Data Visualization in R

customizing ggplot2

2024-08-13

Scales: *position scales*

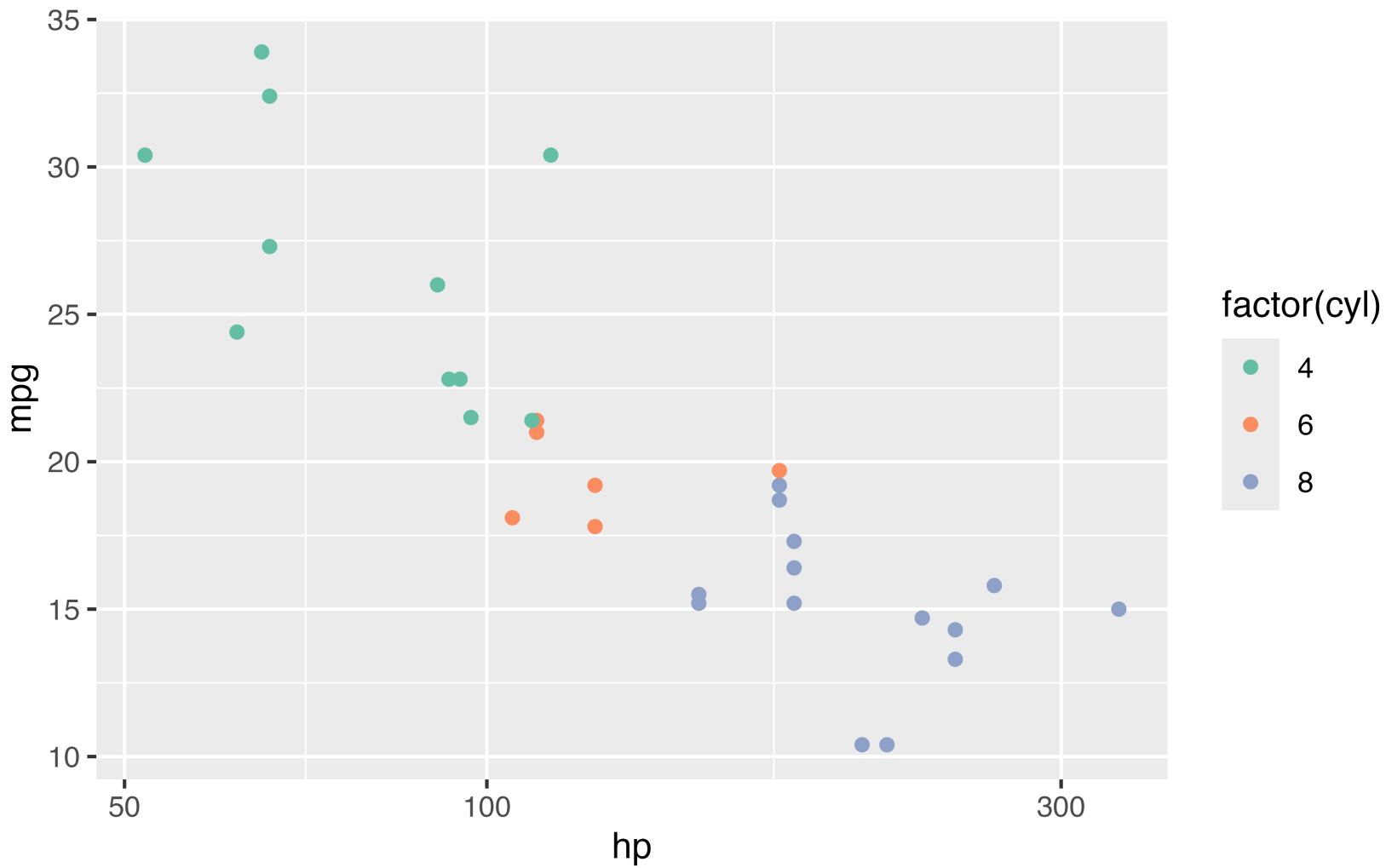
`scale_x_continuous()`

`scale_y_date()` `scale_x_log10()`

Scales: *aesthetic scales*

```
scale_color_hue()
scale_fill_brewer()
scale_shape_manual()
```

```r
mtcars |>
  ggplot(aes(hp, mpg, color = factor(cyl))) +
  geom_point() +
  scale_x_log10() +
  scale_color_brewer(palette = "Set2")
```



Your Turn 10

1. Change the color scale by adding a scale layer. Experiment with `scale_color_distiller()` and `scale_color_viridis_c()`. Check the help pages for different palette options.

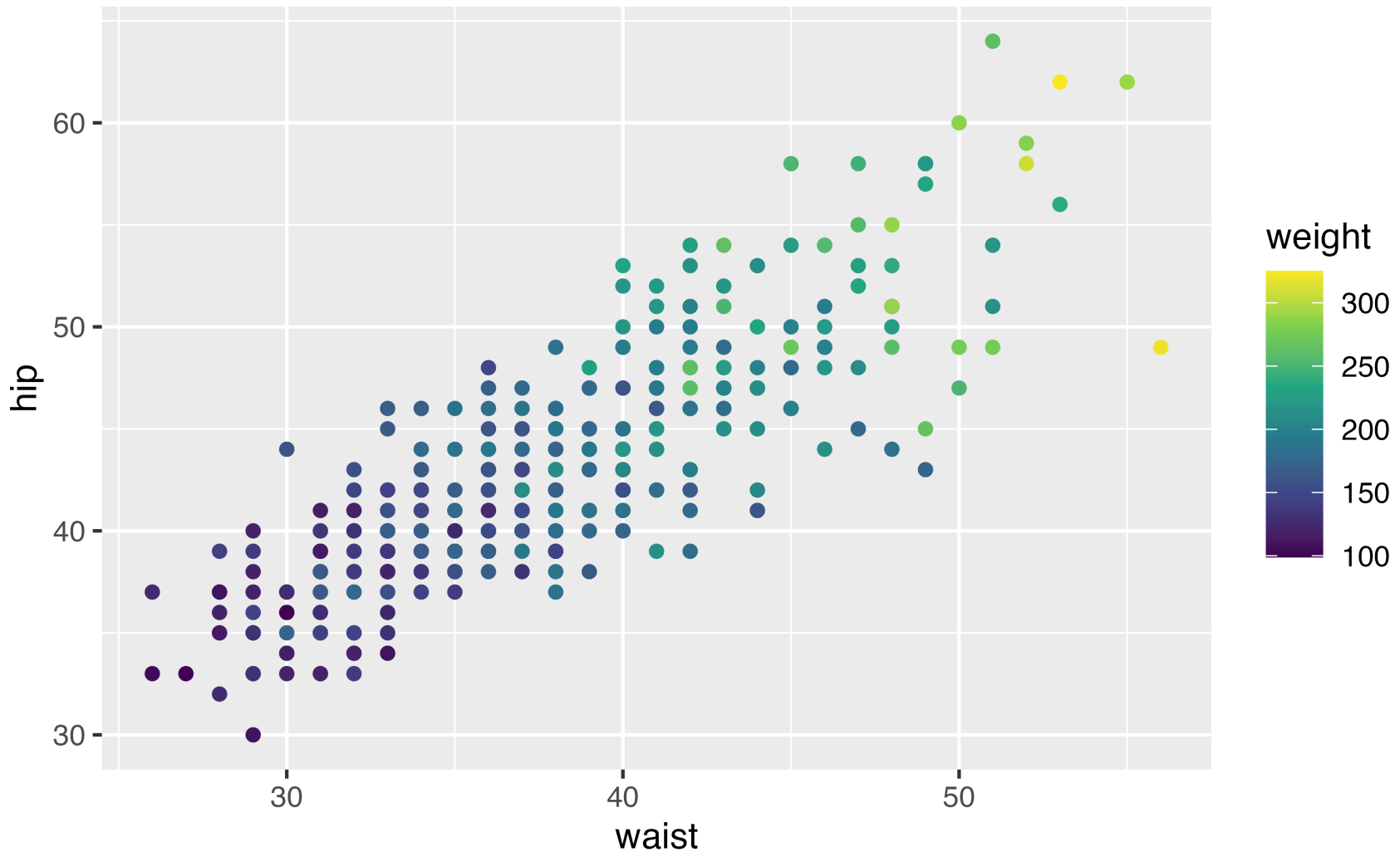
2. Set the color aesthetic to `gender`. Try `scale_color_brewer()`.

