Lattice

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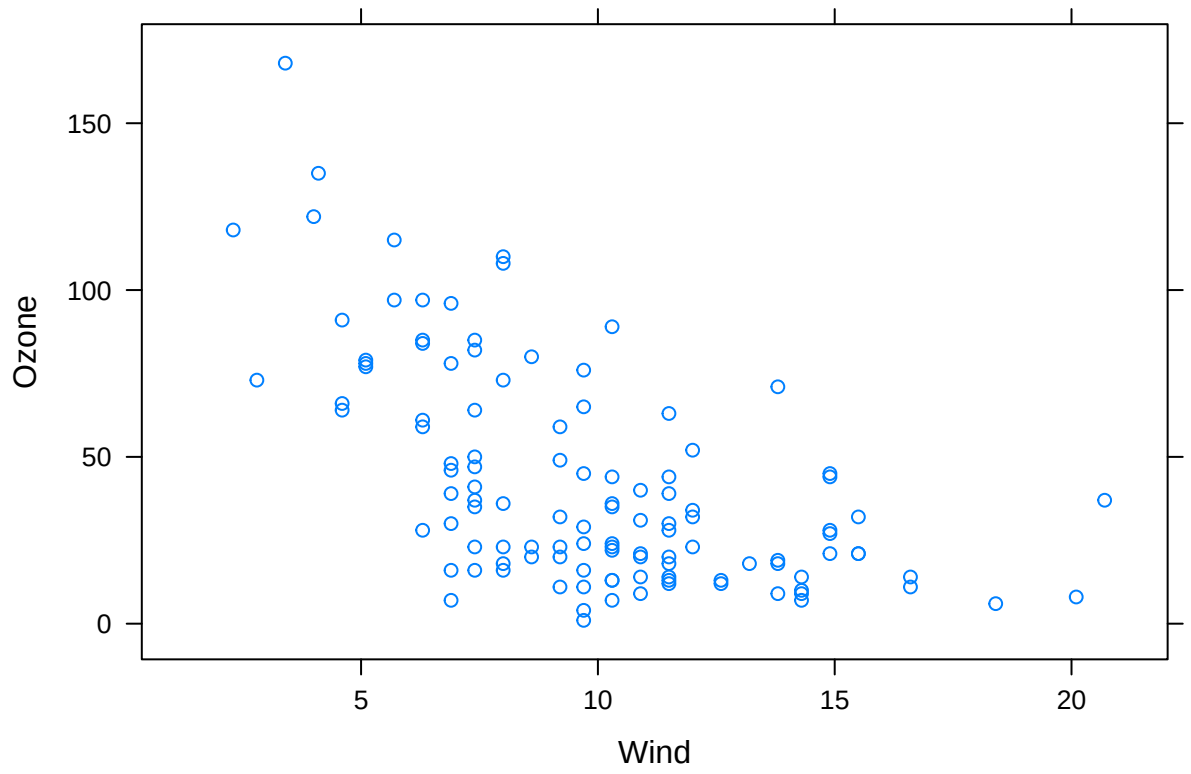
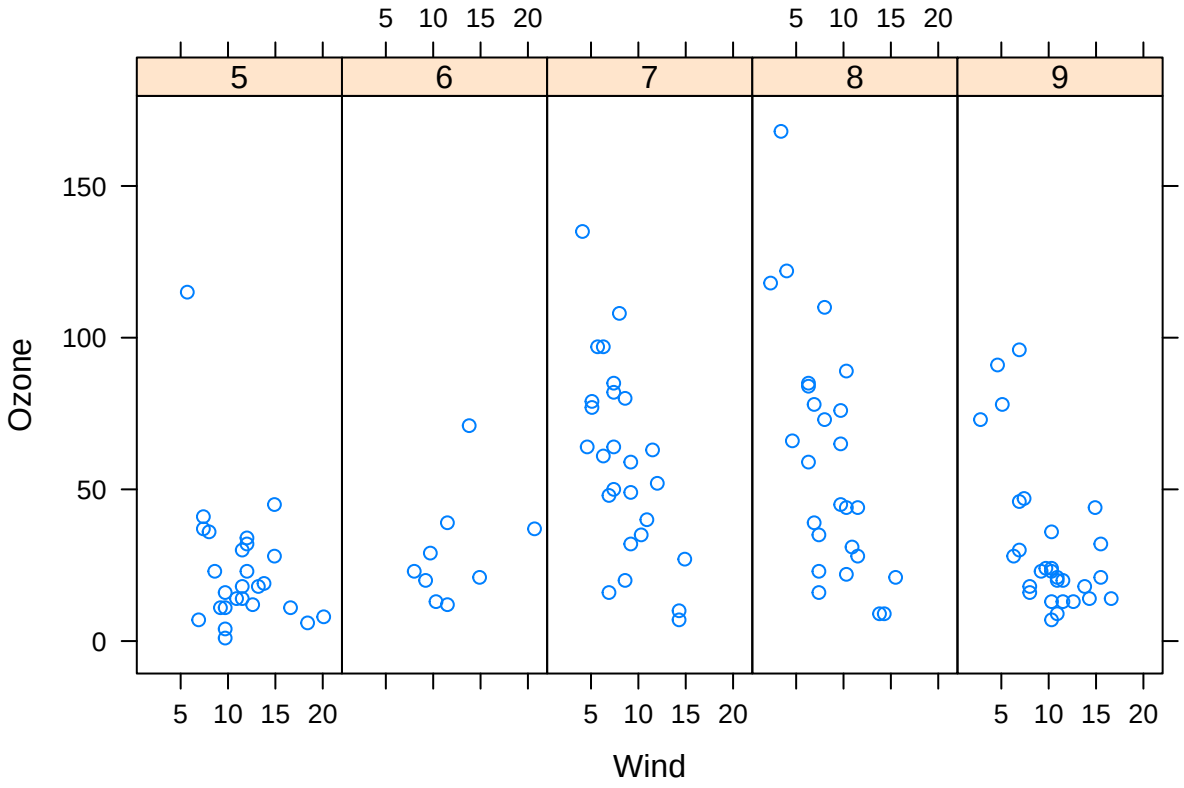
```
library(lattice)
```

#LATTICE

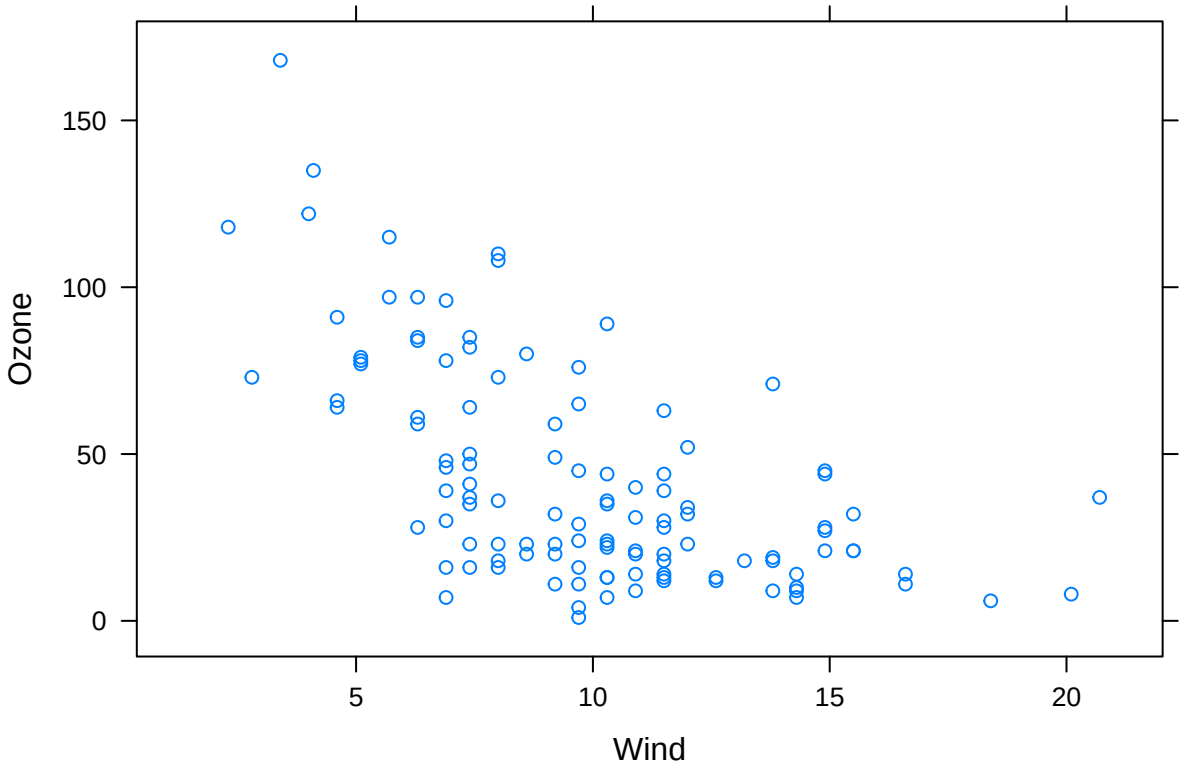
```
library(datasets)
xyplot(Ozone ~ Wind, data = airquality)
```




```
airquality <- transform(airquality, Month = factor(Month))

xyplot(Ozone ~ Wind | Month, data = airquality, layout = c(5,1))
```

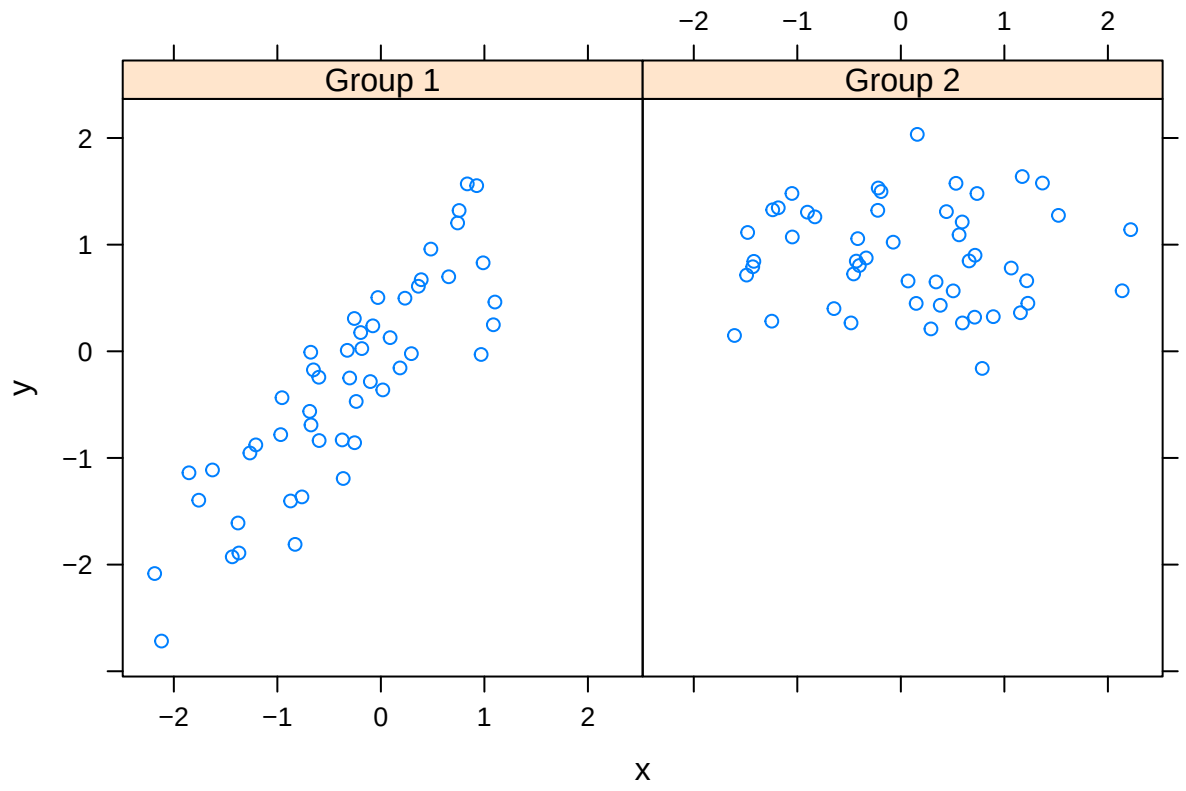



```
p <- xyplot(Ozone ~ Wind, data = airquality)    #Nothing happens
print(p)
```

