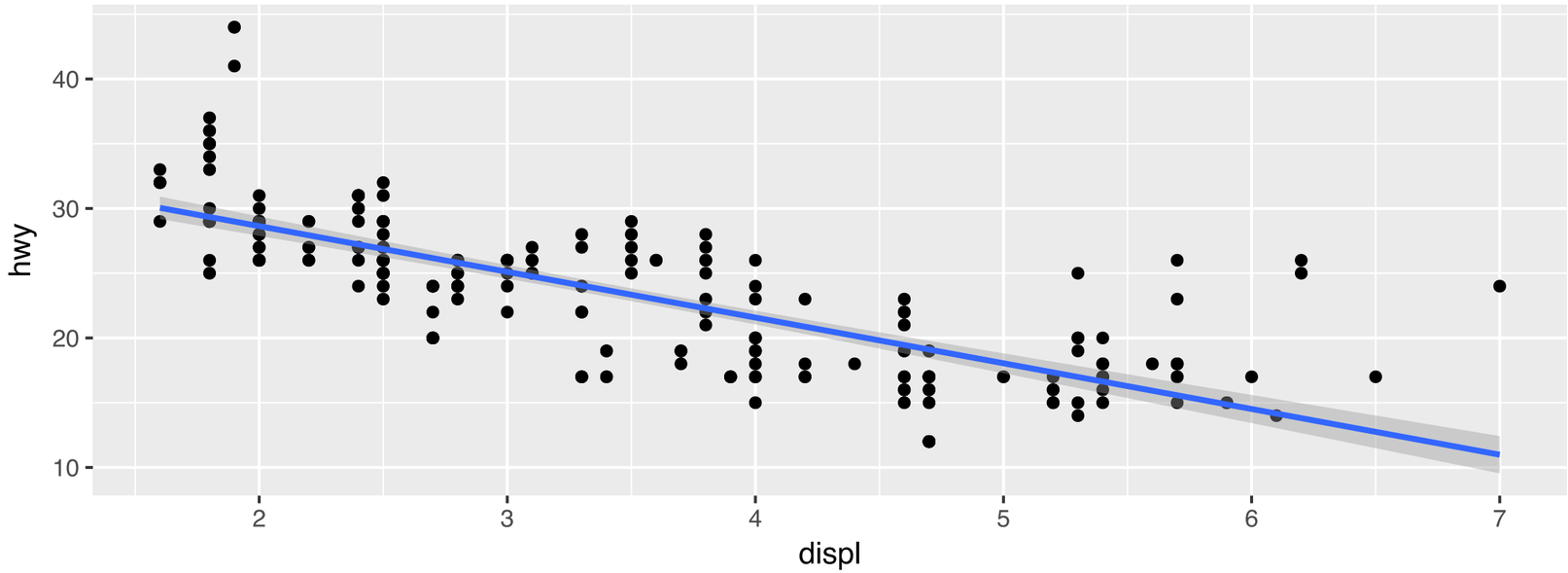
```
ggplot(mpg, aes(x = displ, y = hwy)) +
  geom_point() +
  geom_smooth(span = 1)
```