3. Set the colors manually with `scale_color_manual()`. Use `values = c("#E69F00", "#56B4E9")` in the function call.

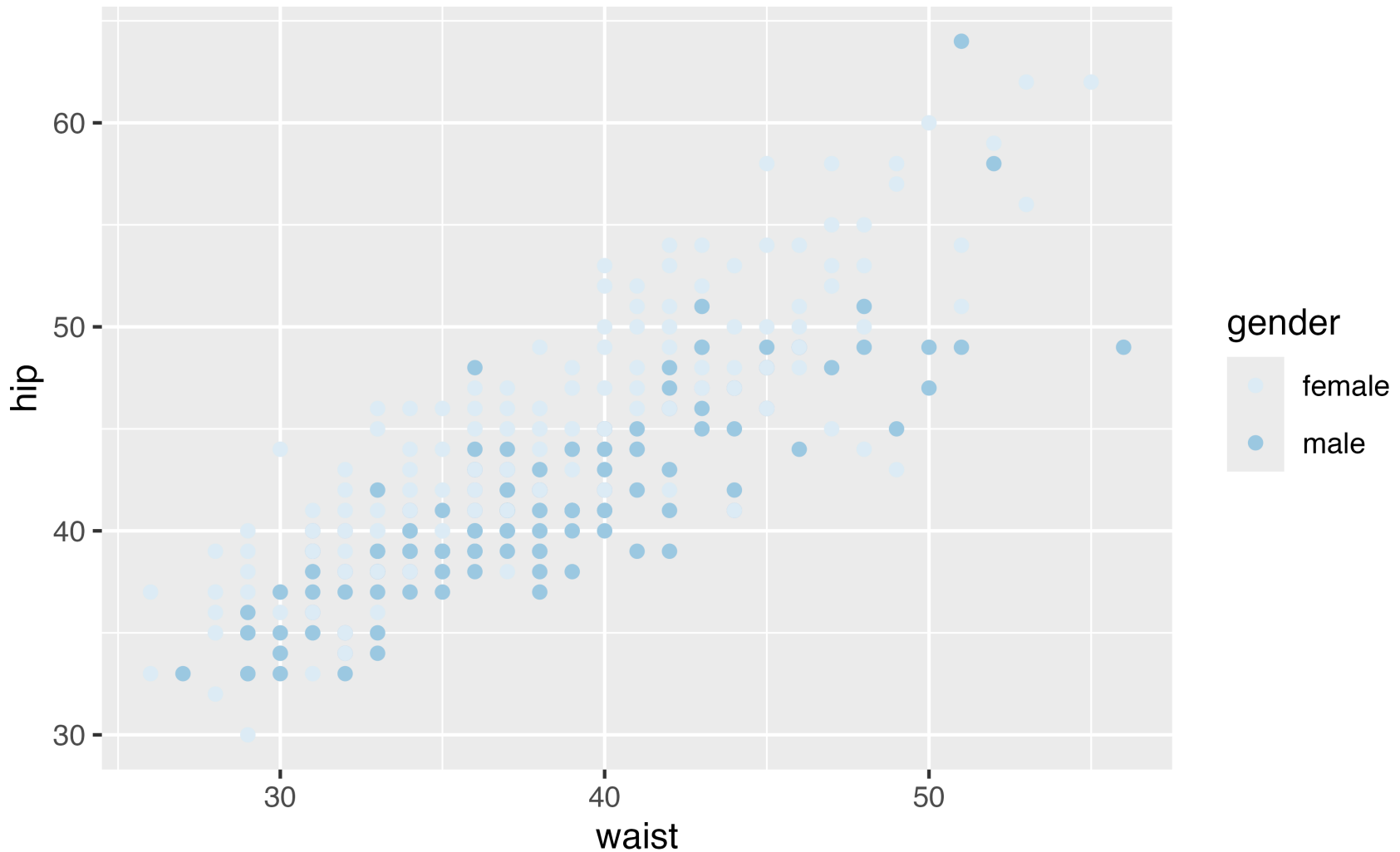
4. Change the legend title for the color legend. Use the `name` argument in whatever scale function you're using.

```
diabetes |>
  ggplot(aes(waist, hip, color = weight)) +
  geom_point()
```

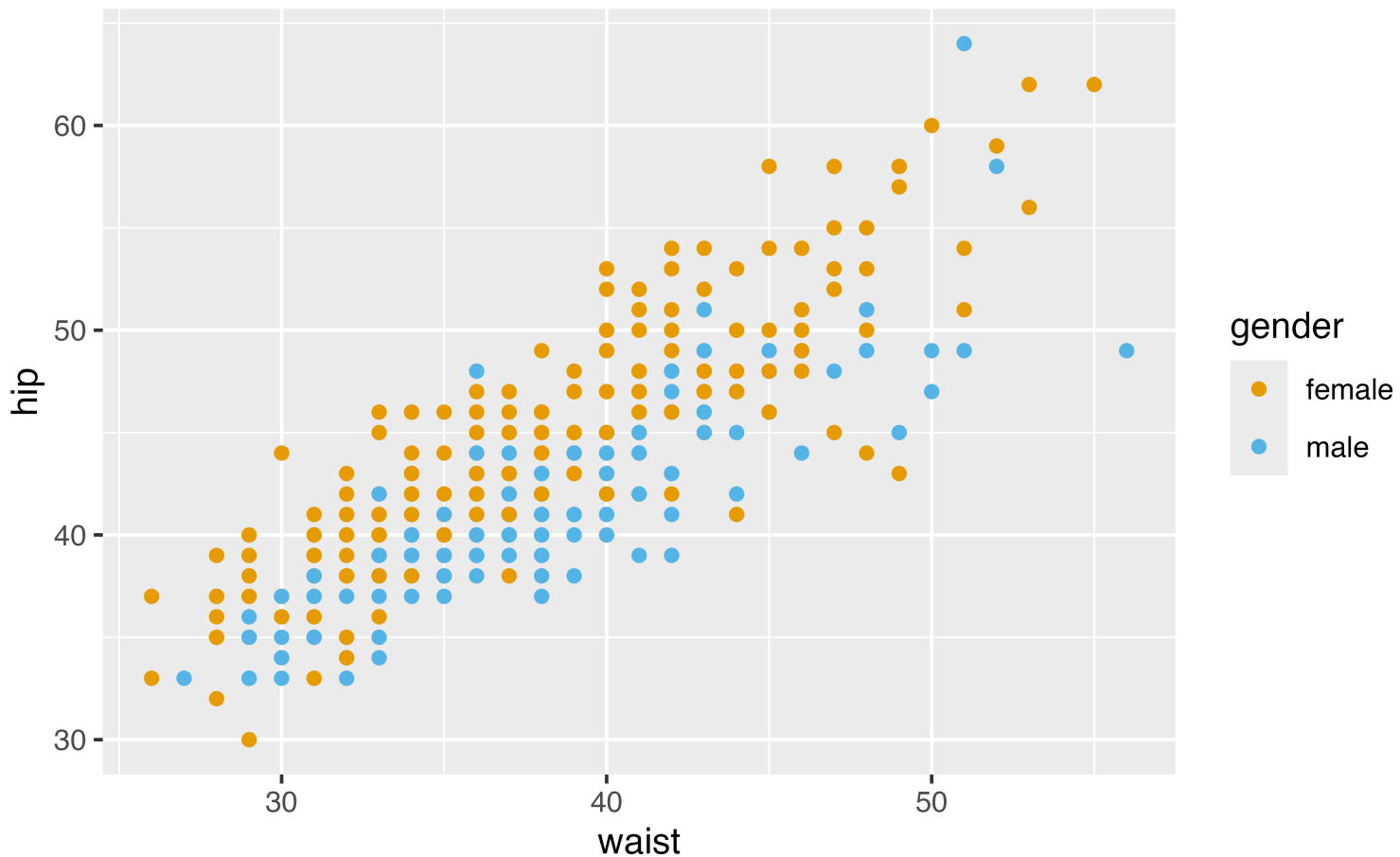
```r
diabetes |>
  ggplot(aes(waist, hip, color = weight)) +
  geom_point() +
  scale_color_viridis_c()
```