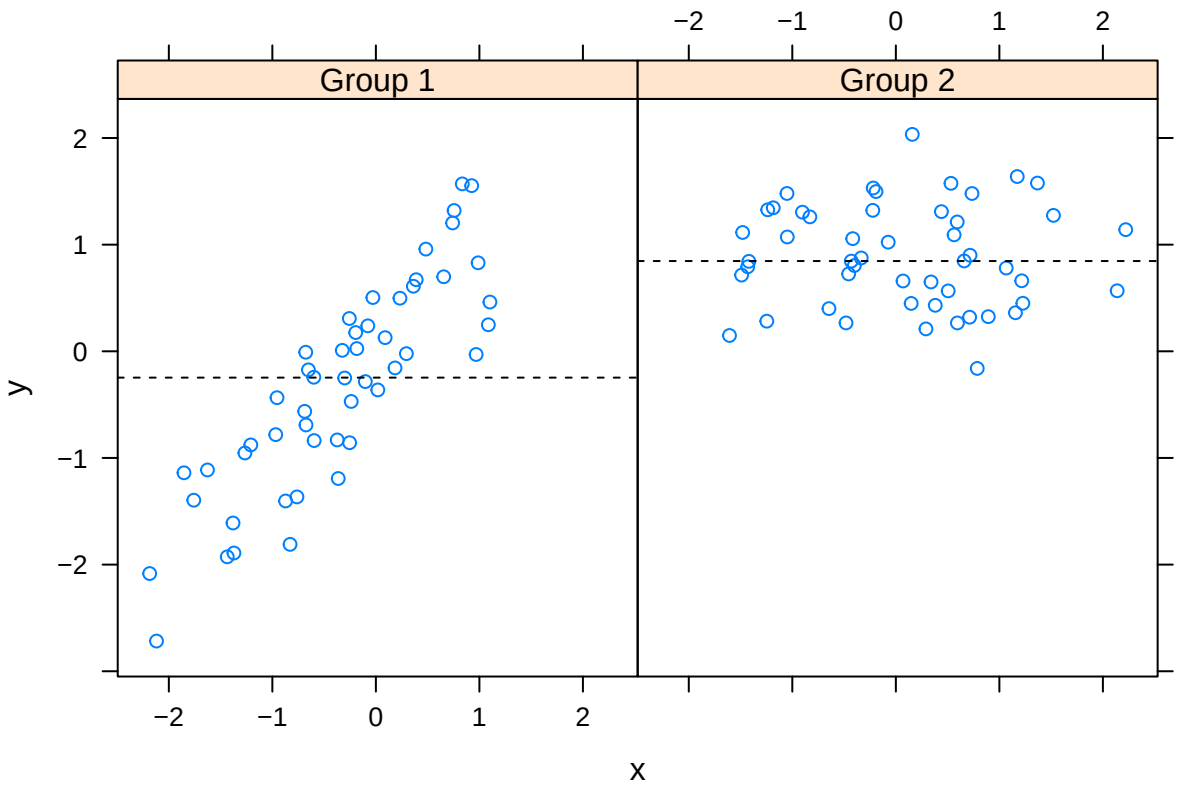


Lattice Panel Functions

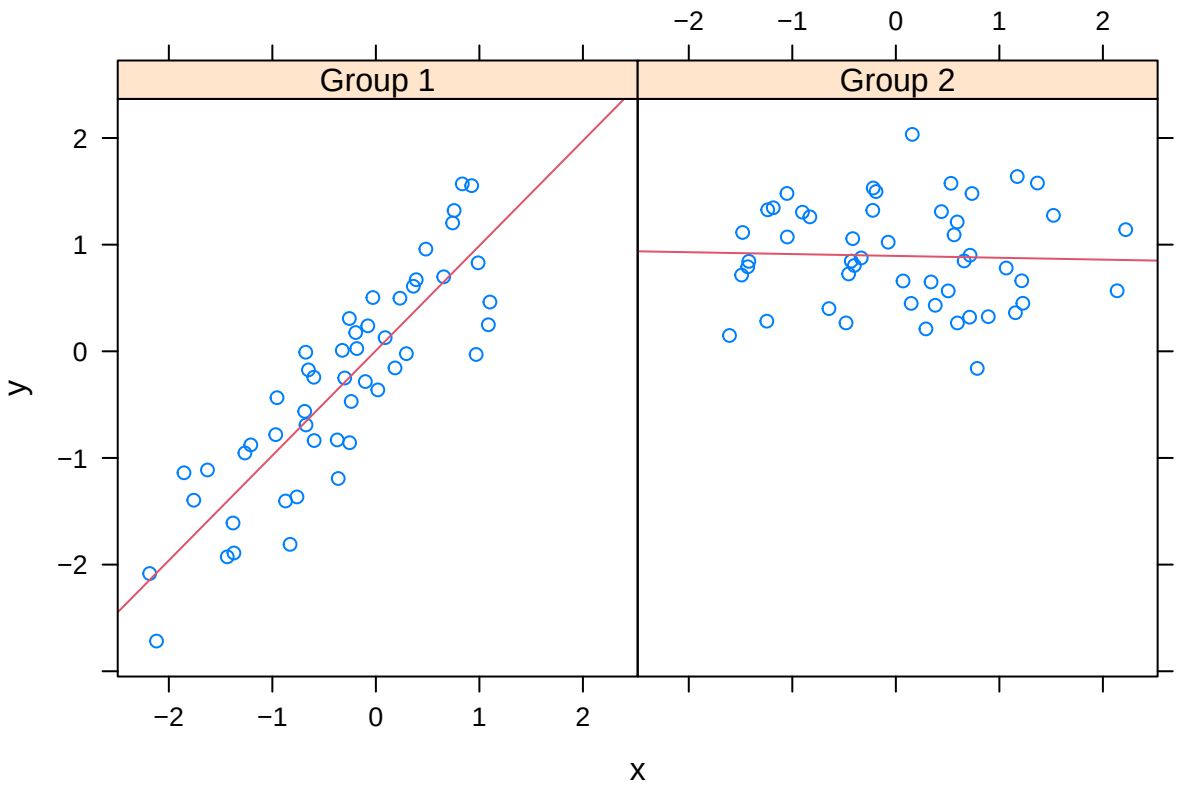
```
set.seed(10)
x <- rnorm(100)
f <- rep(0:1, each = 50)
y <- x + f - f * x + rnorm(100, sd = 0.5)
f <- factor(f, labels = c("Group 1", "Group 2"))
xyplot(y ~ x | f, layout = c(2,1))
```




```
xyplot(y ~ x | f, panel = function(x, y, ...){
  panel.xyplot(x, y, ...)  #First call the default panel function for 'xyplot'
  panel.abline(h = median(y), lty = 2)   #Add horizontal line
})
```




```
xyplot(y ~ x | f, panel = function(x, y, ...){
  panel.xyplot(x, y, ...)
  panel.lmline(x, y, col = 2)
})
```

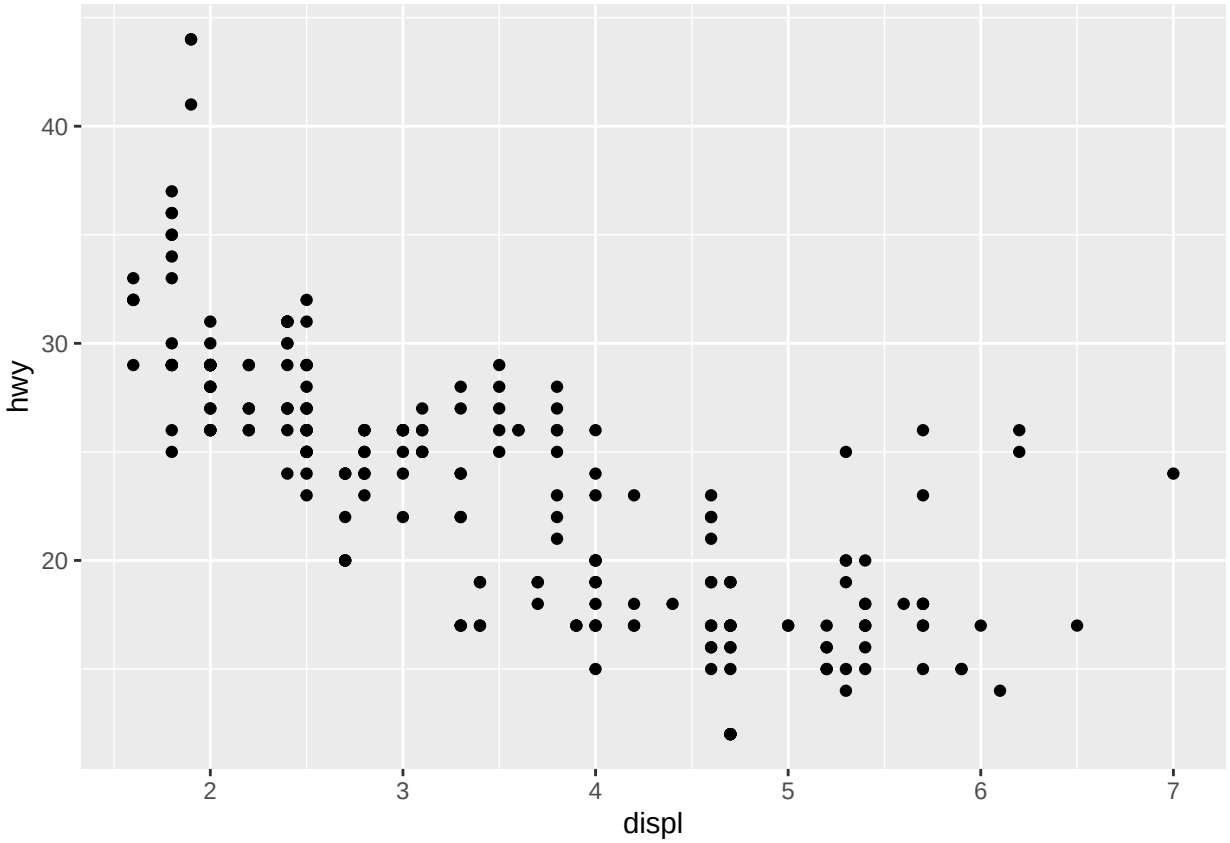


#GGPLOT2 (QPLOT)

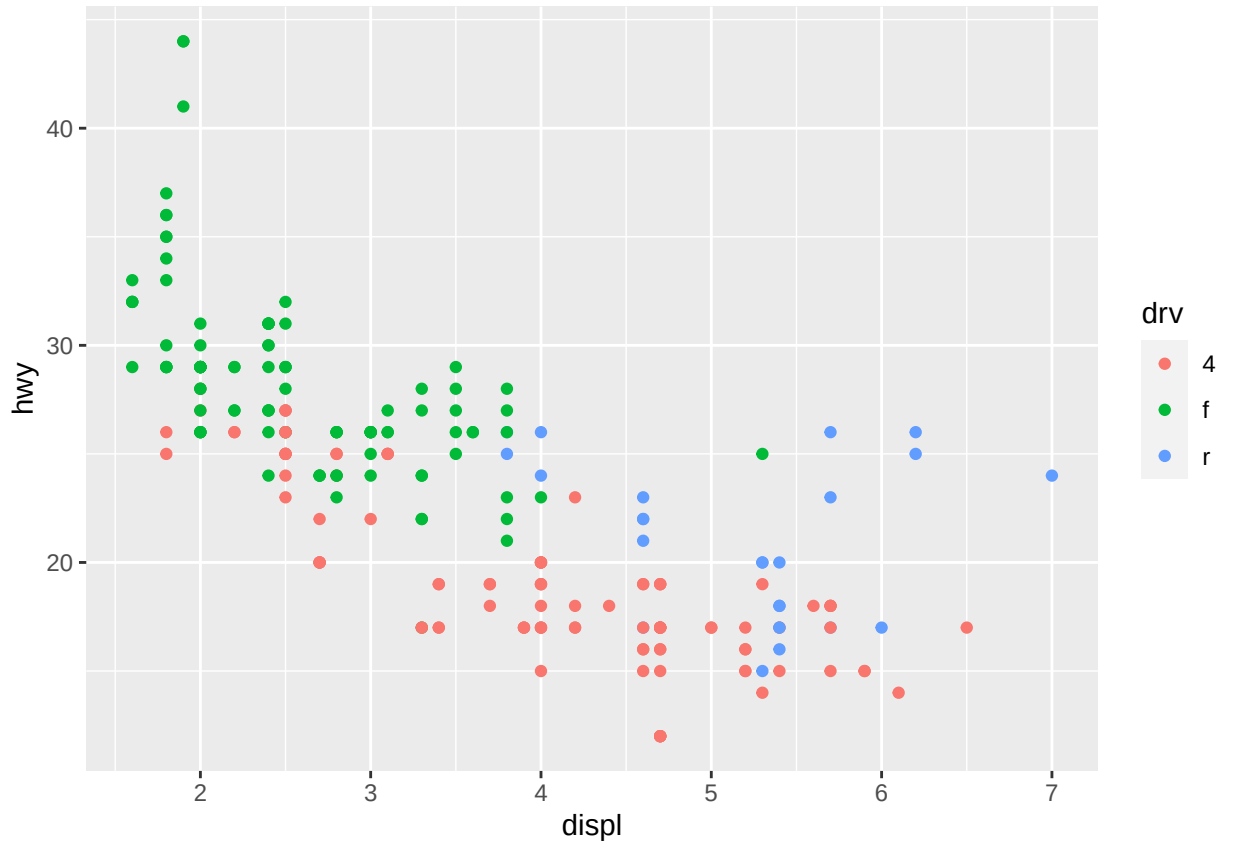
```
library(ggplot2)
str(mpg)
```

```
## tibble [234 x 11] (S3: tbl_df/tbl/data.frame)
##  $ manufacturer: chr [1:234] "audi" "audi" "audi" "audi" ...
##  $ model       : chr [1:234] "a4" "a4" "a4" "a4" ...
##  $ displ       : num [1:234] 1.8 1.8 2 2 2.8 2.8 3.1 1.8 1.8 2 ...
##  $ year        : int [1:234] 1999 1999 2008 2008 1999 1999 2008 1999 1999 2008 ...
##  $ cyl         : int [1:234] 4 4 4 4 6 6 6 4 4 4 ...
##  $ trans       : chr [1:234] "auto(l5)" "manual(m5)" "manual(m6)" "auto(av)" ...
##  $ drv         : chr [1:234] "f" "f" "f" "f" ...
##  $ cty         : int [1:234] 18 21 20 21 16 18 18 18 16 20 ...
##  $ hwy         : int [1:234] 29 29 31 30 26 26 27 26 25 28 ...
##  $ fl          : chr [1:234] "p" "p" "p" "p" ...
##  $ class       : chr [1:234] "compact" "compact" "compact" "compact" ...
```

```
qplot(displ, hwy, data = mpg)
```

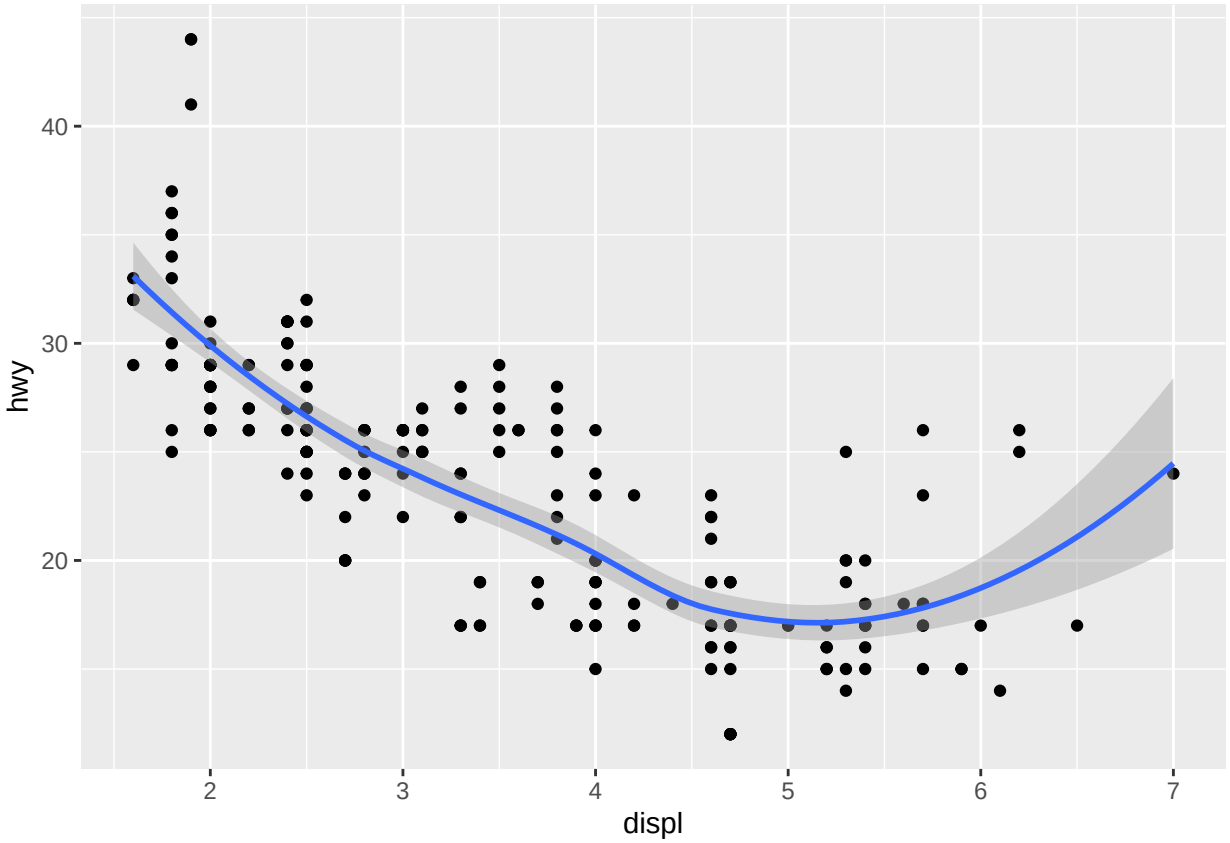



```
qplot(displ, hwy, data = mpg, color = drv)
```