# ggplot 2

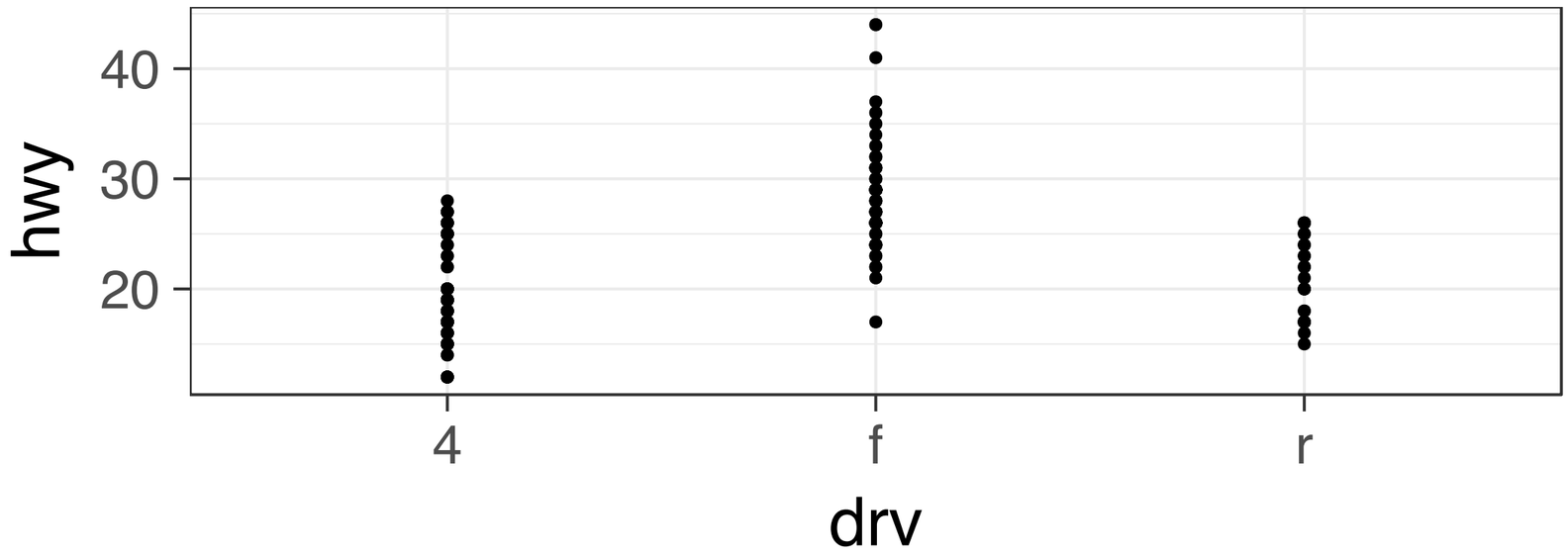
## geom_smooth() linear model

```
ggplot(mpg, aes(x = displ, y = hwy)) +
  geom_point() +
  geom_smooth(method = "lm")
```