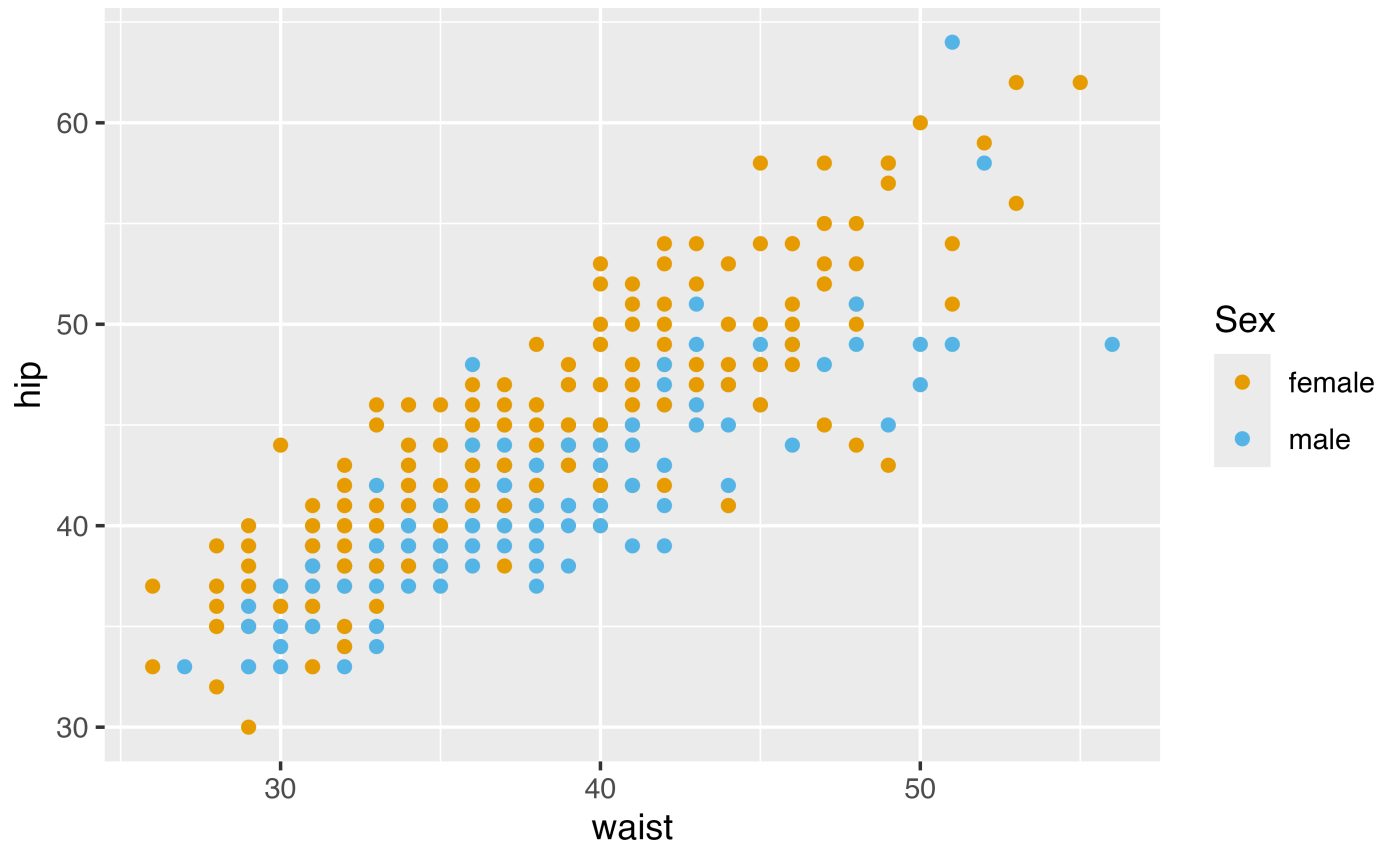
```r
diabetes |>
  ggplot(aes(waist, hip, color = gender)) +
  geom_point() +
  scale_color_brewer()
```



```r
diabetes |>
  ggplot(aes(waist, hip, color = gender)) +
  geom_point() +
  scale_color_manual(
    values = c("#E69F00", "#56B4E9")
  )
```



```r
diabetes |>
  ggplot(aes(waist, hip, color = gender)) +
  geom_point() +
  scale_color_manual(
    name = "Sex",
    values = c("#E69F00", "#56B4E9")
  )
```



Color Palettes

https://github.com/EmilHvitfeldt/r-color-palettes

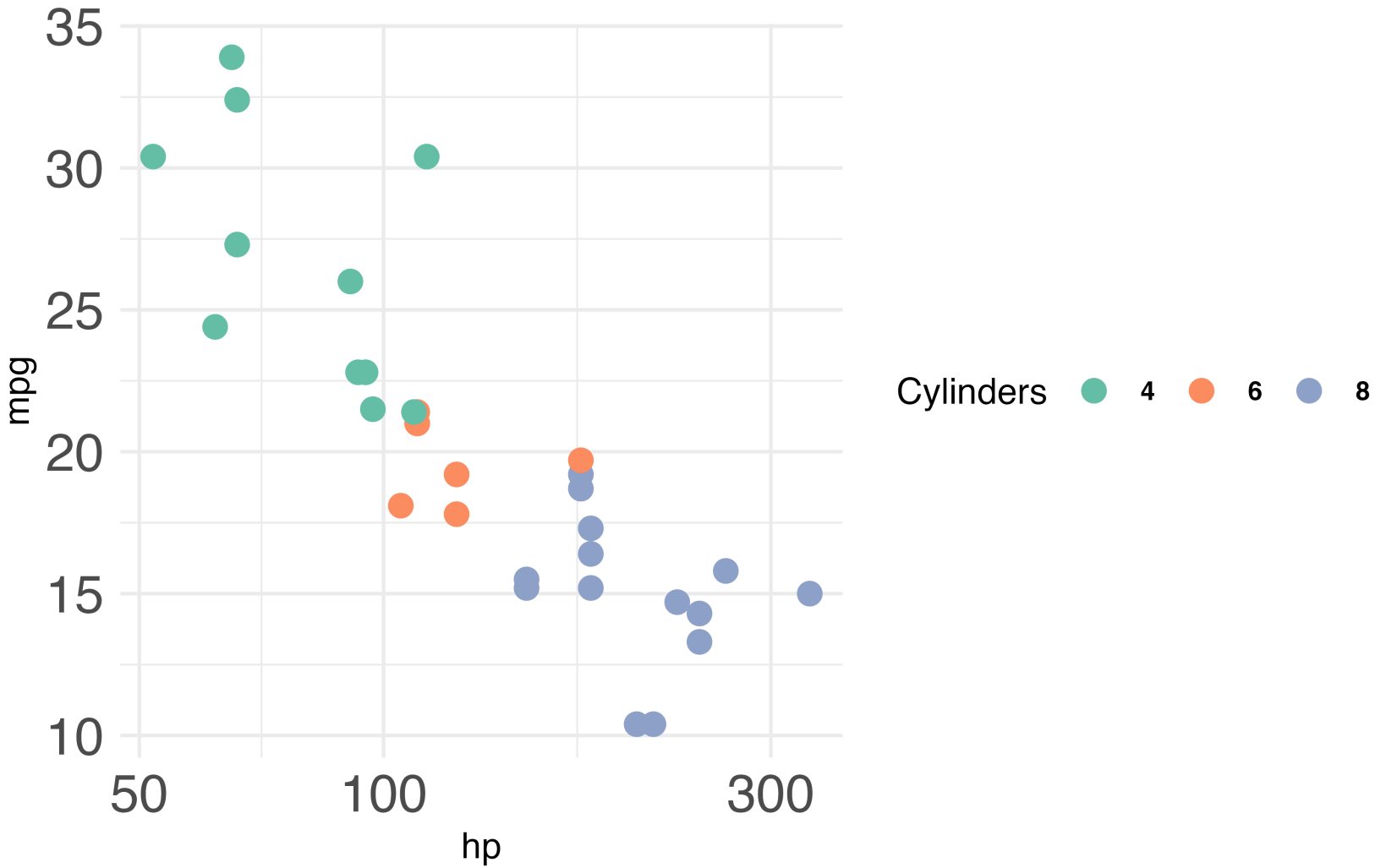
Themes

Non-data ink (text, background, etc)

Pre-specified themes: **`theme_gray()`** (default), **`theme_minimal()`**, **`theme_light()`**, etc.