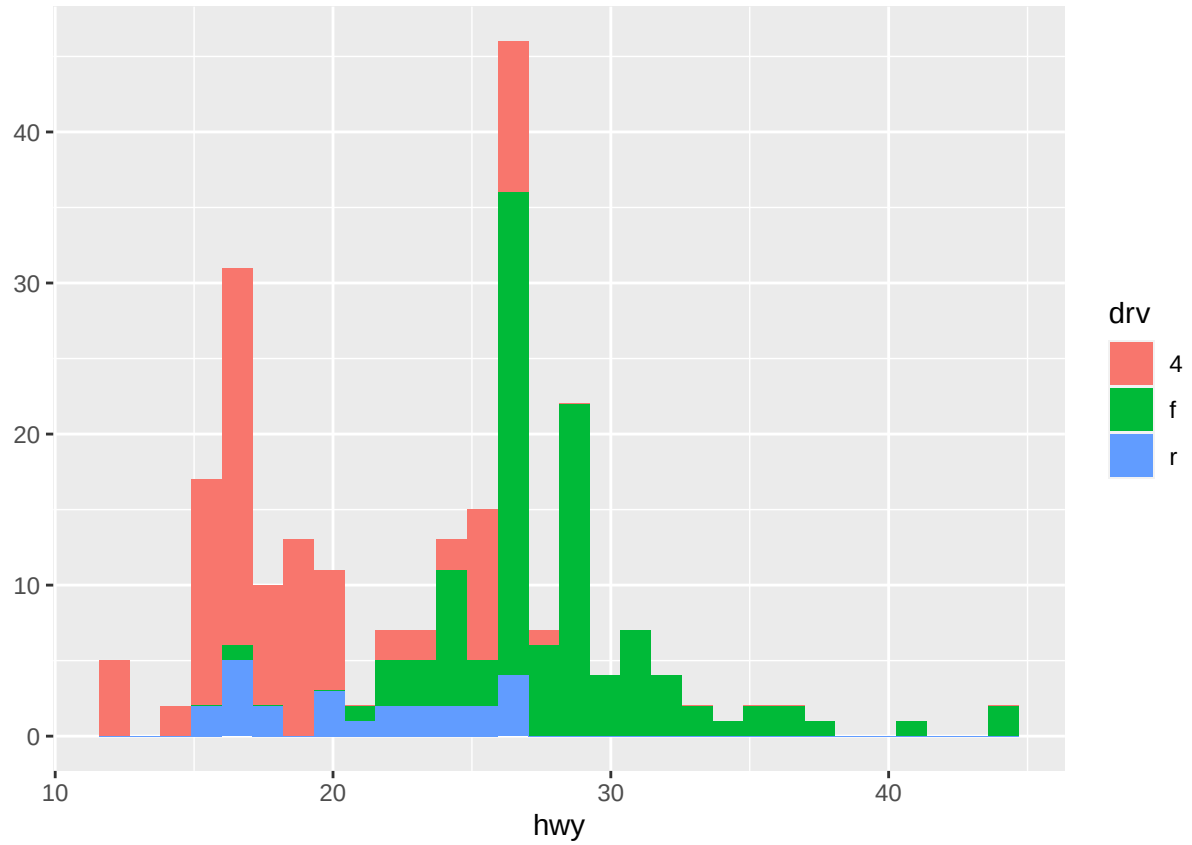

```
qplot(displ, hwy, data = mpg, geom = c("point", "smooth"))
```

```
## `geom_smooth()` using method = 'loess' and formula 'y ~ x'
```

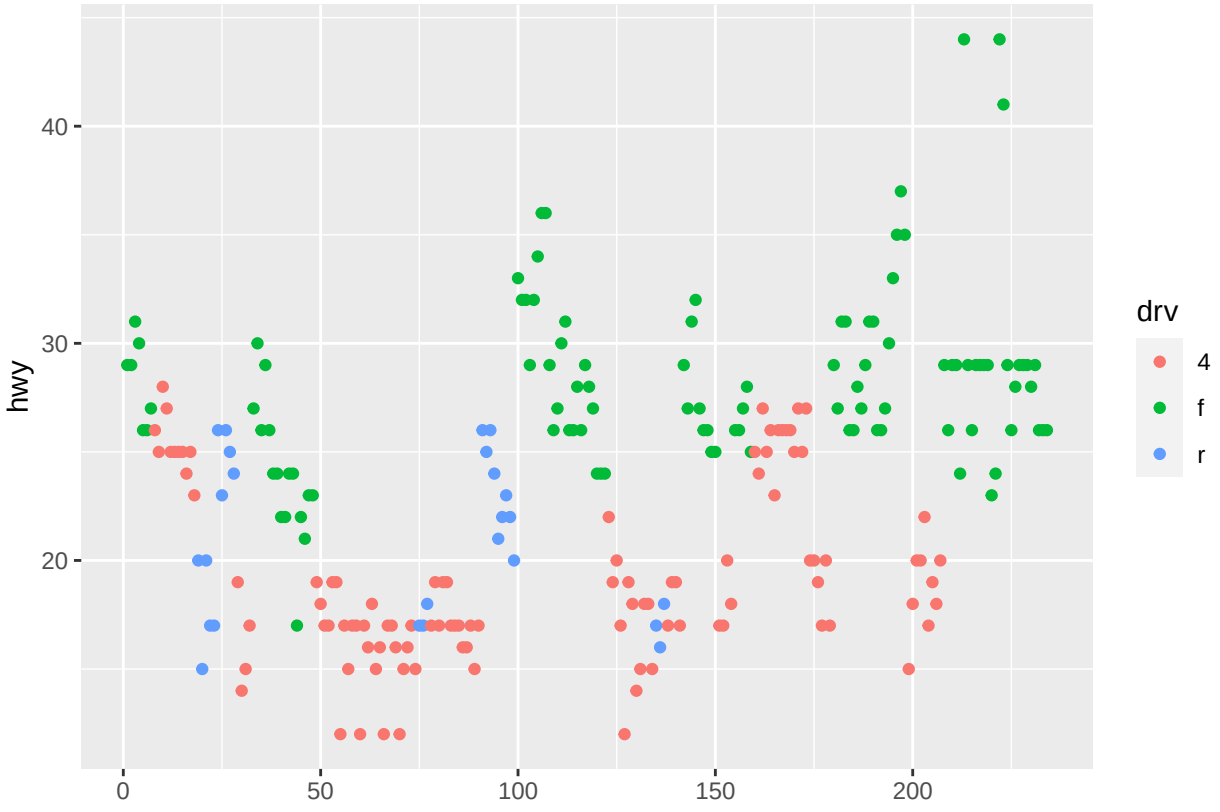



```
qplot(hwy, data = mpg, fill = drv)
```

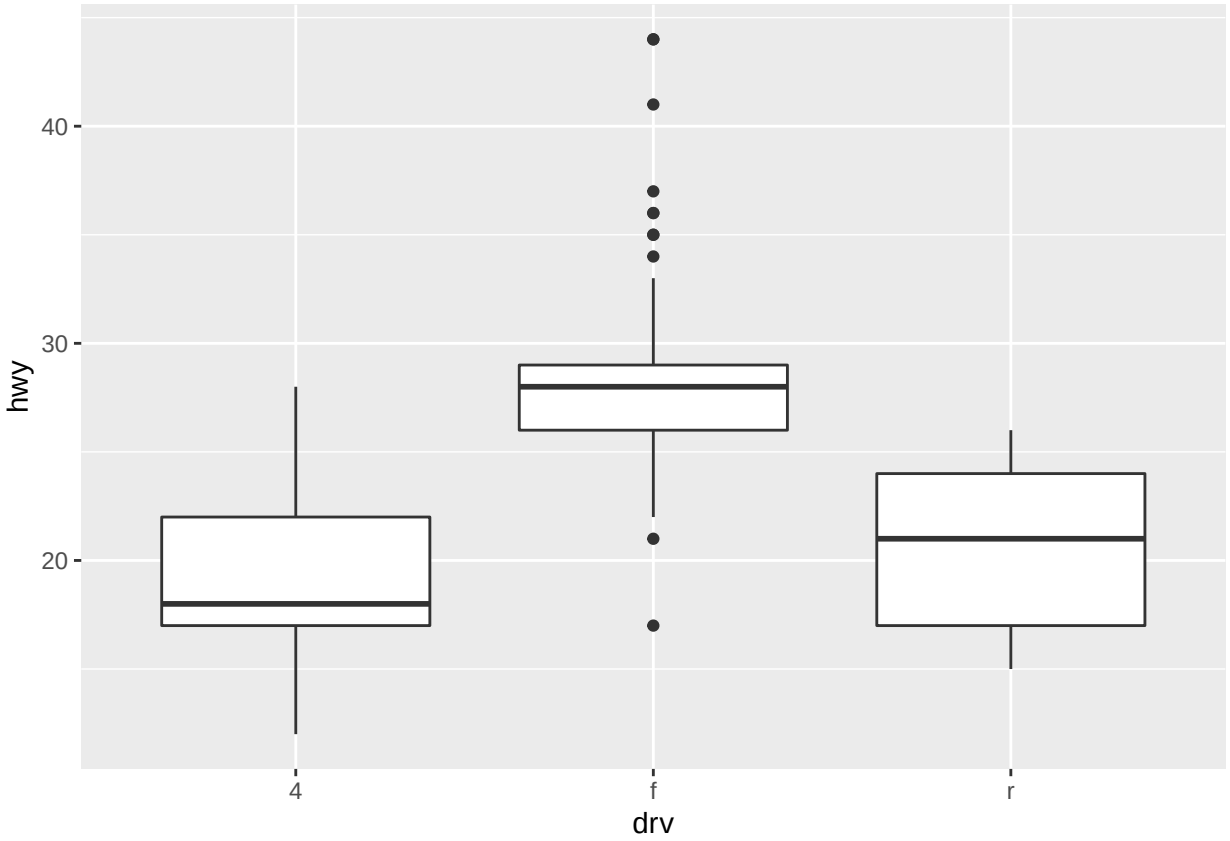
```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```



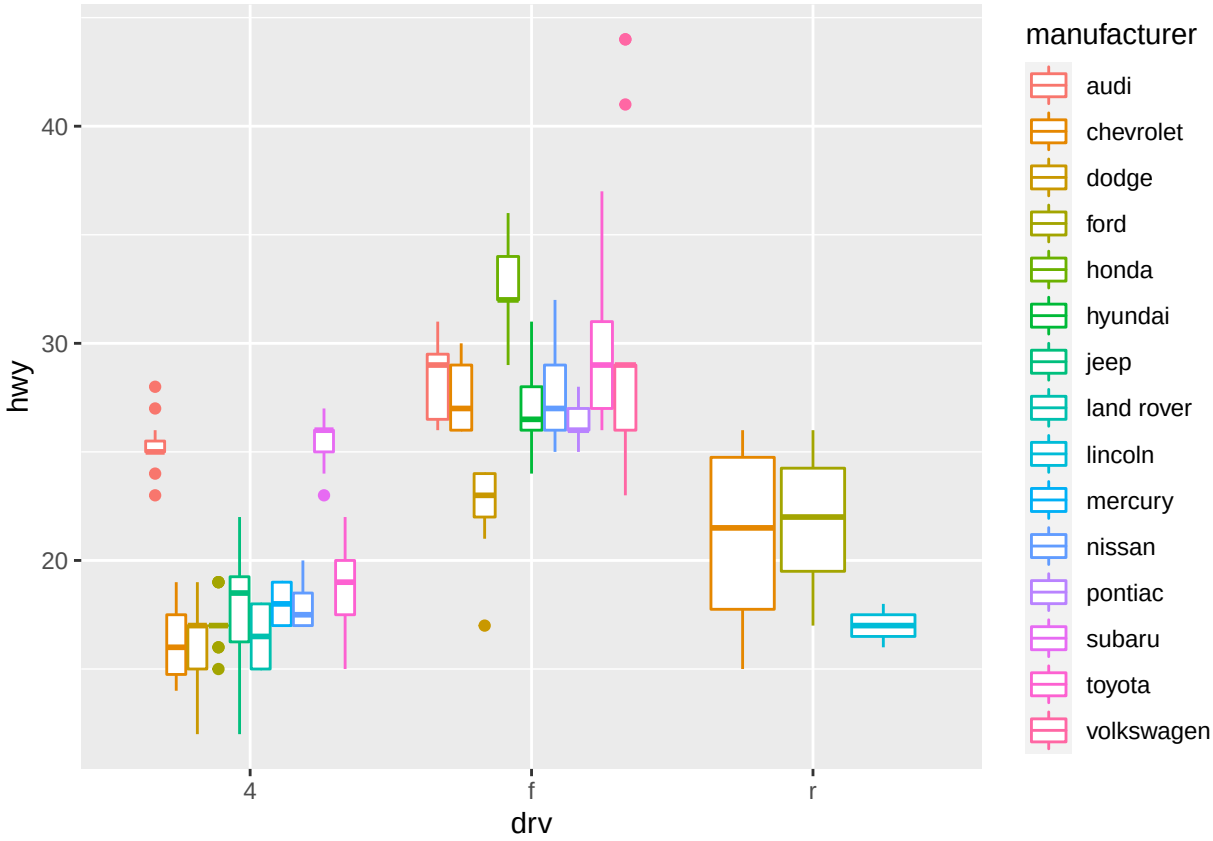

```
qplot(y=hwy, data = mpg, color = drv)
```



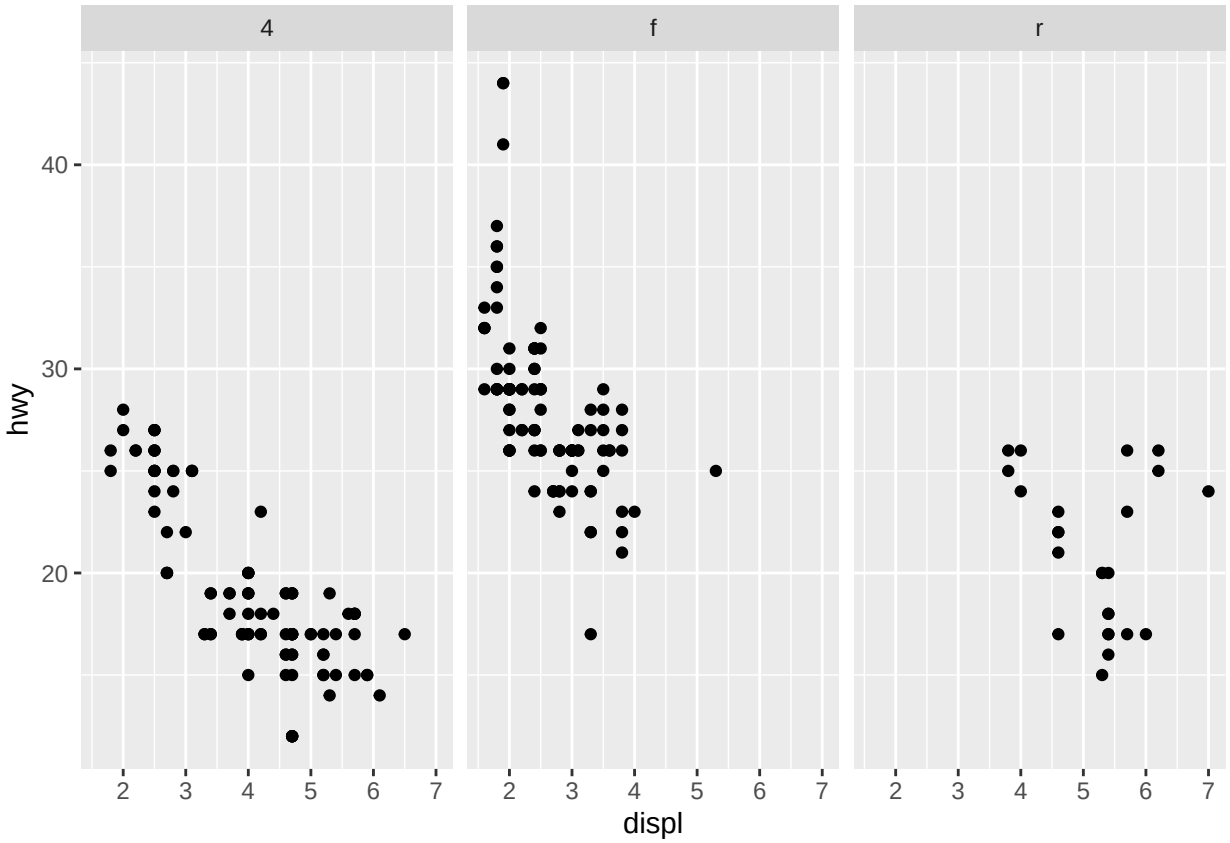