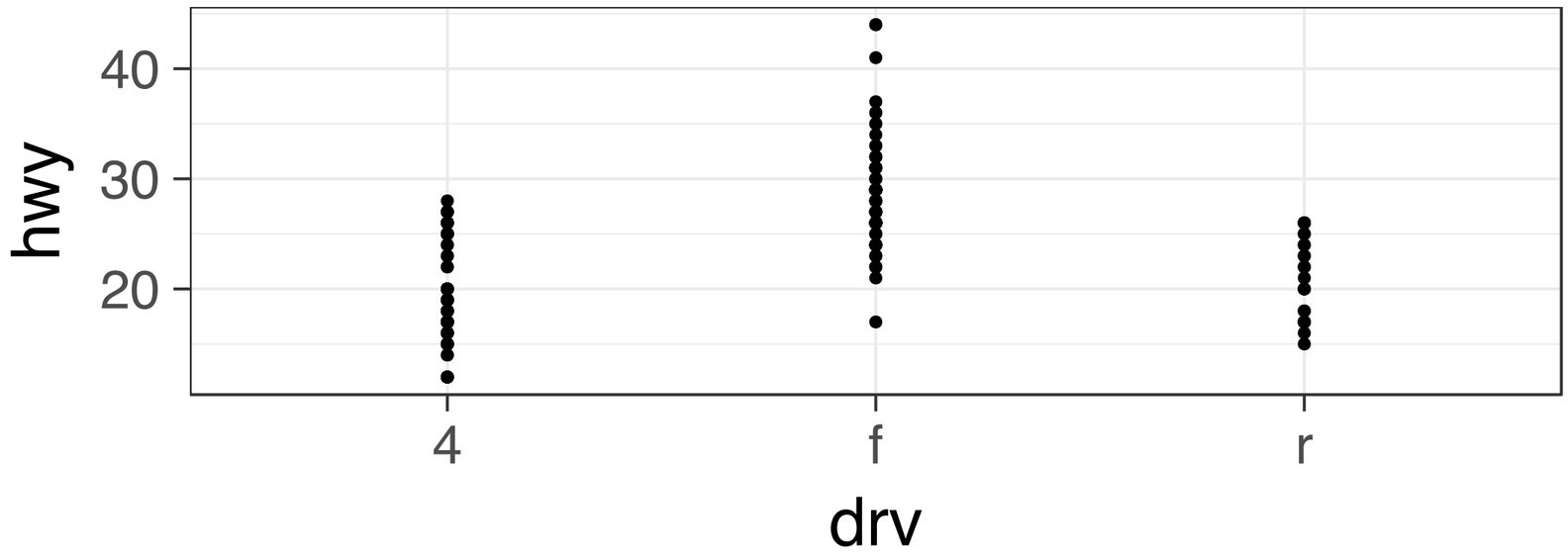
# ggplot 2

## Boxplots and Jittered points



# ggplot 2

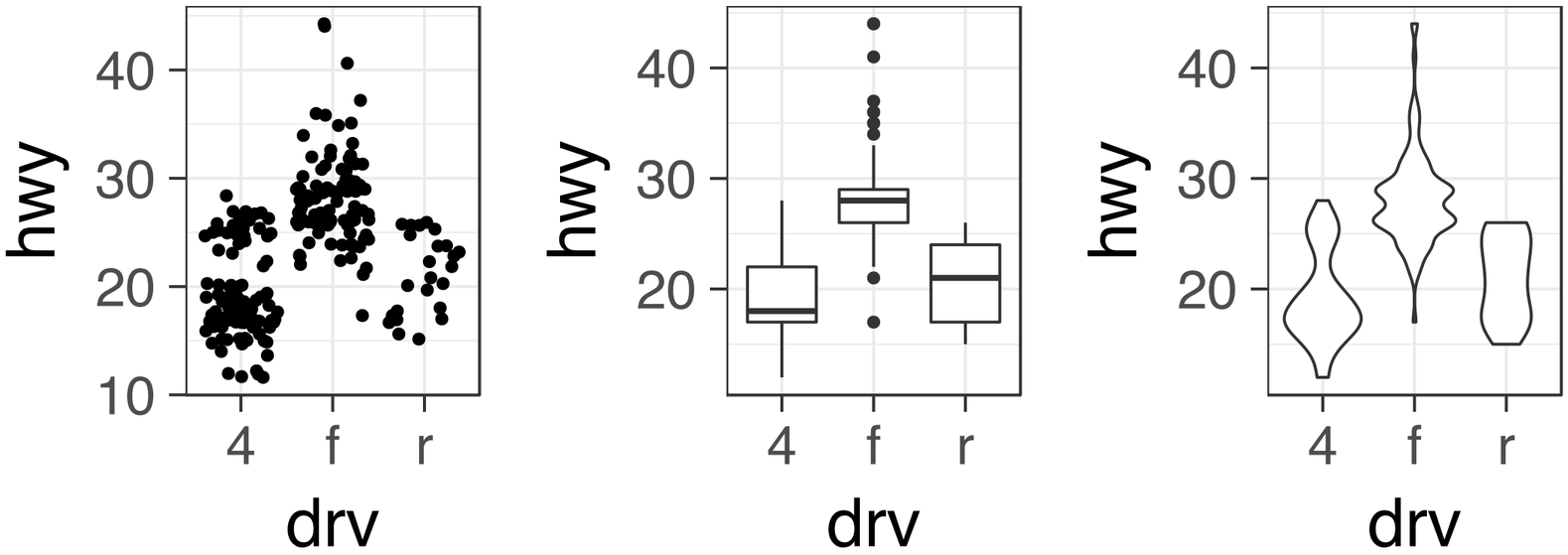
## Boxplots and Jittered points




- few unique values (lots of overplotting)
  - geom_jitter
  - geom_boxplot
  - geom_violin