`theme()`

```r
mtcars |>
  ggplot(aes(hp, mpg, color = factor(cyl))) +
  geom_point(size = 3) +
  scale_x_log10() +
  scale_colour_brewer(name = "Cylinders", palette = "Set2") +
  theme_minimal() +
  theme(
    axis.text = element_text(size = 16),
    legend.text = element_text(size = 8, face = "bold"),
    legend.direction = "horizontal"
  )
```


35
30
25
20
15
10
mpg
50
100
300
hp
Cylinders
4
6
8

theme elements

element	draws
`element_blank()`	nothing (remove element)
`element_line()`	lines
`element_rect()`	borders and backgrounds
`element_text()`	text

Your Turn 11

1. Change the theme using one of the built-in theme functions.

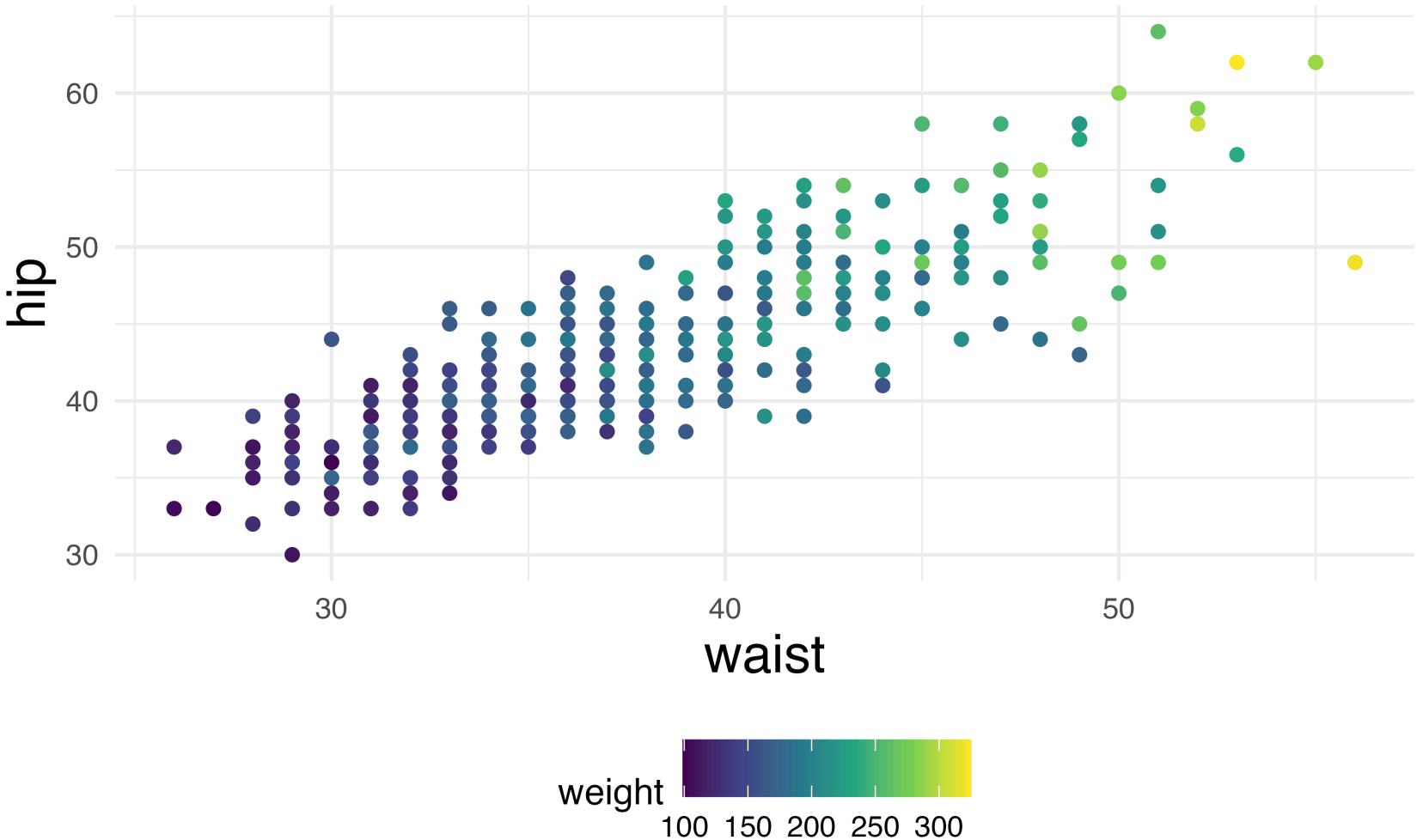
2. Use `theme()` to change the legend to the bottom with `legend.position = "bottom"`.

3. Remove the axis ticks by setting the `axis.ticks` argument to `element_blank()`

4. Change the font size for the axis titles. Use `element_text()`. Check the help page if you don't know what option to change.

```
diabetes |>
  ggplot(aes(waist, hip, color = weight)) +
  geom_point() +
  scale_color_viridis_c()
```

```r
diabetes |>
  ggplot(aes(waist, hip, color = weight)) +
  geom_point() +
  scale_color_viridis_c() +
  theme_minimal() +
  theme(
    legend.position = "bottom",
    axis.ticks = element_blank(),
    axis.title = element_text(size = 16)
  )
```


hip
60
50
40
30
30
40
50
waist
weight
100 150 200 250 300

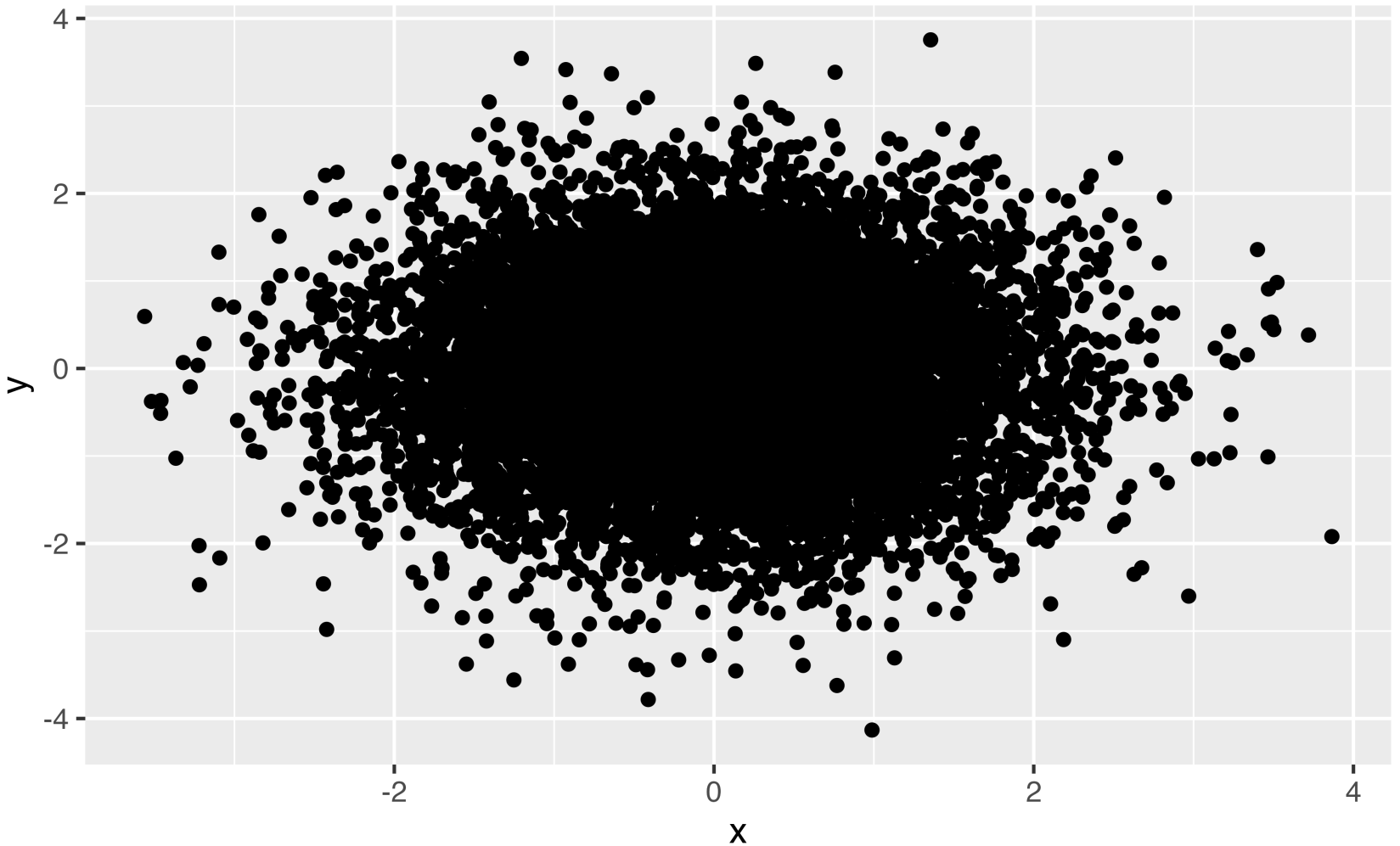
High-density plots

?rnorm, ?Distributions

```
1 bigger_data <- tibble(x = rnorm(10000), y = rnorm(10000))
```