```
qplot(drv, hwy, data = mpg, geom = "boxplot")
```



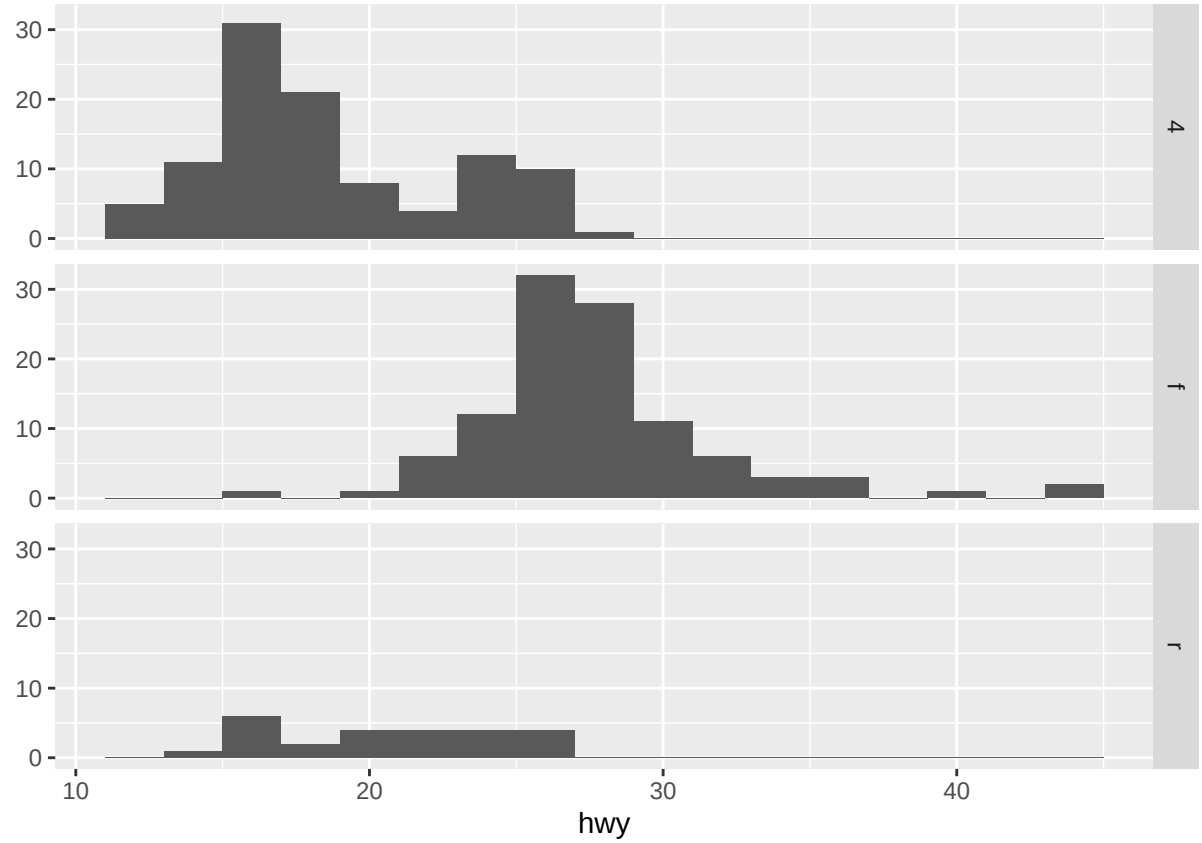

```
qplot(drv, hwy, data = mpg, geom = "boxplot", color = manufacturer)
```



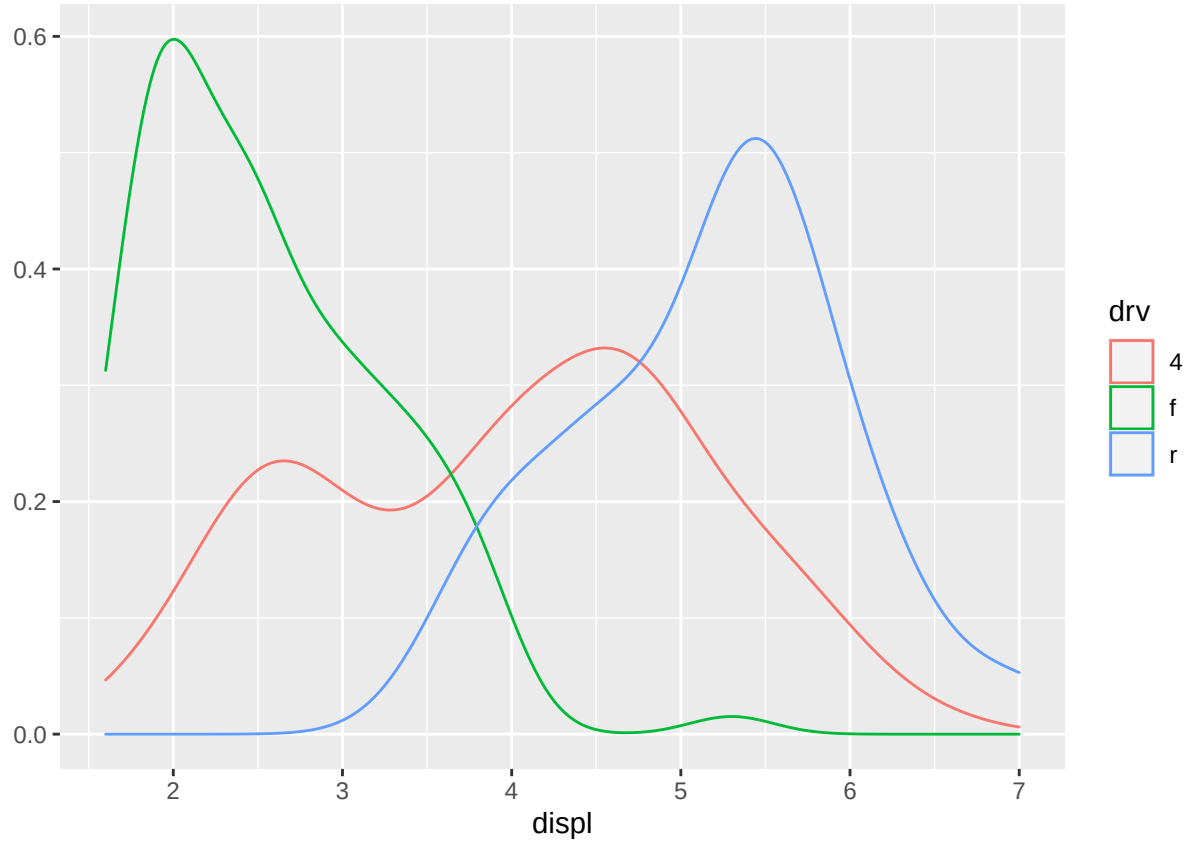

```
qplot(displ, hwy, data = mpg, facets = . ~ drv)
```



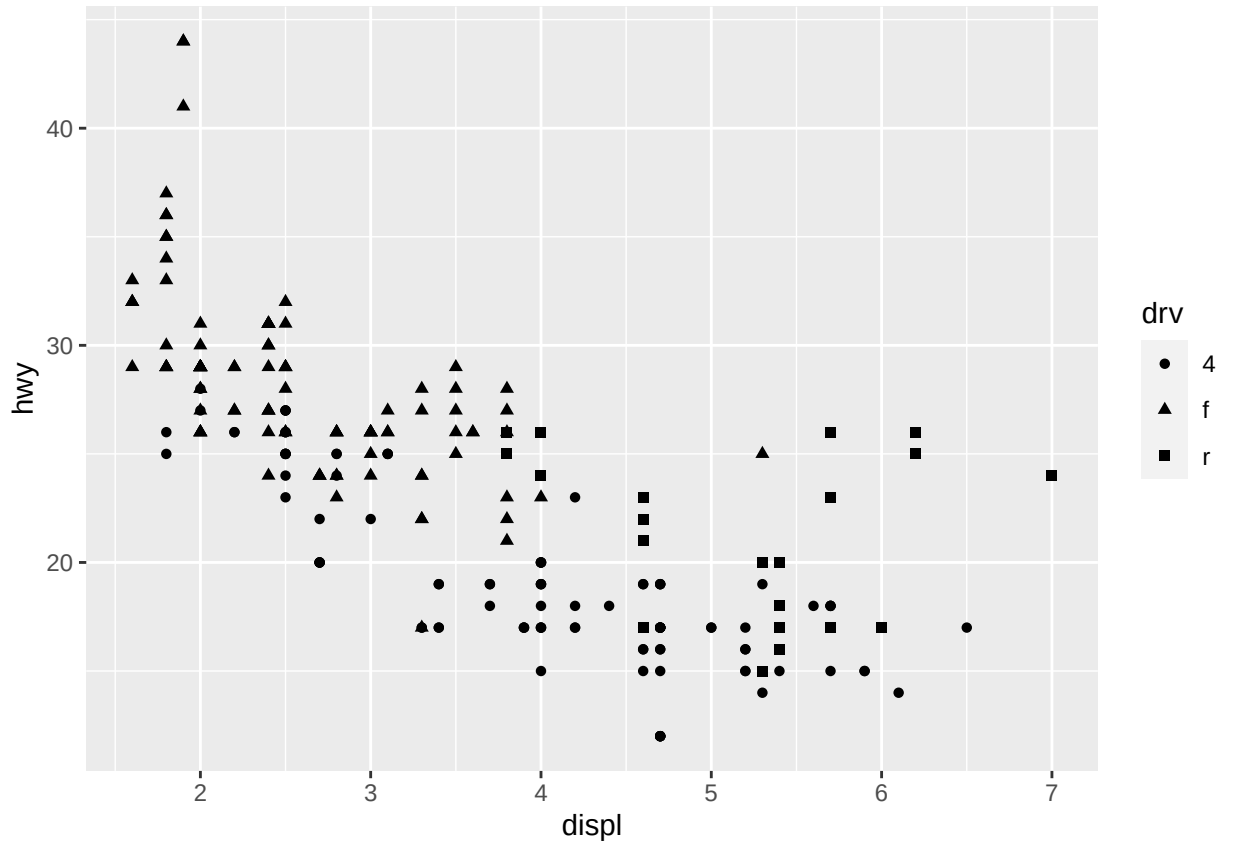

```
qplot(hwy, data = mpg, facets = drv ~ ., binwidth = 2)
```




```
qplot(displ, data = mpg, geom = "density", color = drv)
```

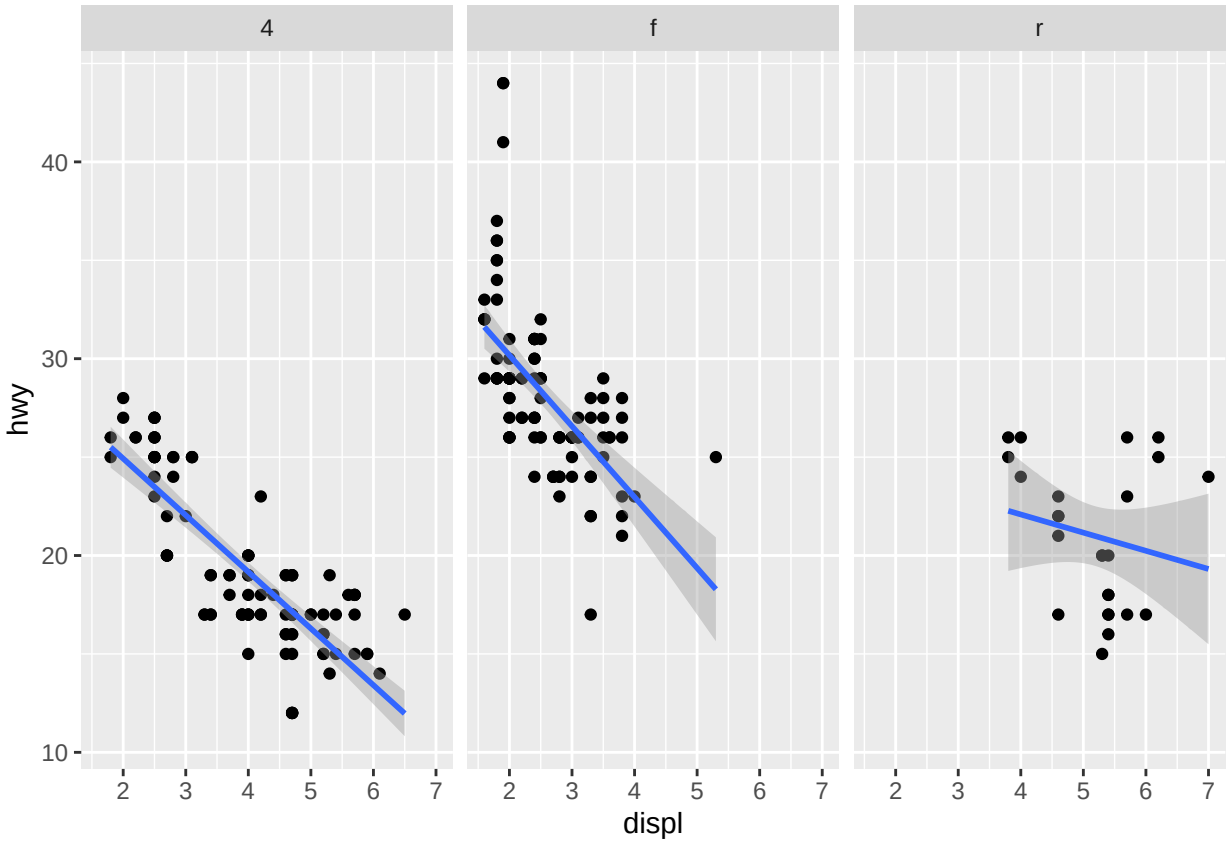



```
qplot(displ, hwy, data = mpg, shape = drv)
```



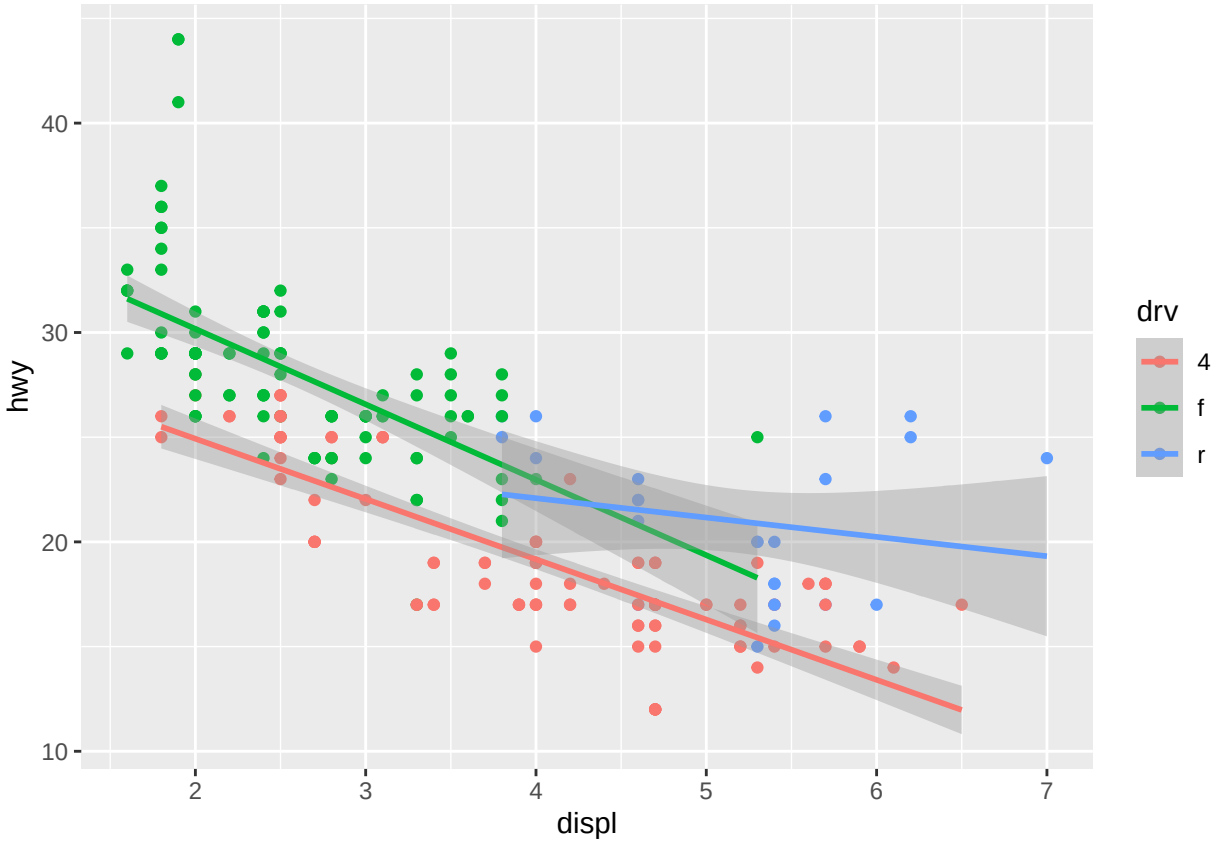

```
qplot(displ, hwy, data = mpg, facets = . ~ drv) + geom_smooth(method = "lm")
```