# ggplot 2

## Boxplots, Jittered Points and Violin Plots



# ggplot 2

## Histograms

```
ggplot(mpg, aes(hwy)) +
  geom_histogram()
```

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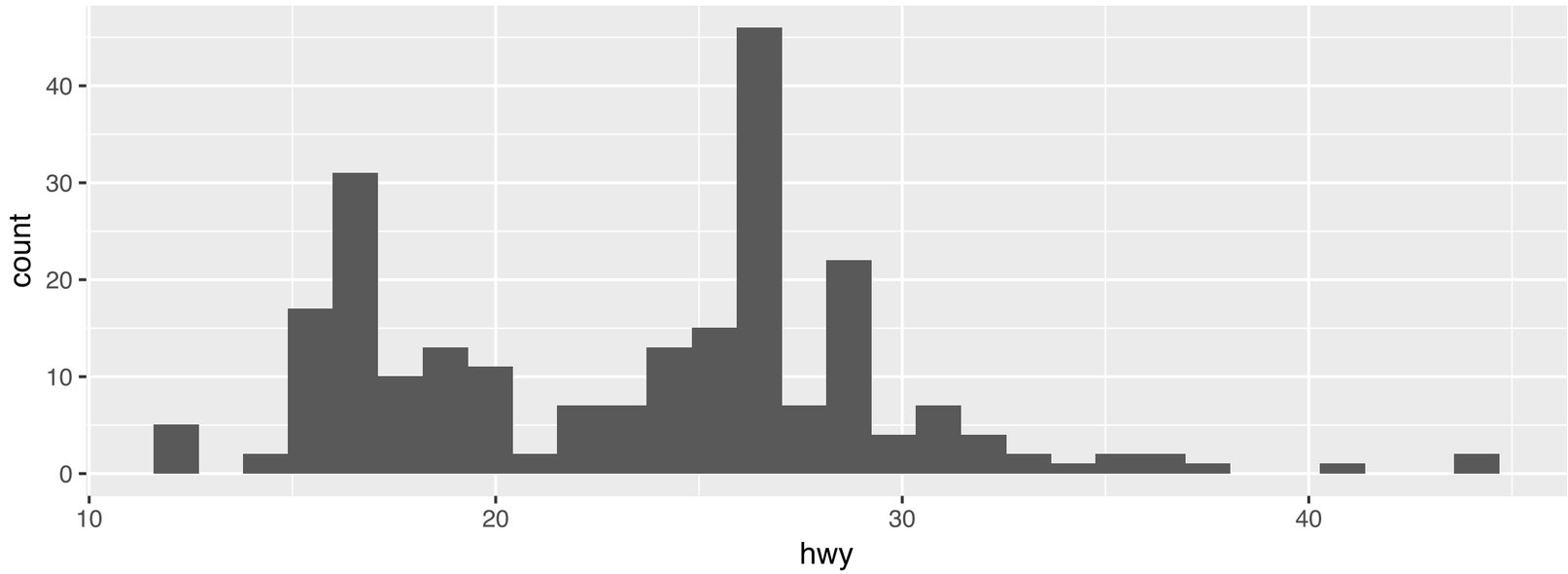
## Histograms

```
ggplot(mpg, aes(hwy)) +
  geom_histogram()
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `
```



# ggplot 2

## Histograms

```
ggplot(mpg, aes(hwy)) +
  geom_histogram(binwidth = 2.5)
```

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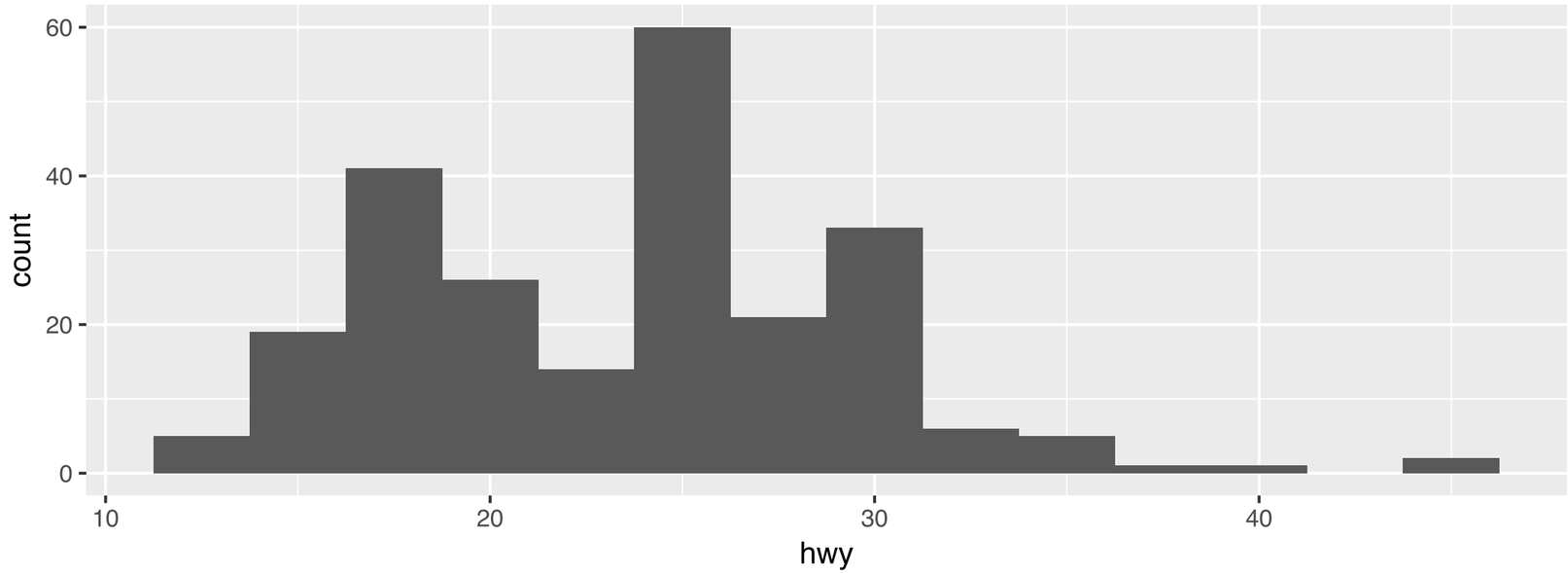
```
ggplot(mpg, aes(hwy)) +
  geom_histogram(binwidth = 2.5)
```