High-density plots

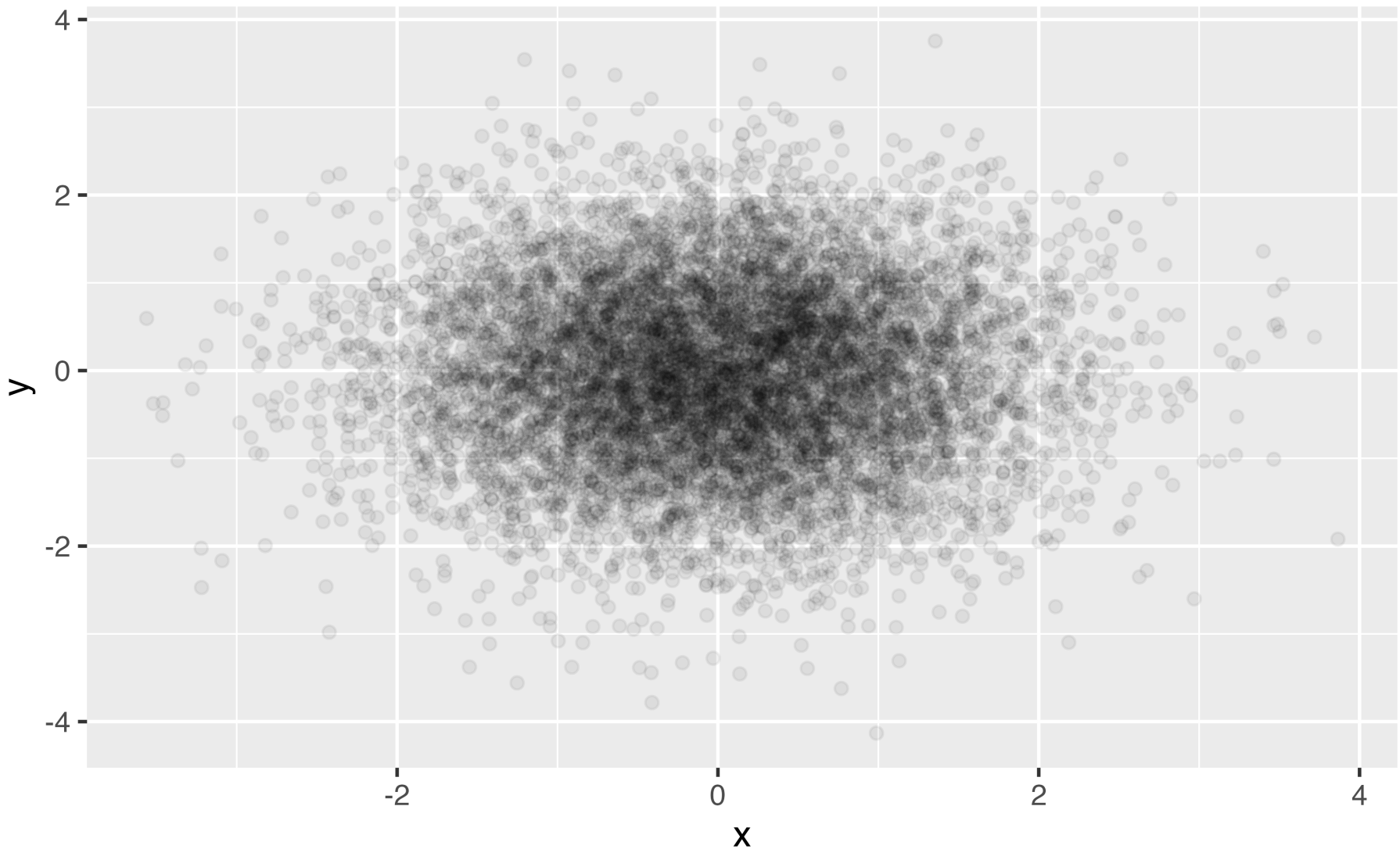
```
bigger_data |>
  ggplot(aes(x, y)) +
  geom_point()
```