```
## `geom_smooth()` using formula 'y ~ x'
```




```
qplot(displ, hwy, data = mpg, color = drv) + geom_smooth(method = "lm")
```

```
## `geom_smooth()` using formula 'y ~ x'
```



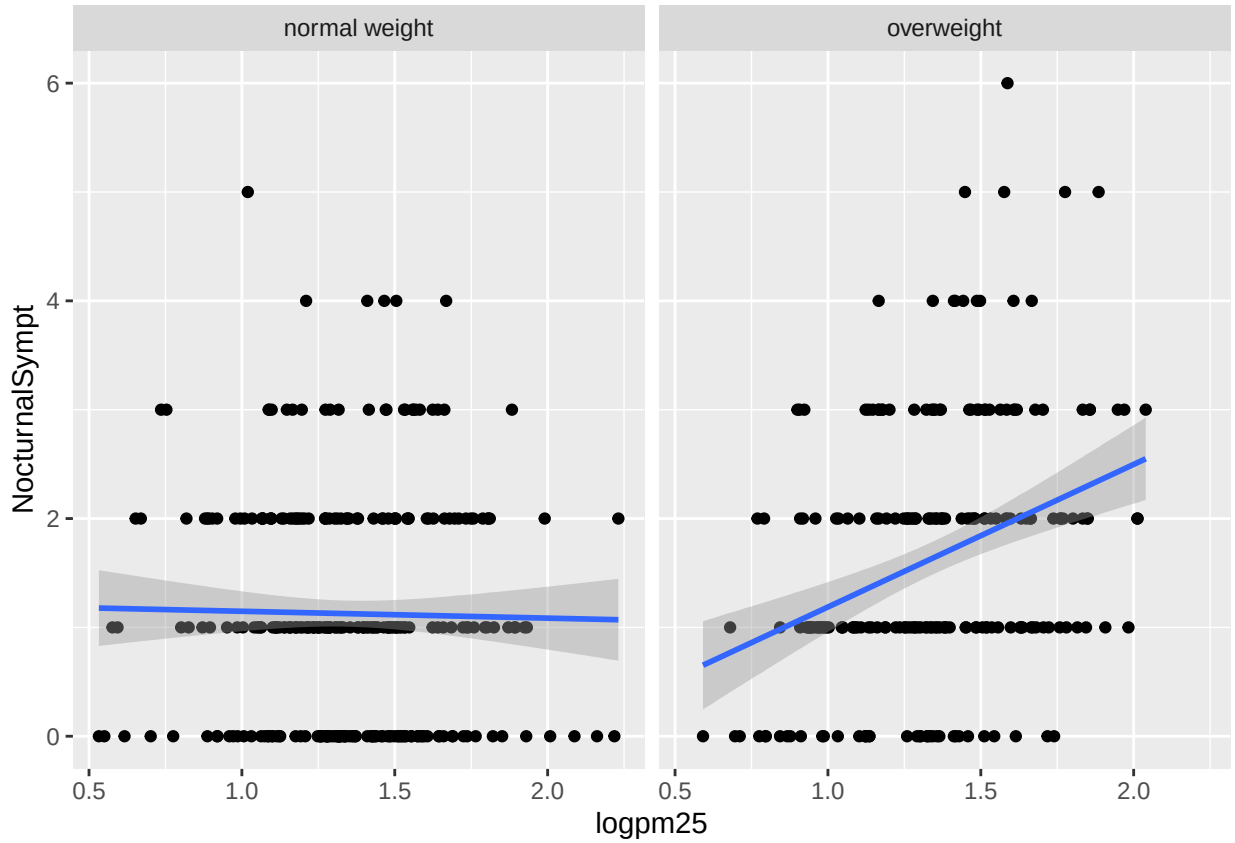
#GGPLOT2 (ggplot)

```
# fileUrl <- "https://raw.githubusercontent.com/rdpeng/artofdatascience/master/manuscript/data/bmi_pm25
fileUrl <- "https://raw.githubusercontent.com/rdpeng/artofdatascience/master/manuscript/data/bmi_pm25_n
maacs <- read.csv(fileUrl)
```

```
qplot(logpm25, NocturnalSympt, data = maacs,  facets = . ~ bmicat, geom = c("point", "smooth"), method =
```

```
## Warning: Ignoring unknown parameters: method
```

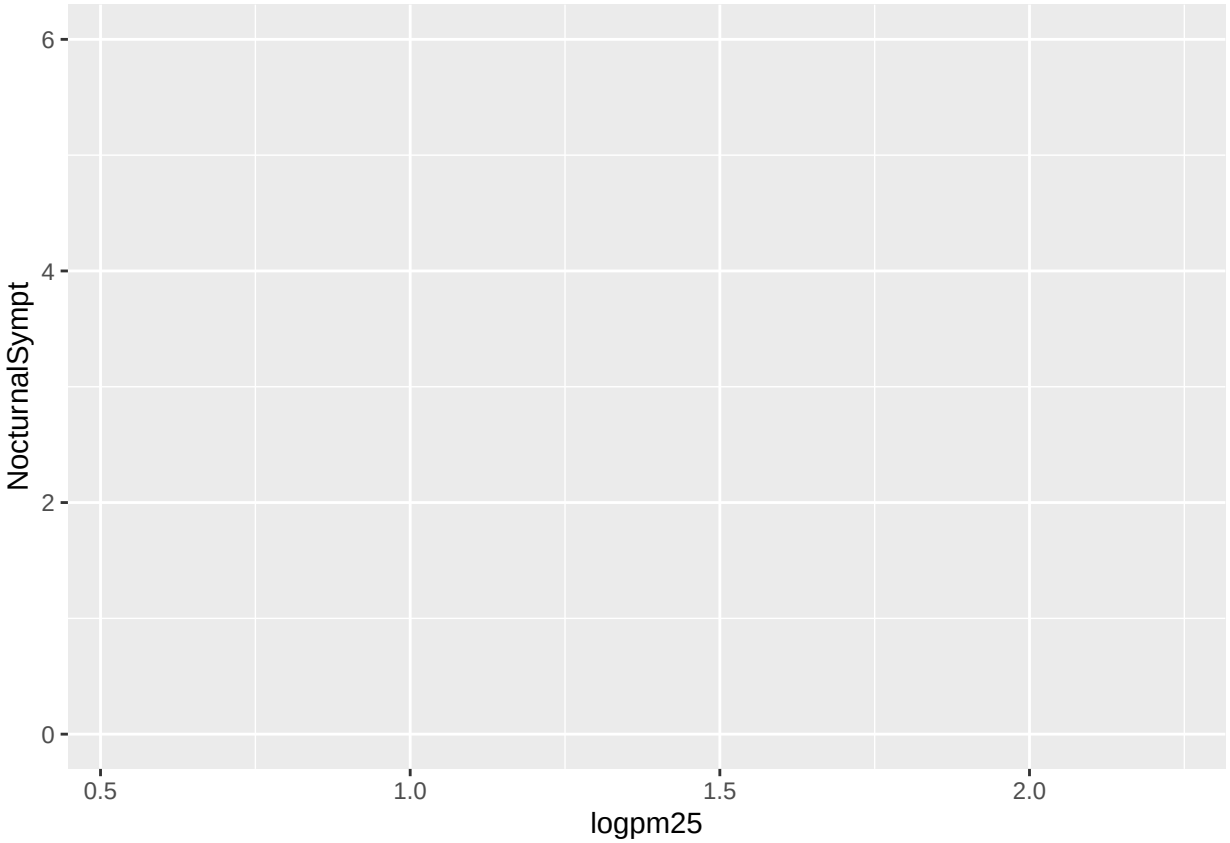
```
## `geom_smooth()` using formula 'y ~ x'
```



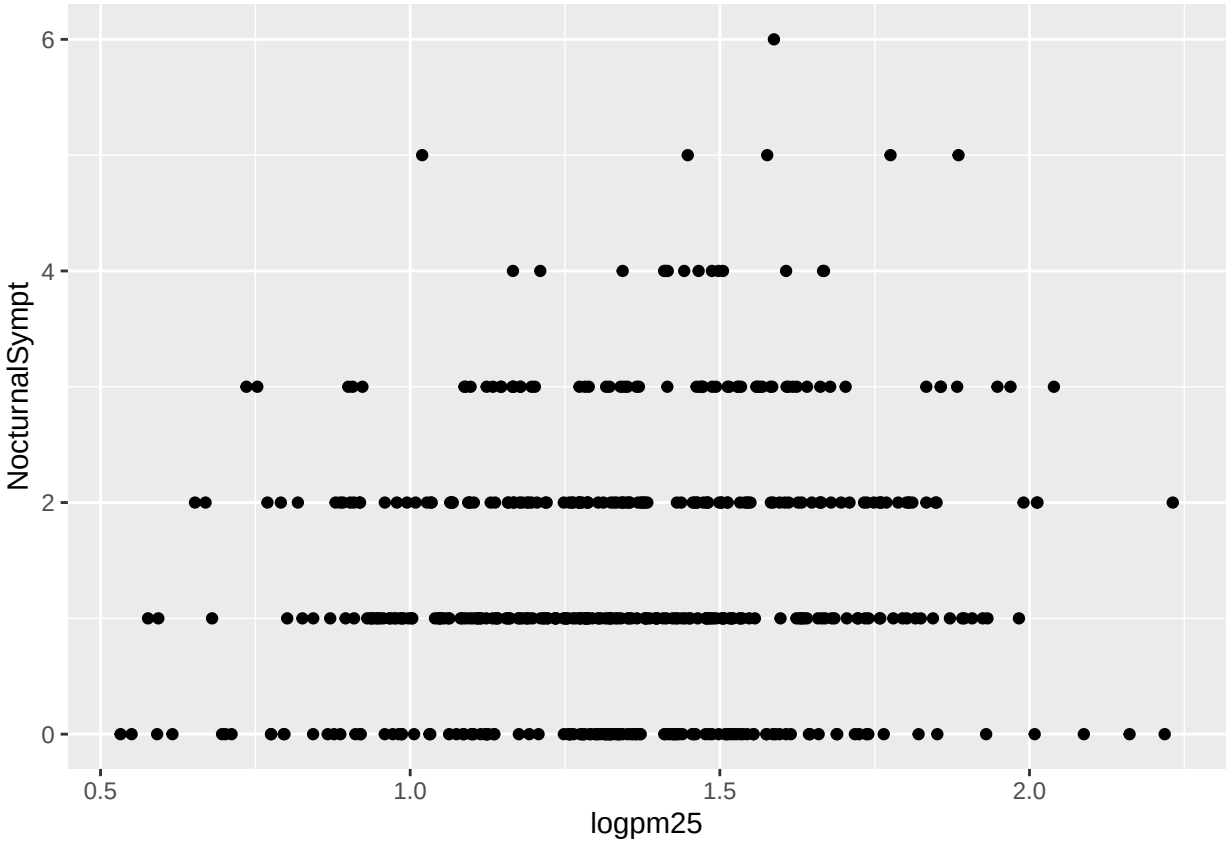

```
g <- ggplot(maacs, aes(logpm25, NocturnalSympt))
summary(g)
```

```
## data: logpm25, logno2_new, bmicat, NocturnalSympt [517x4]
## mapping:  x = ~logpm25, y = ~NocturnalSympt
## faceting: <ggproto object: Class FacetNull, Facet, gg>
##     compute_layout: function
##     draw_back: function
##     draw_front: function
##     draw_labels: function
##     draw_panels: function
##     finish_data: function
##     init_scales: function
##     map_data: function
##     params: list
##     setup_data: function
##     setup_params: function
##     shrink: TRUE
##     train_scales: function
##     vars: function
##     super:  <ggproto object: Class FacetNull, Facet, gg>
```