# ggplot 2

## Frequency Polygons

```
ggplot(mpg, aes(hwy)) +
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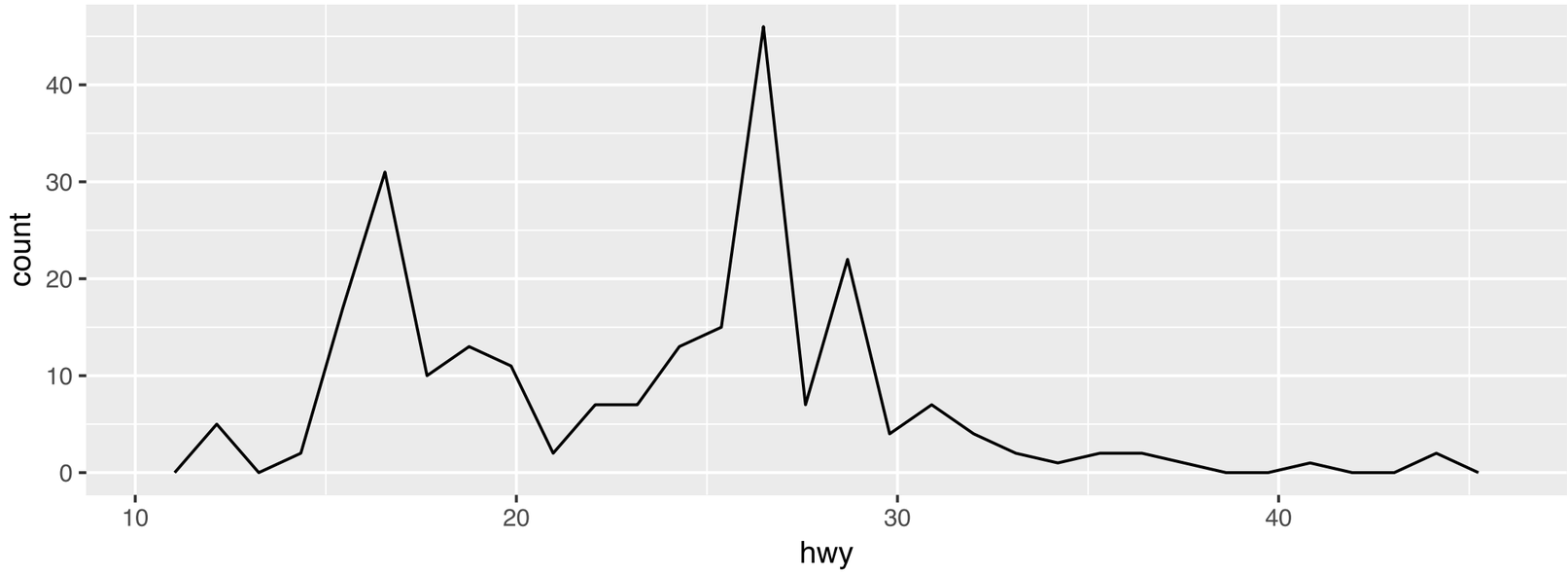
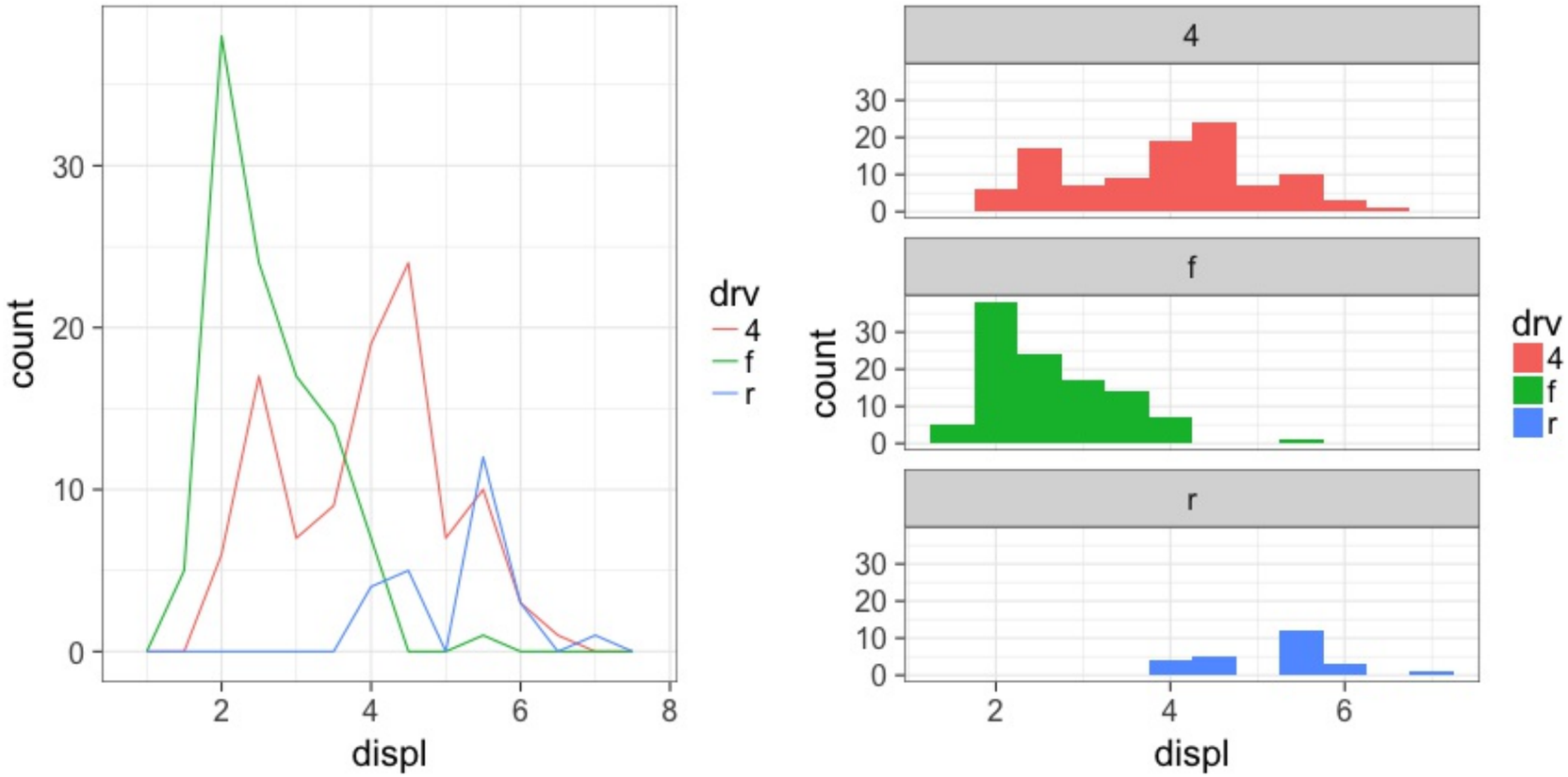


# ggplot 2

## Frequency Polygons and Histograms



# Library

## GridExtra

- install package gridExtra
- load package gridExtra into your script

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```
library(gridExtra)

g_freq <- ggplot(mpg, aes(displ, colour = drv)) +
  geom_freqpoly(binwidth = 0.5) +
  theme_bw(base_size = 20)

g_hist <- ggplot(mpg, aes(displ, fill = drv)) +
  geom_histogram(binwidth = 0.5)  +
  facet_wrap(~drv, ncol = 1) +
  theme_bw(base_size = 20)

grid.arrange(g_freq, g_hist, ncol = 2)
```

# Next steps

## Learn more and have fun!

### Try R Codeschool

### Hadley Wickham - R for Data Science

...and if you have questions, just write me and email: **r-tistic@lse.de**