4
2
0
-2
-4
y
-2
0
2
4
x

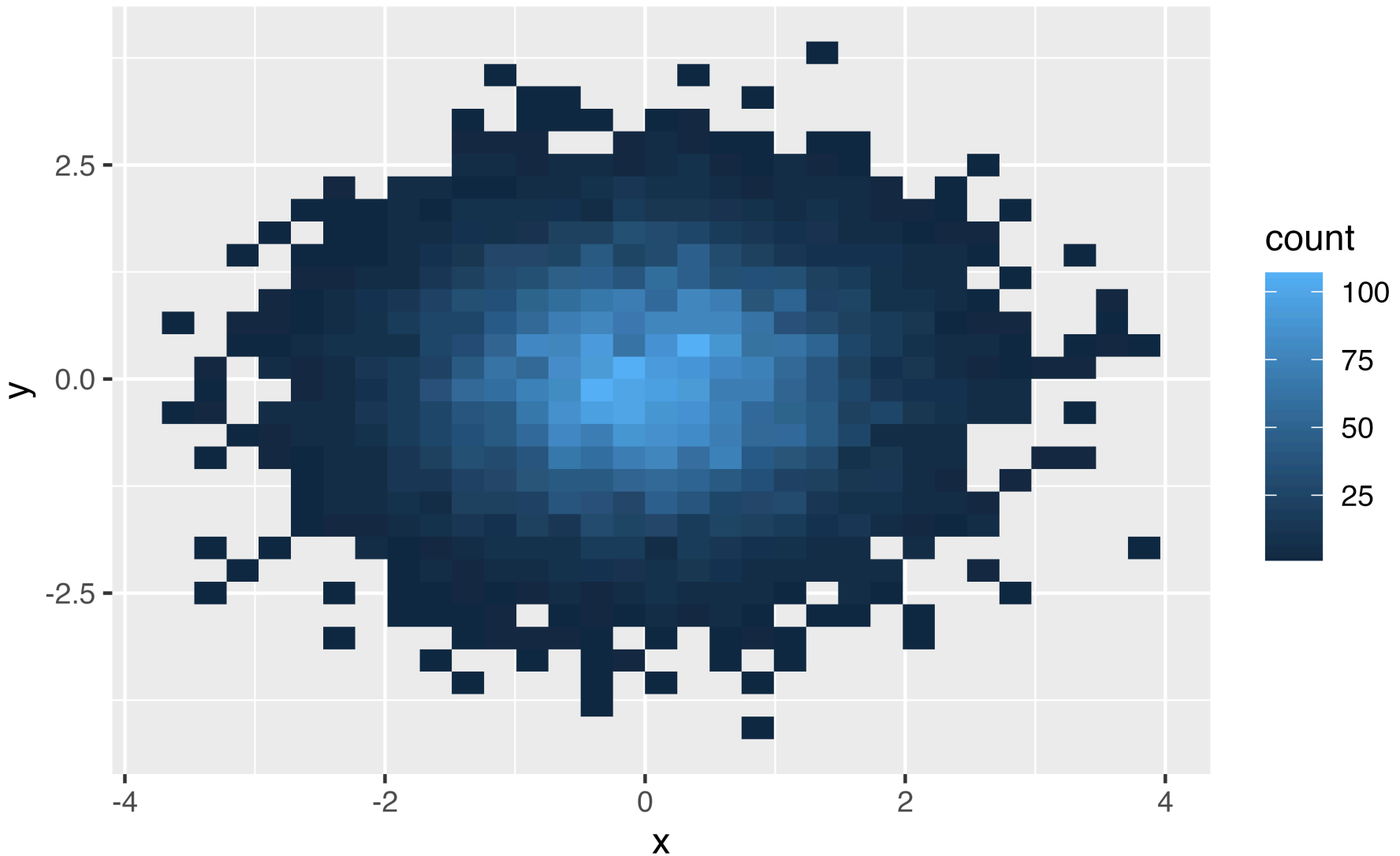
High-density plots

1. Transparency
2. Binning
3. Visualize other summary data

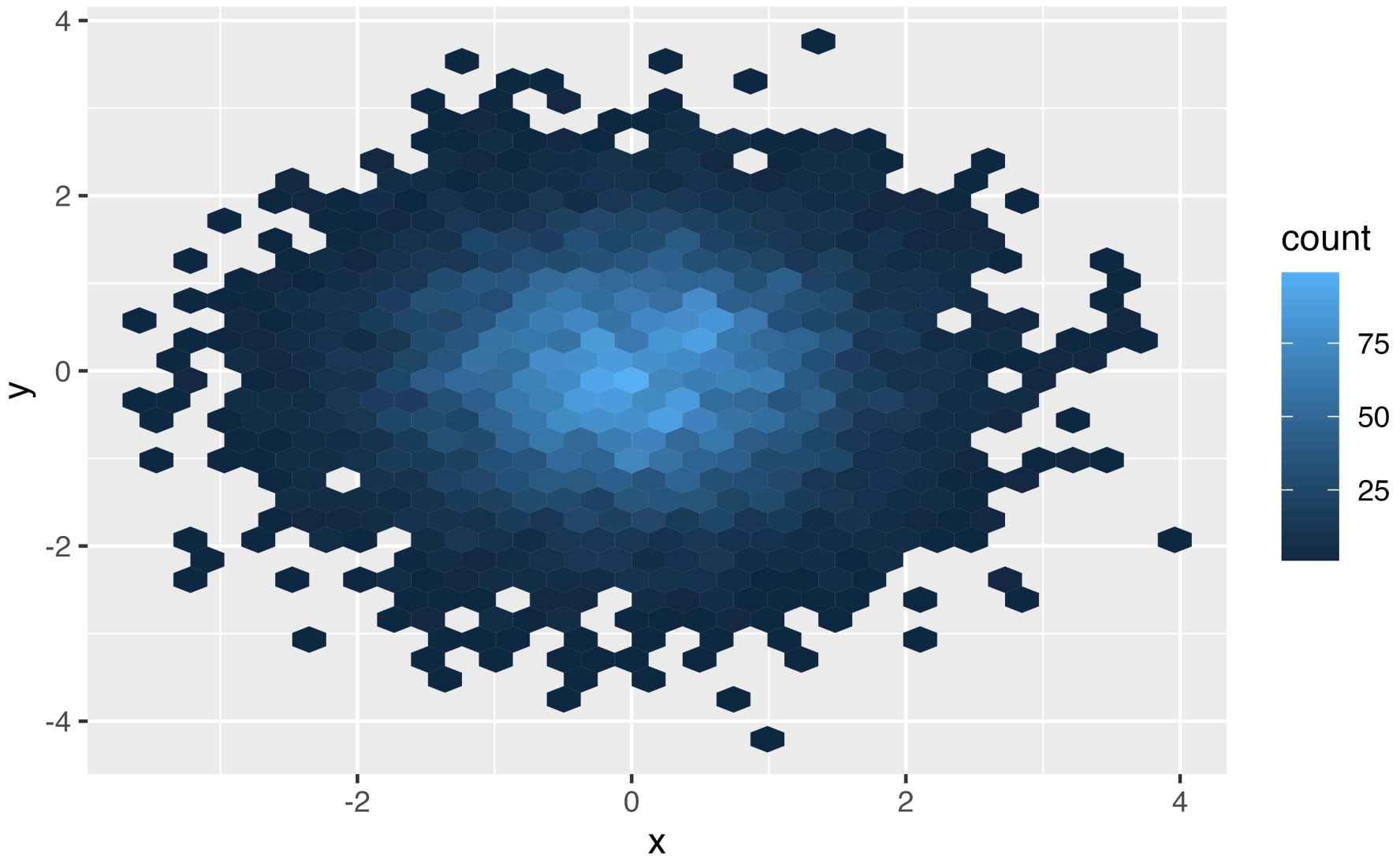
```r
bigger_data |>
  ggplot(aes(x, y)) +
  geom_point(alpha = .05)
```



```r
bigger_data |>
  ggplot(aes(x, y)) +
  geom_bin2d()
```



```r
bigger_data |>
  ggplot(aes(x, y)) +
  geom_hex()
```



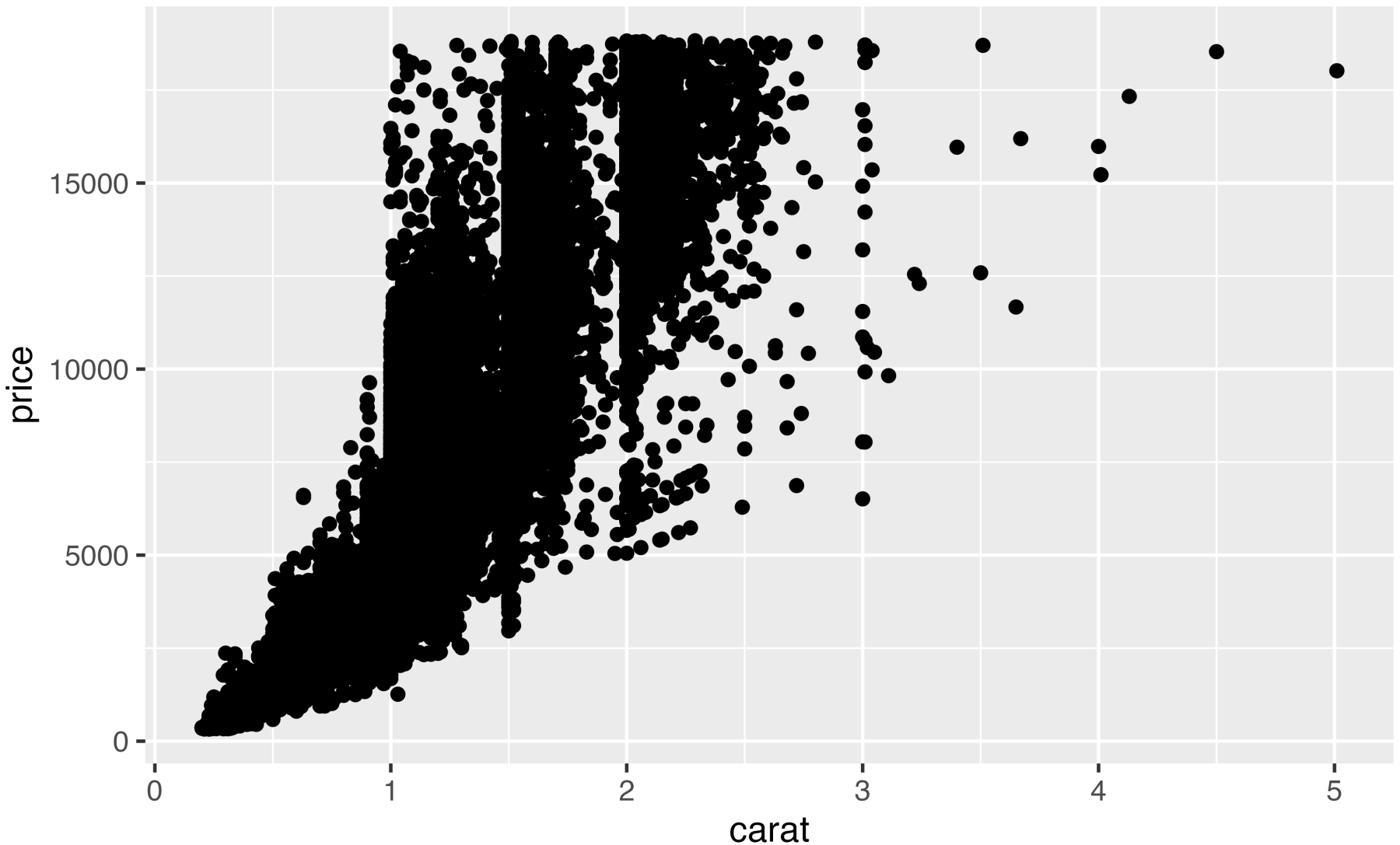
Your Turn 12

Take a look at the `diamonds` data set from ggplot2. How many rows does it have?