```
print(g)
```

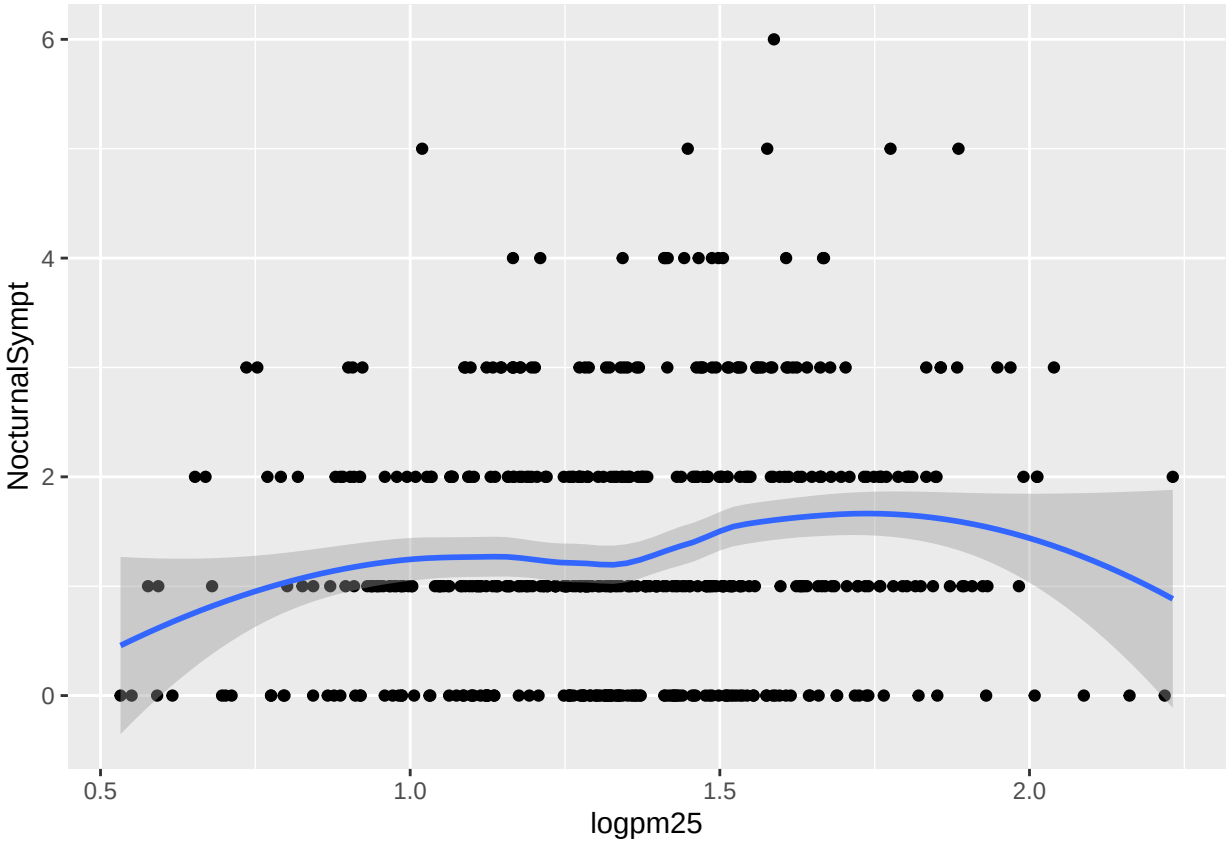



```
g + geom_point()
```



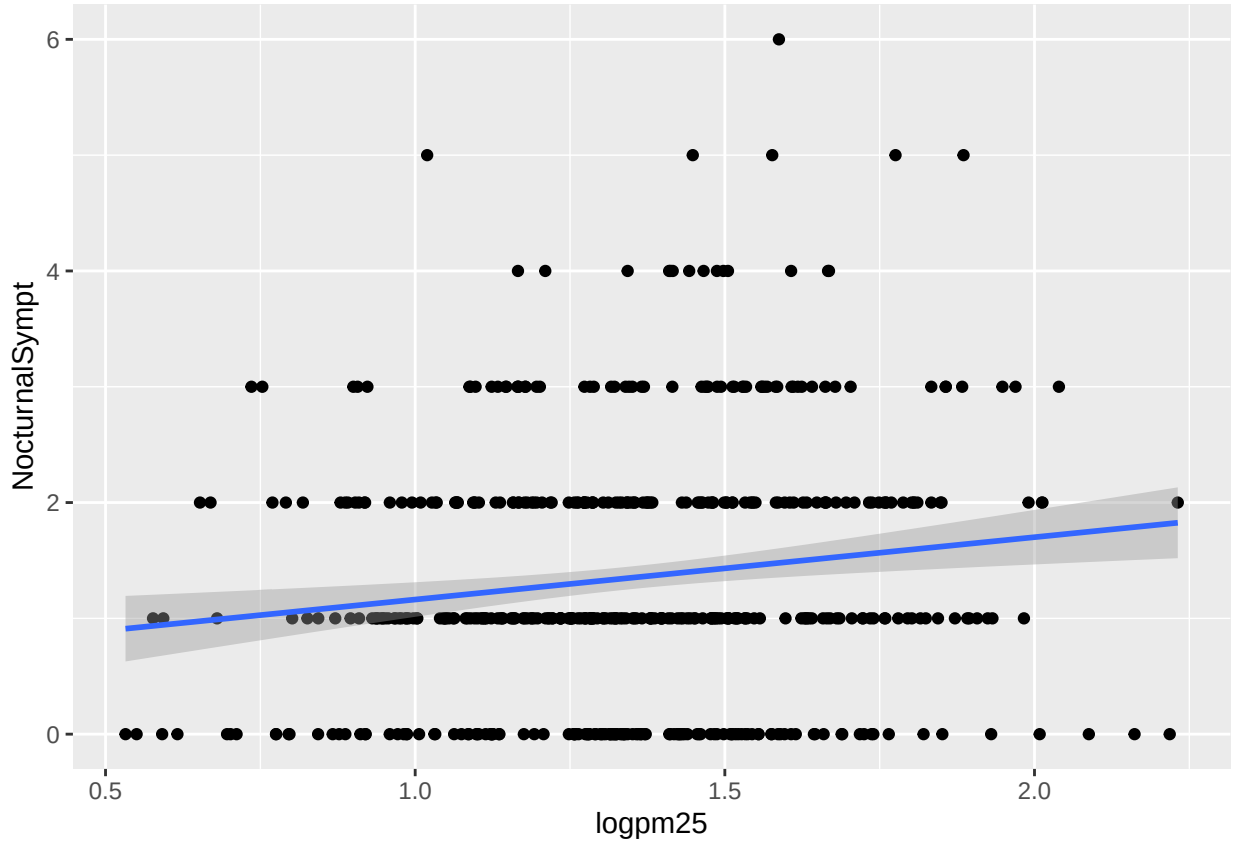

```
g + geom_point() + geom_smooth()
```

```
## `geom_smooth()` using method = 'loess' and formula 'y ~ x'
```



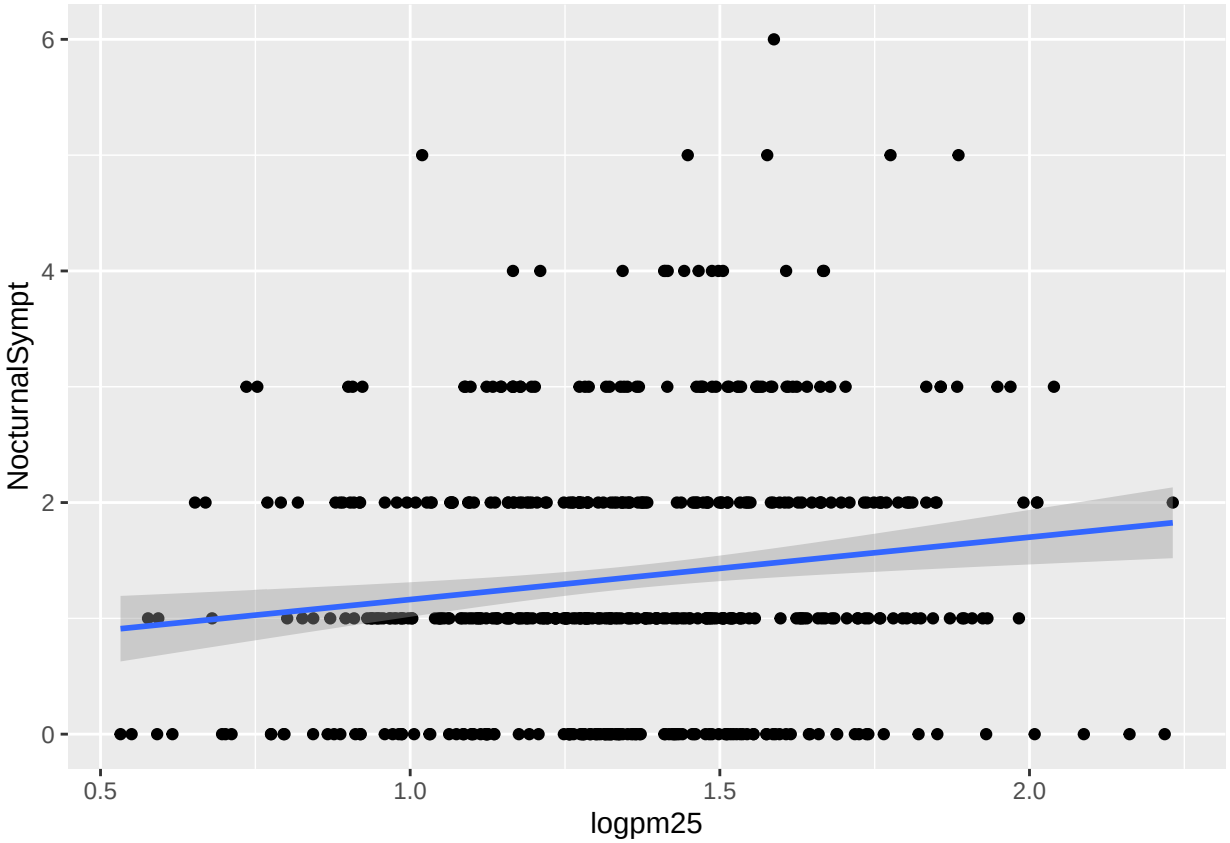

```
g + geom_point() + geom_smooth(method = "lm")
```

```
## `geom_smooth()` using formula 'y ~ x'
```



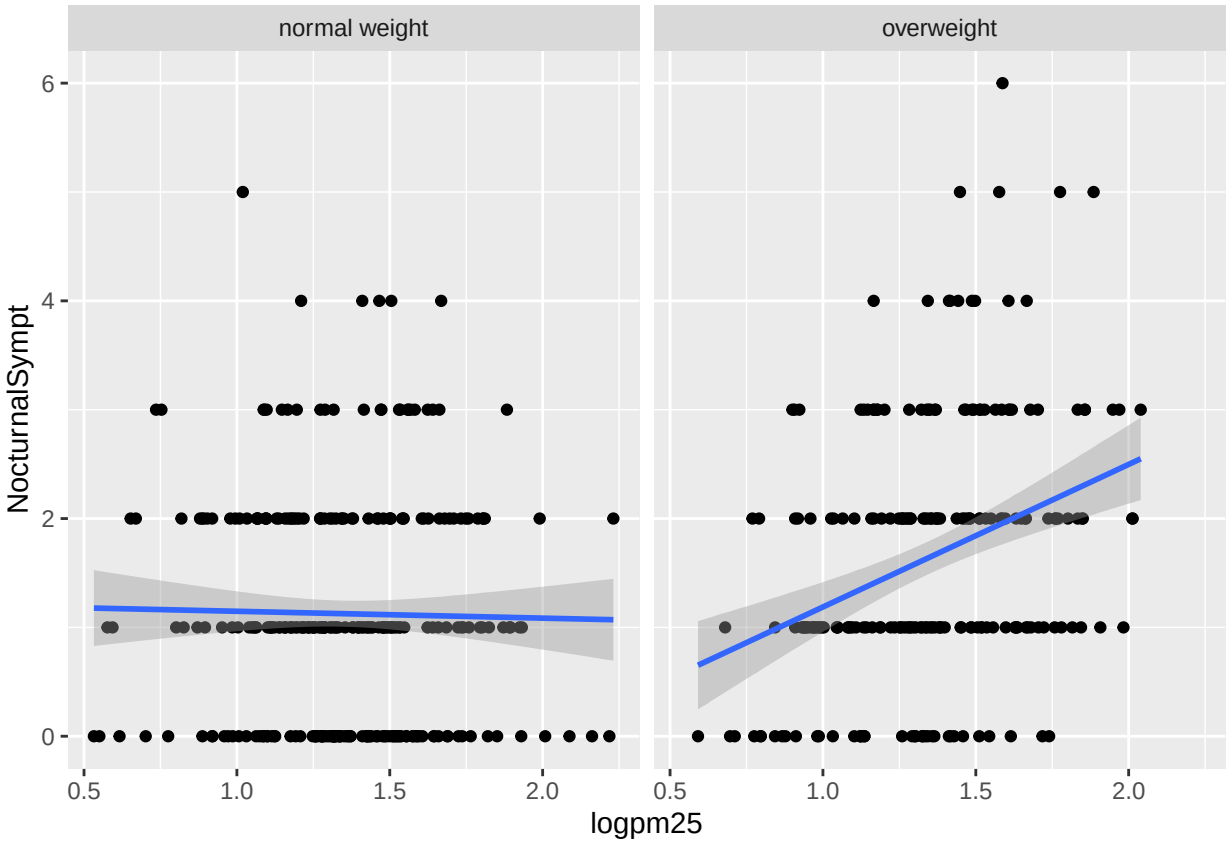

```
g + geom_point() + geom_smooth(method = "lm")
```

```
## `geom_smooth()` using formula 'y ~ x'
```

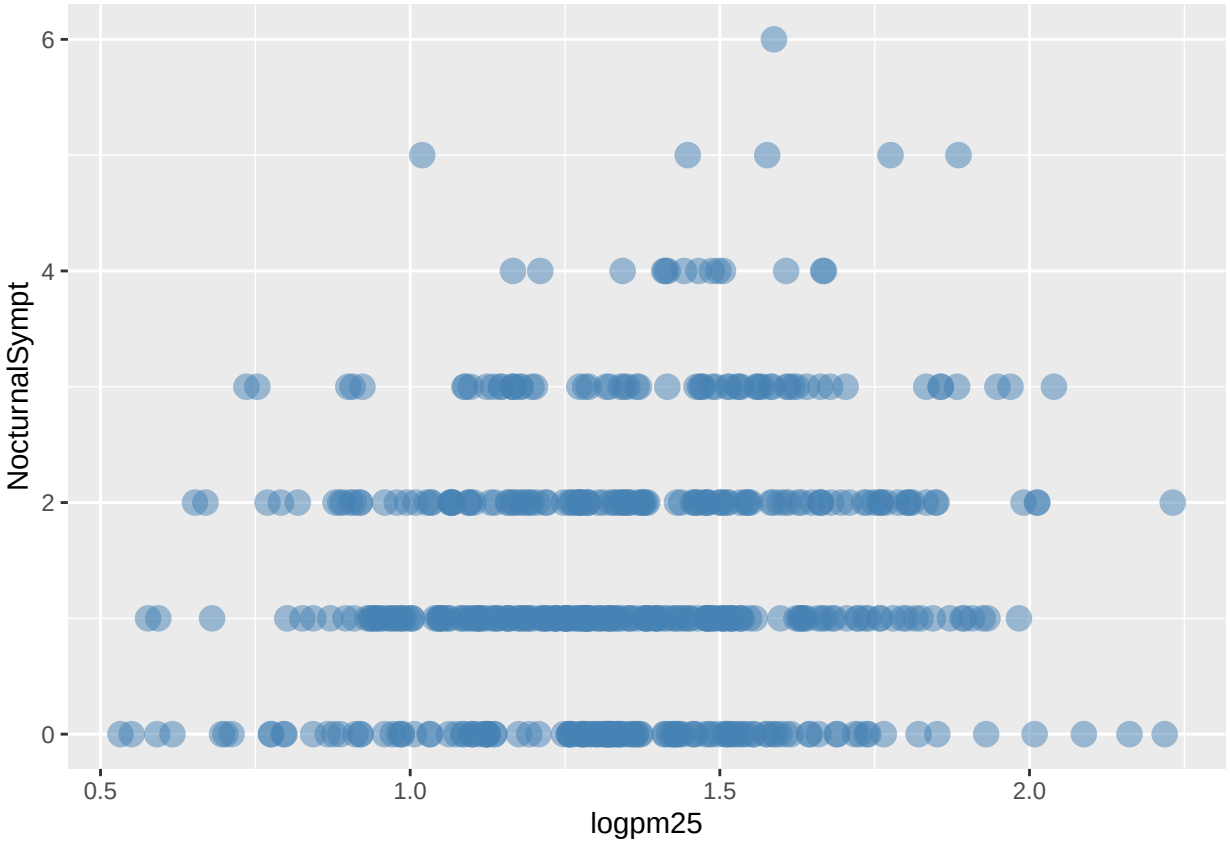



```
g + geom_point() + facet_grid(. ~ bmicat) + geom_smooth(method = "lm")
```

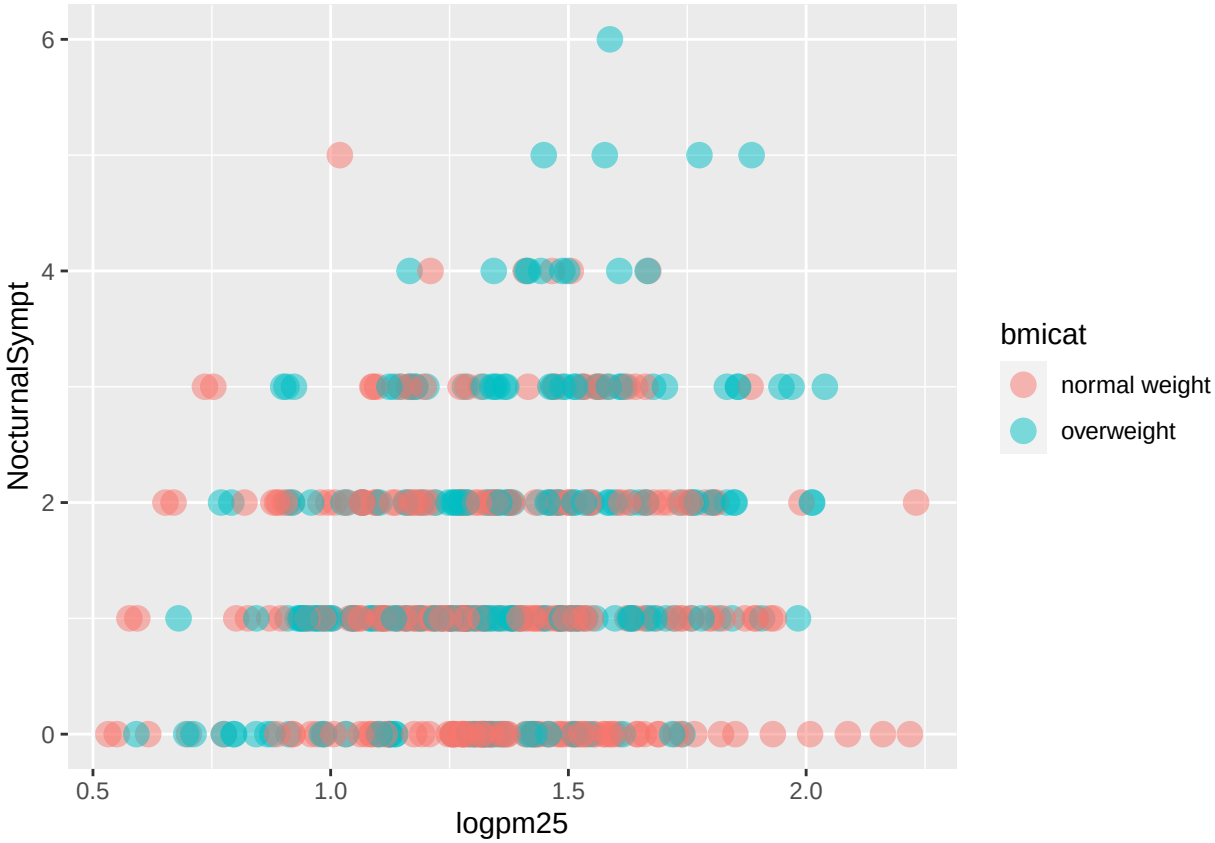
```
## `geom_smooth()` using formula 'y ~ x'
```



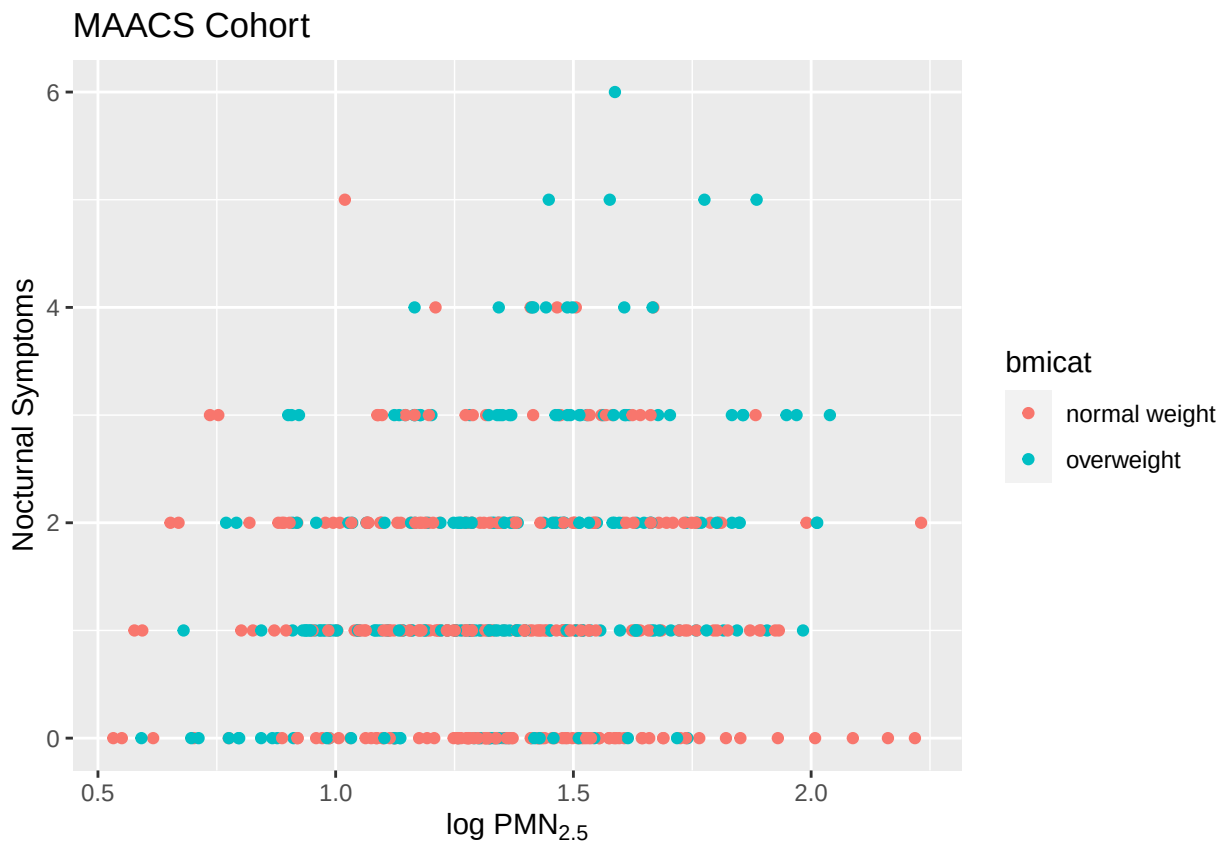

```
g + geom_point(color = "steelblue", size = 4, alpha = 1/2)
```




```
g + geom_point(aes(color = bmicat), size = 4, alpha = 1/2)  # we use aes because color is a variable no
```

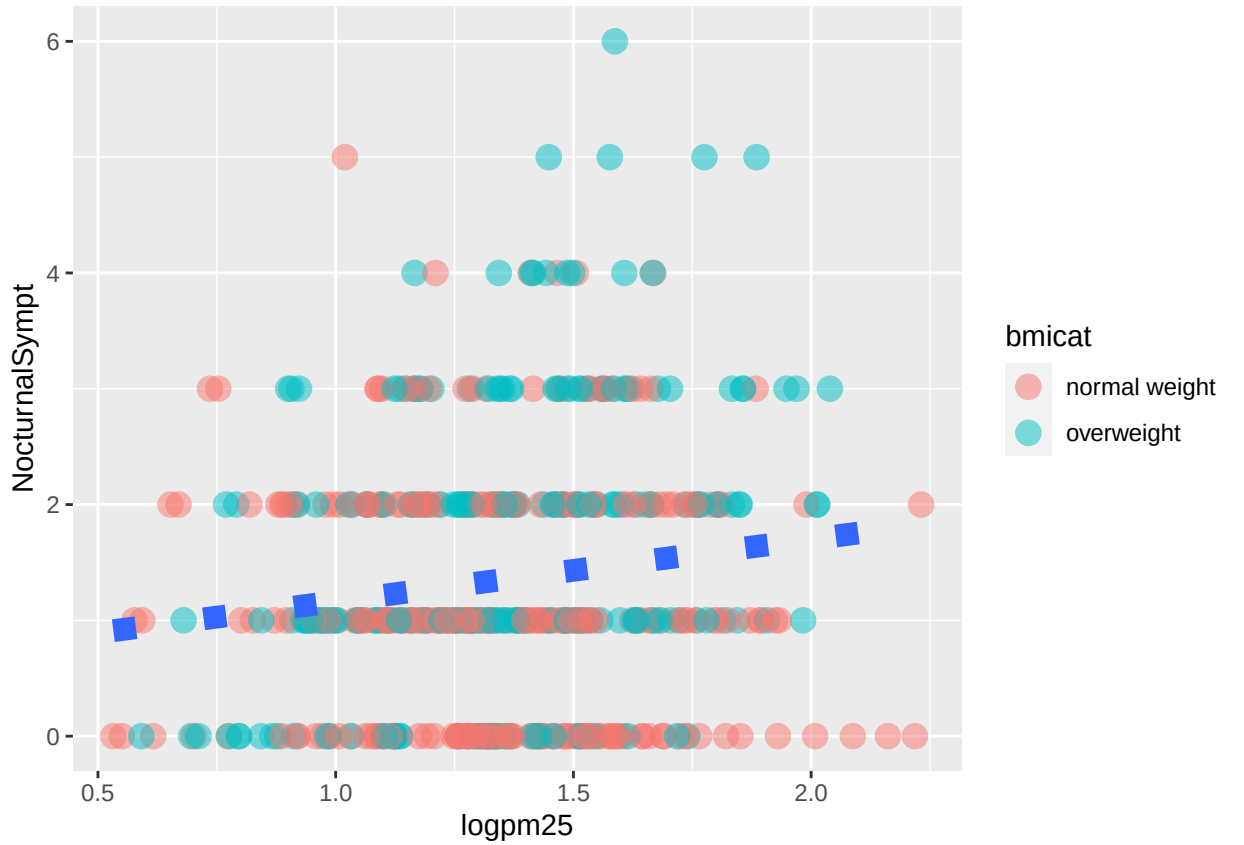



```
g + geom_point(aes(color = bmicat)) + labs(title = "MAACS Cohort") + labs(x = expression("log " * PMN[2
```

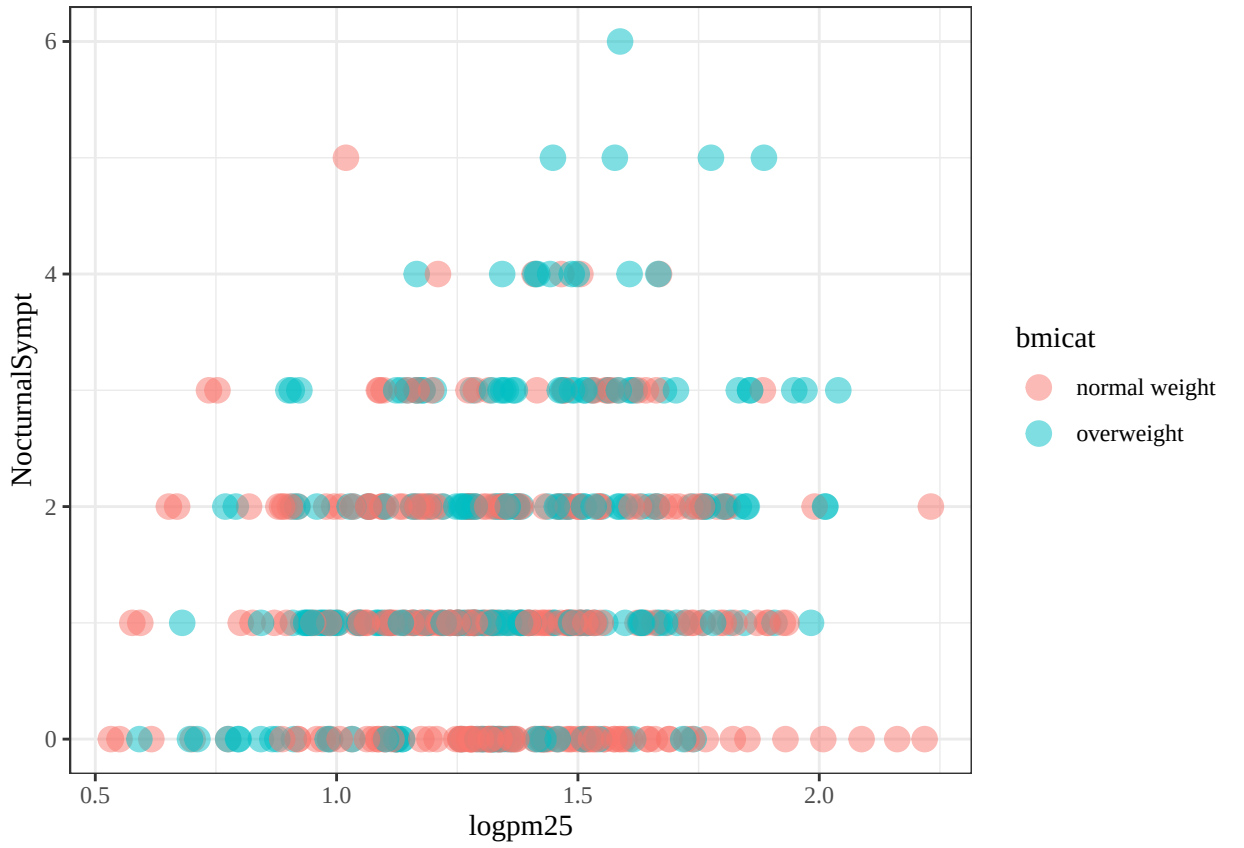



```
g + geom_point(aes(color = bmicat), size = 4, alpha = 1/2) + geom_smooth(size = 4, linetype = 3, method
```

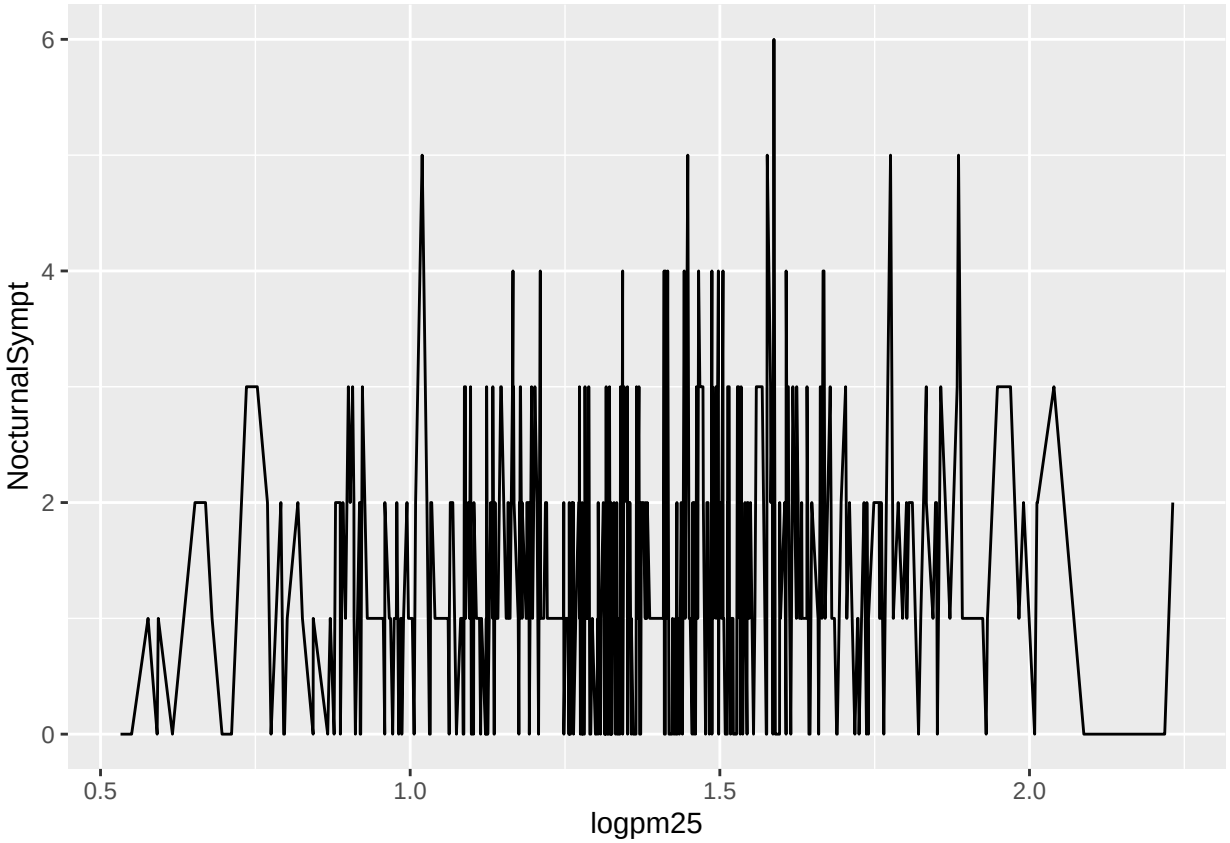
```
## `geom_smooth()` using formula 'y ~ x'
```



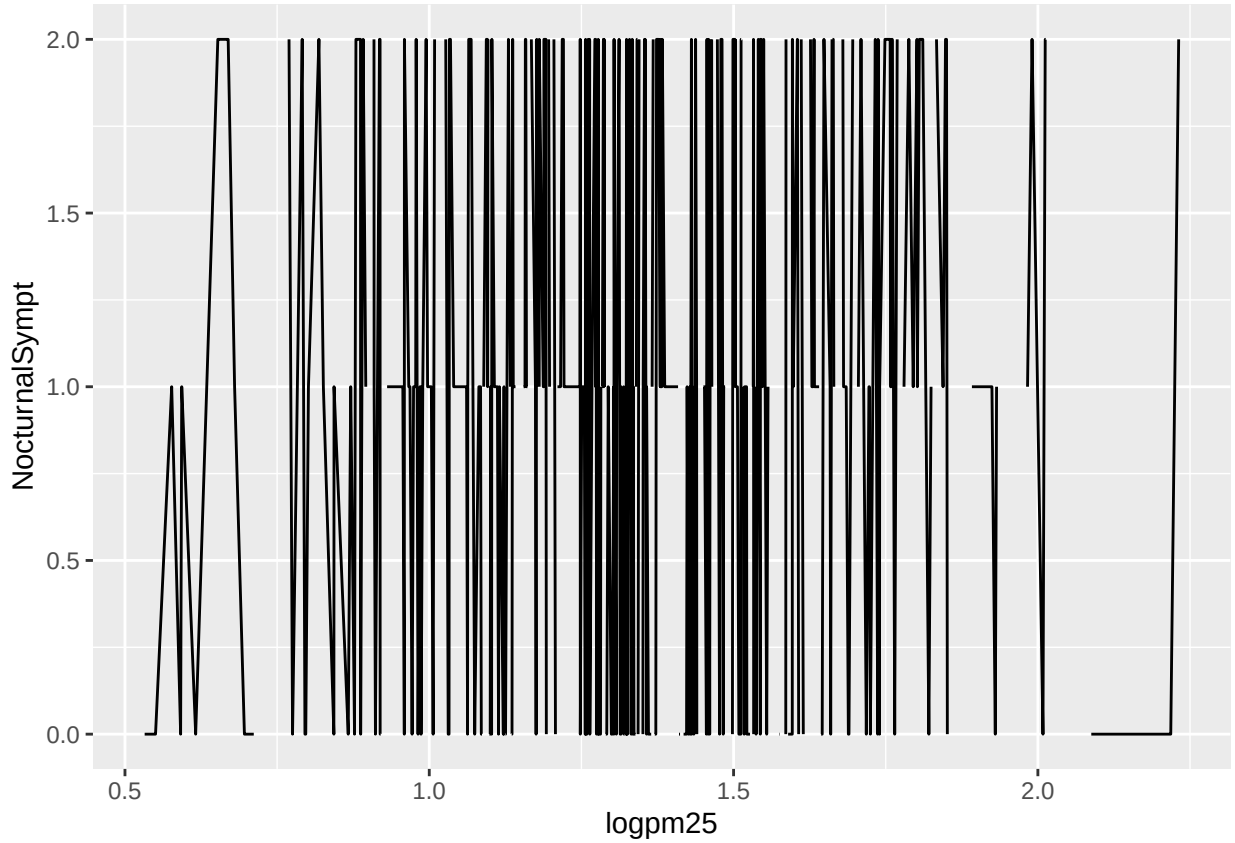