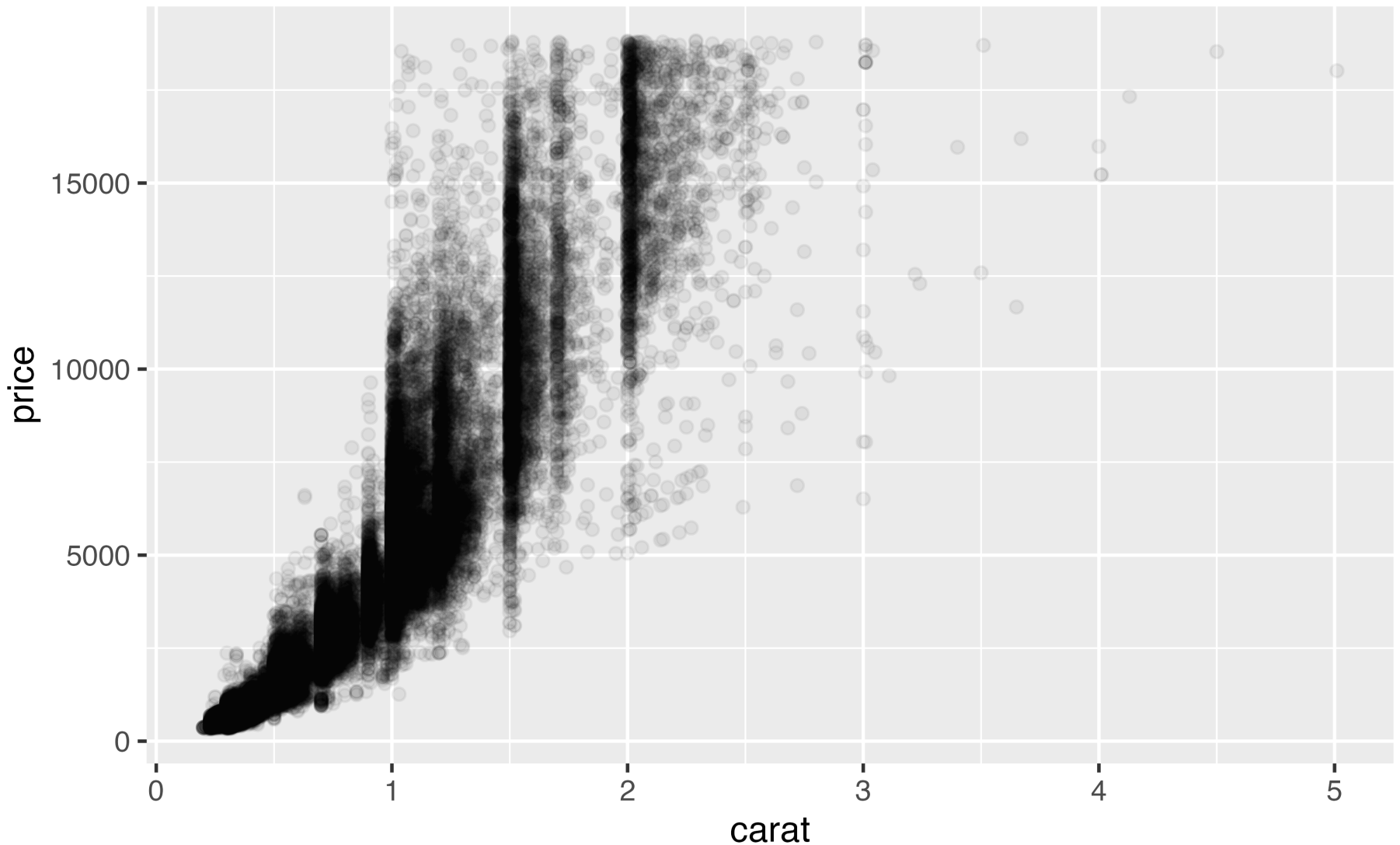
```
1  diamonds
```

1. Make a scatterplot of `carat` vs. `price`. How's it look?
2. Try adjusting the transparency.
3. Replace `geom_point()` with 2d bins.
4. Try hex bins.

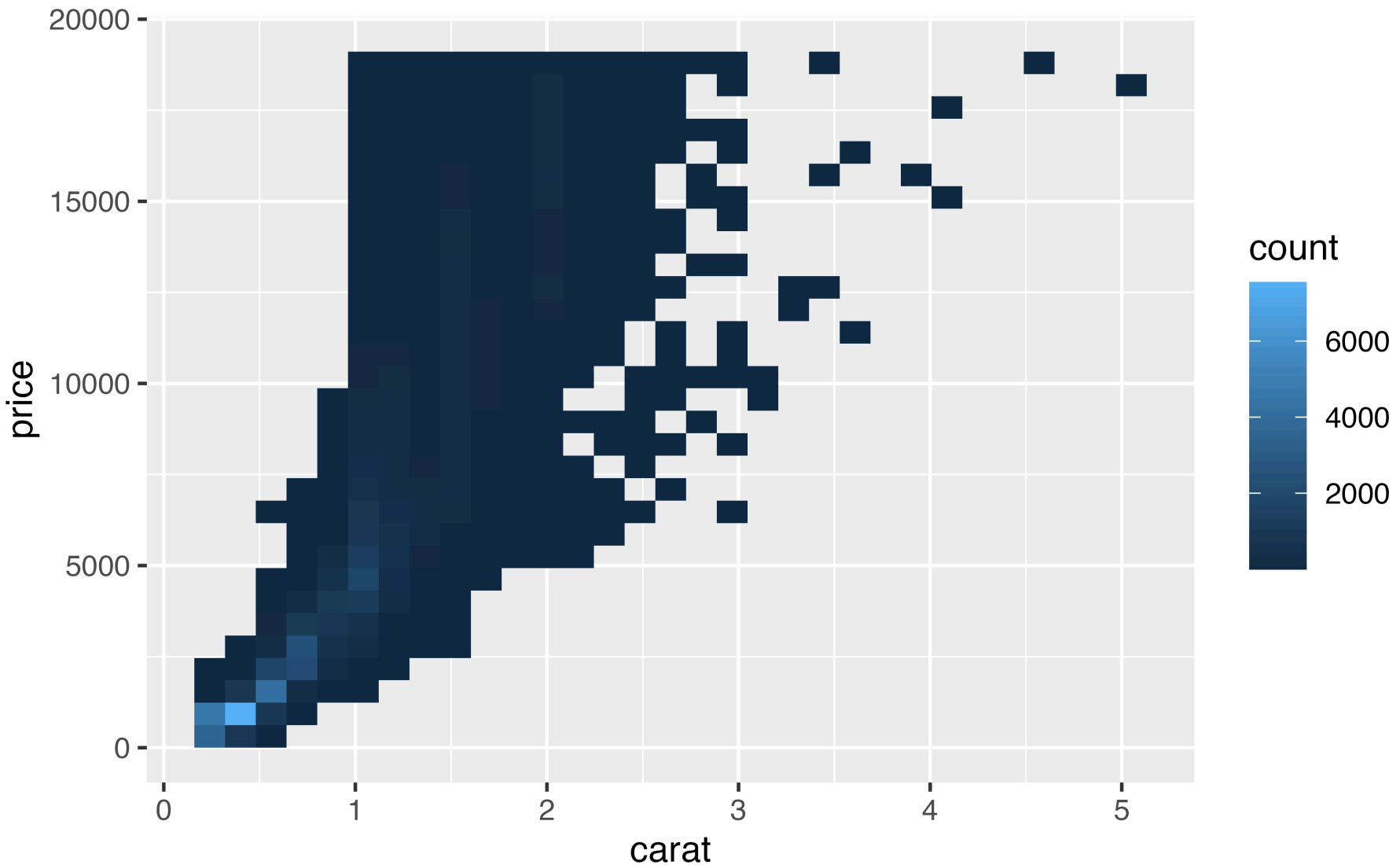
```
diamonds |>
  ggplot(aes(x = carat, price)) +
  geom_point()
```



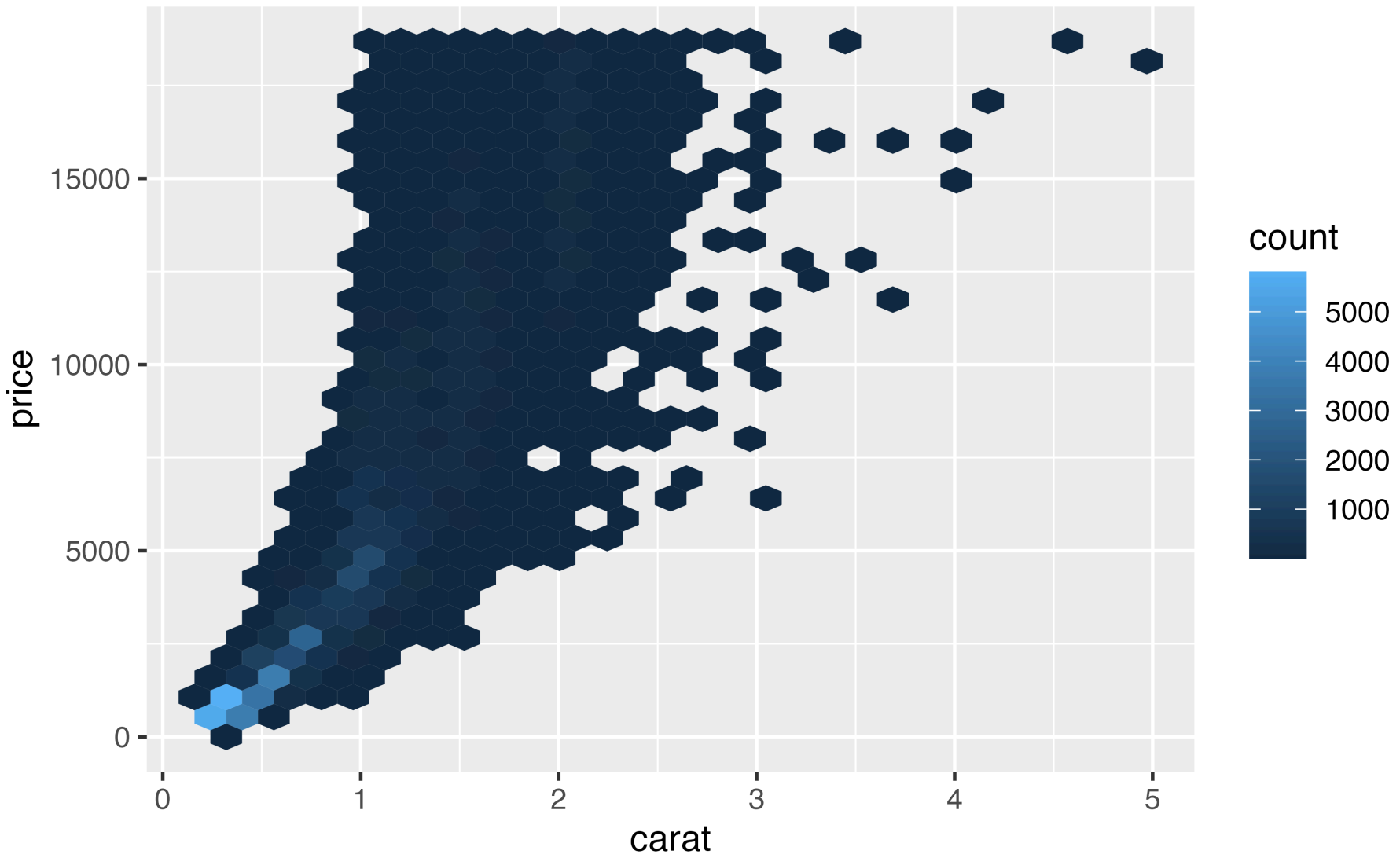
```
diamonds |>
  ggplot(aes(x = carat, price)) +
  geom_point(alpha = .05)
```



```
diamonds |>
  ggplot(aes(x = carat, price)) +
  geom_bin2d()
```



```
diamonds |>
  ggplot(aes(x = carat, price)) +
  geom_hex()
```



Labels, titles, and legends

Labels, titles, and legends

Add a title:

```
ggtitle()
labs(title = "My Awesome Plot")
```

Labels, titles, and legends

Change a label:

```
xlab(),ylab()
labs(x = "X Label", y = "Y Label")
```

Labels, titles, and legends

Change a legend:

`scale_*()` functions

```
labs(color = "Wow, labs does
everything", fill = "Yup")
```

Labels, titles, and legends

Remove the legend:

```
theme(legend.position = "none")
```

Your Turn 13

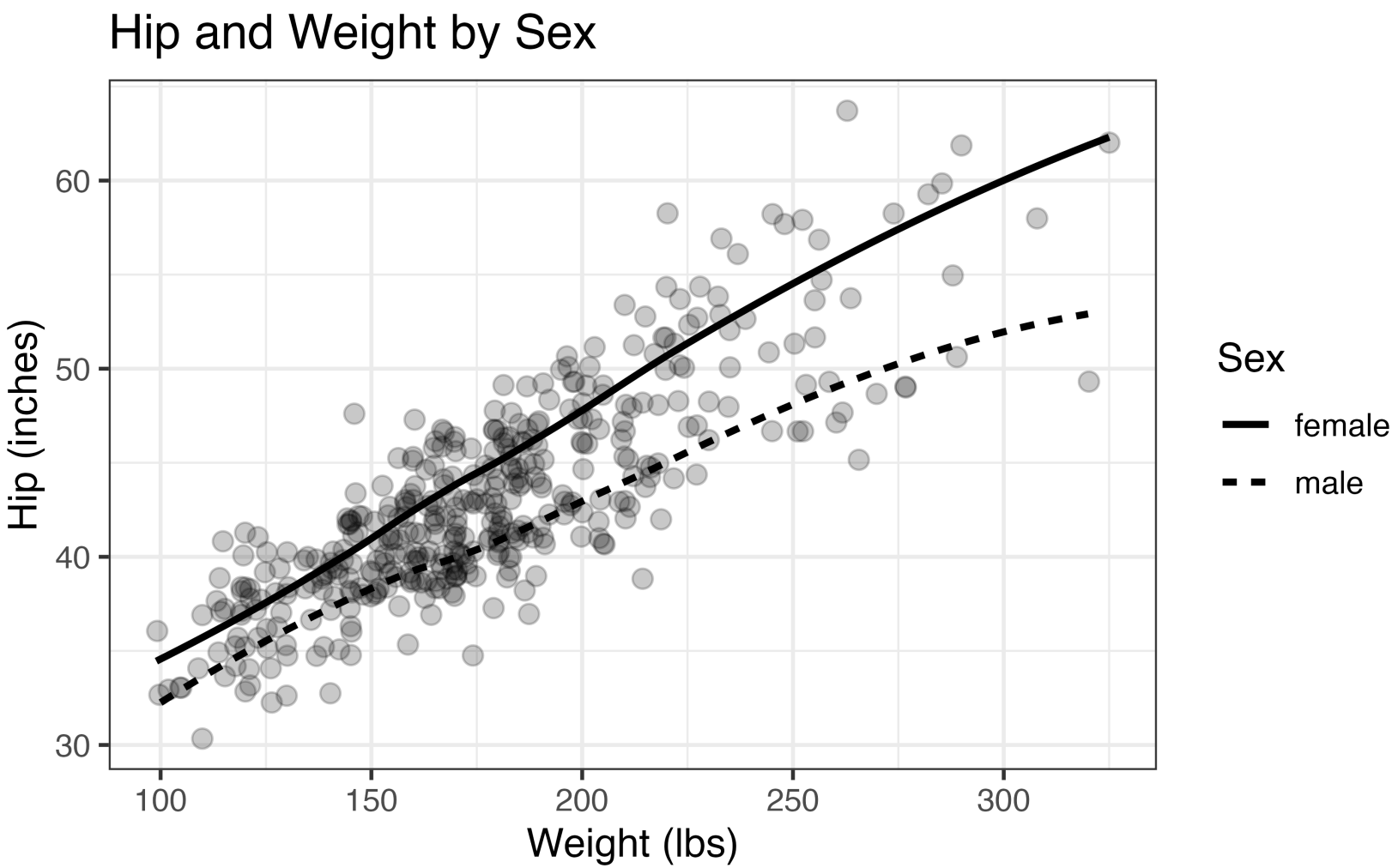
1. Add a title.

2. Change the x and y axis labels to include the units (inches for `hip` and pounds for `weight`). You can use either `labs()` or `xlab()` and `ylab()`

3. Add `scale_linetype()` and set the `name` argument to "Sex".

```
ggplot(diabetes, aes(weight, hip, linetype = gender)) +
  geom_jitter(alpha = .2, size = 2.5) +
  geom_smooth(color = "black", se = FALSE) +
  theme_bw(base_size = 12)
```

```r
ggplot(diabetes, aes(weight, hip, linetype = gender)) +
  geom_jitter(alpha = .2, size = 2.5) +
  geom_smooth(color = "black", se = FALSE) +
  theme_bw(base_size = 12) +
  labs(x = "Weight (lbs)", y = "Hip (inches)") +
  ggtitle("Hip and Weight by Sex") +
  scale_linetype(name = "Sex")
```


Hip and Weight by Sex
Hip (inches)
60
50
40
30
100
150
200
250
300
Weight (lbs)
Sex
female
male

```r
ggplot(diabetes, aes(weight, hip, linetype = gender)) +
  geom_jitter(alpha = .2, size = 2.5) +
  geom_smooth(color = "black", se = FALSE) +
  theme_bw(base_size = 12) +
  labs(
    title = "Hip and Weight by Sex",
    x = "Weight (lbs)",
    y = "Hip (inches)",
    linetype = "Sex"
  )
```

Saving plots

`ggsave()`

```
ggsave(
  filename = "figure_name.png",
  dpi = 320
)
```

Saving plots

ggsave()

```
ggsave(
  filename = "figure_name.png",
  plot = plot_you_just_made,
  dpi = 320
)
```

Your Turn 14

Save the last plot and then locate it in the files pane.

Your Turn 14

Save the last plot and then locate it in the files pane.

```
1  ggsave("diabetes_weight_hip.png", dpi = 320)
```

Take aways:

You can use this code template to make thousands of graphs with ggplot2.

```
ggplot(data = <DATA>, mapping = aes(<MAPPINGS>)) +
  <GEOM_FUNCTION>() +
  <SCALE_FUNCTION>() +
  <THEME_FUNCTION>()
```


HELEN
GREEN

Resources

R for Data Science: A comprehensive but friendly introduction to the tidyverse. Free online.

Posit Recipes: Common code patterns in R (with some comparisons to SAS)

Data Visualization: A Practical Introduction: Mostly free online; great ggplot2 intro