```
g + geom_point(aes(color = bmicat), size = 4, alpha = 1/2) + theme_bw(base_family = "Times")
```


NocturnalSympt
6
4
2
0
0.5
1.0
1.5
2.0
logpm25
bmicat
normal weight
overweight

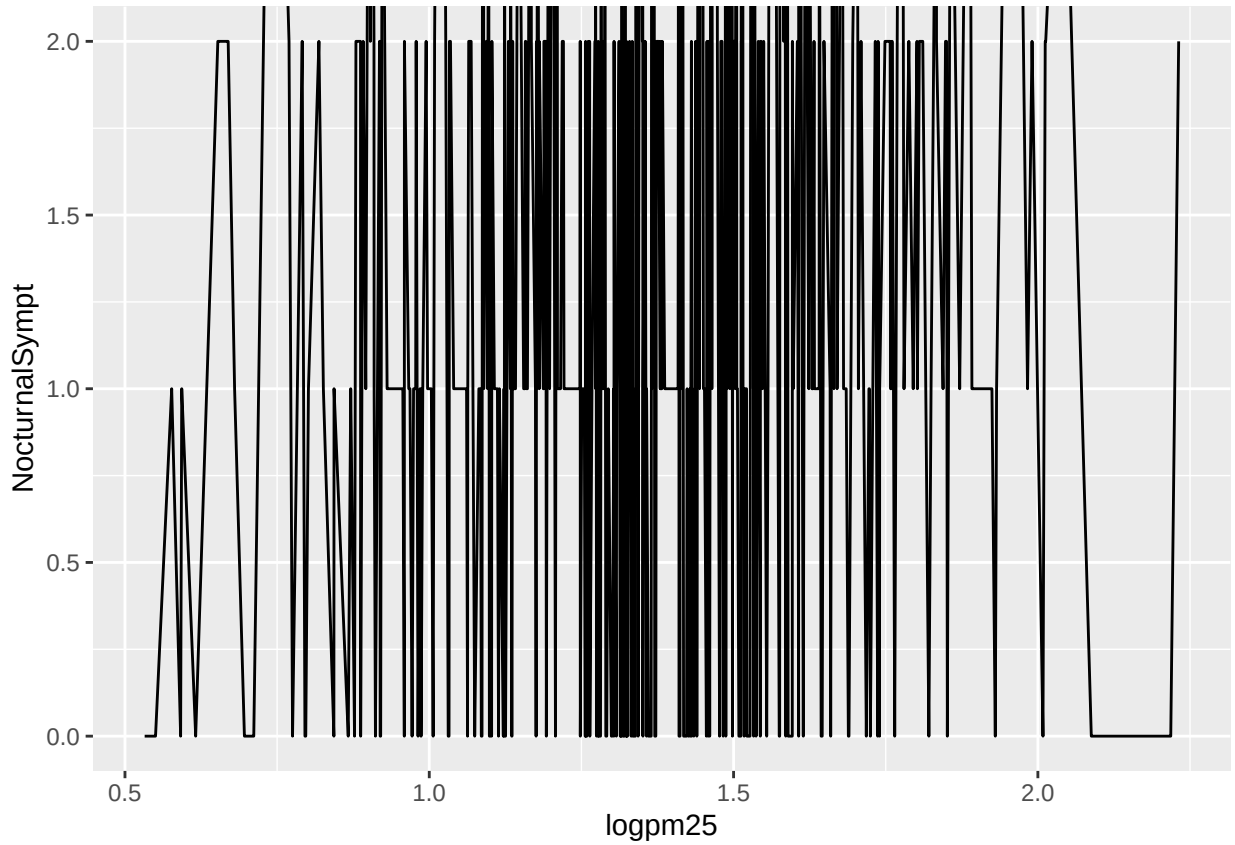
```
g + geom_line()
```




```
g + geom_line() + ylim(0,2)  #points out of range (outliers) are deleted
```



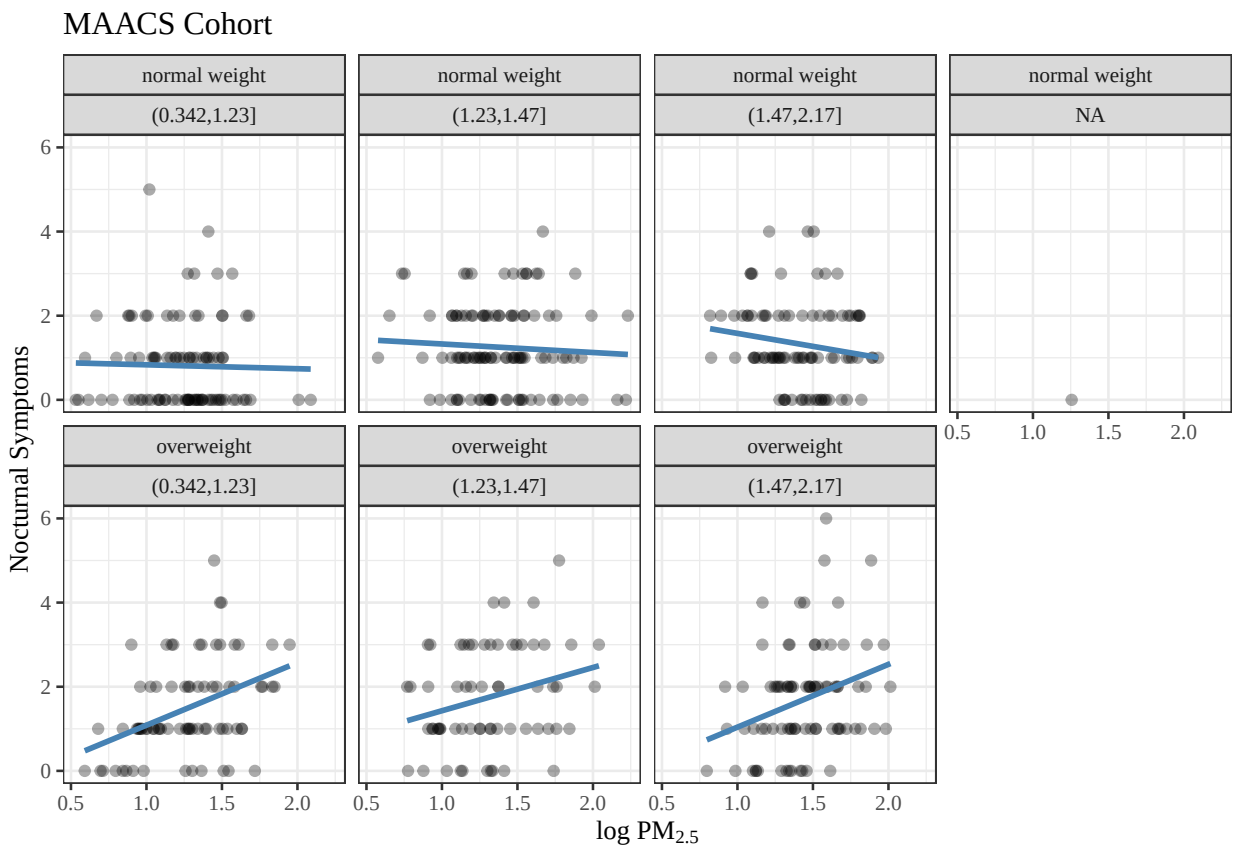

```
g + geom_line() + coord_cartesian(ylim = c(0,2))   #plot all points and some are out of scale
```




```
cutpoints <- quantile(maacs$logno2_new, seq(0, 1, length = 4))
maacs$no2dec <- cut(maacs$logno2_new, cutpoints)
```

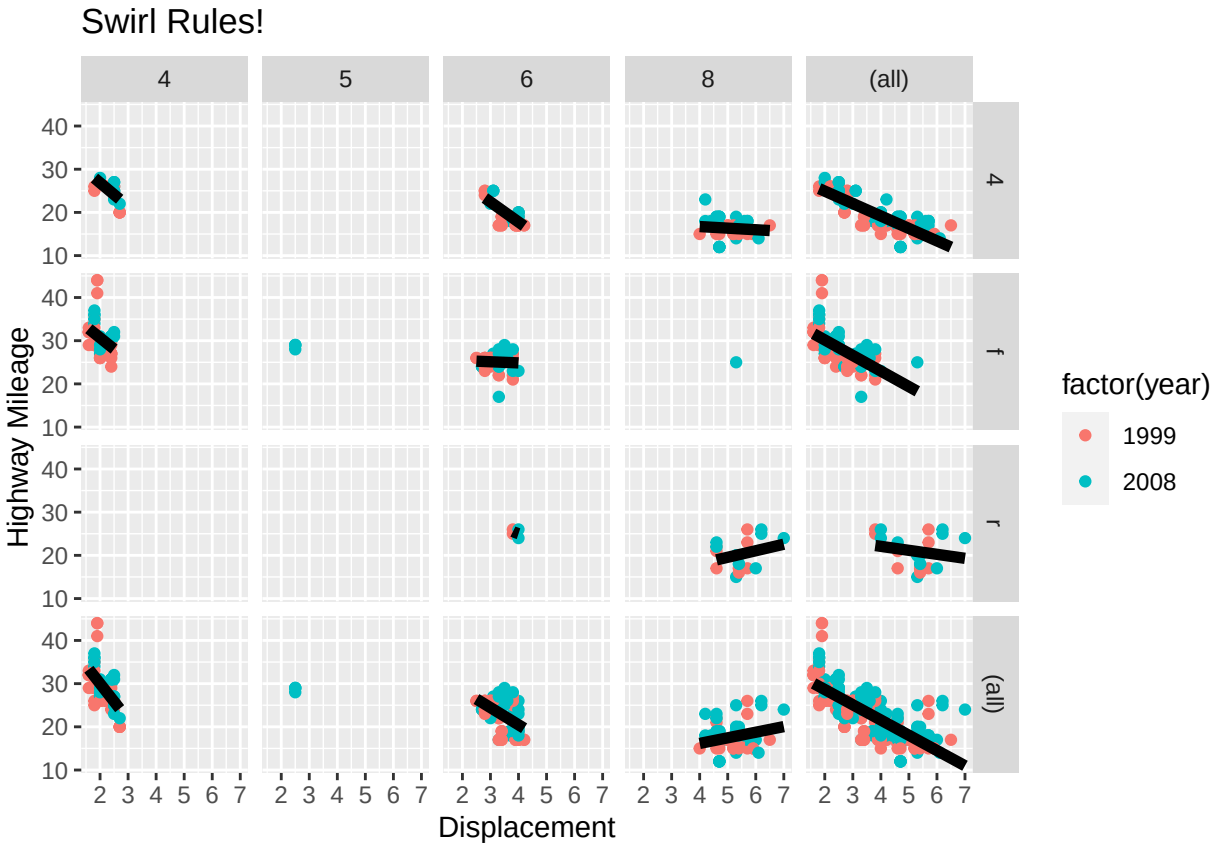
```
g <- ggplot(maacs, aes(logpm25, NocturnalSympt))

g + geom_point(alpha = 1/3) +
  facet_wrap(bmicat ~ no2dec, nrow = 2, ncol = 4) +
  geom_smooth(method = "lm", se = FALSE, col = "steelblue") +
  theme_bw(base_family = "Times", base_size = 10) +
  labs(x = expression("log " * PM[2.5])) +
  labs(y = "Nocturnal Symptoms") +
  labs(title = "MAACS Cohort")
```

```
## `geom_smooth()` using formula 'y ~ x'
```

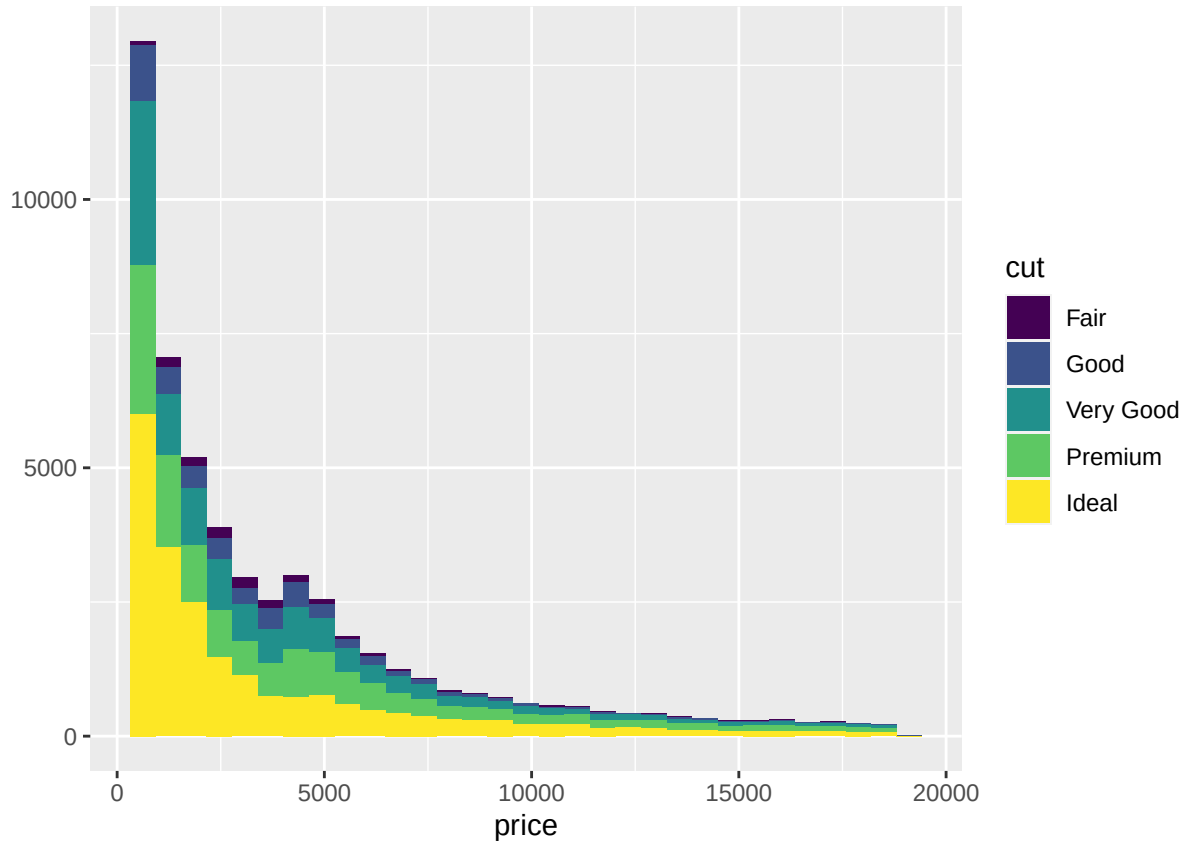



```
g <- ggplot(mpg, aes(x=displ, y=hwy, color = factor(year)))
g + geom_point() + facet_grid(drv~cyl,margins=TRUE)+geom_smooth(method="lm",size=2,se=FALSE,color="blac
```

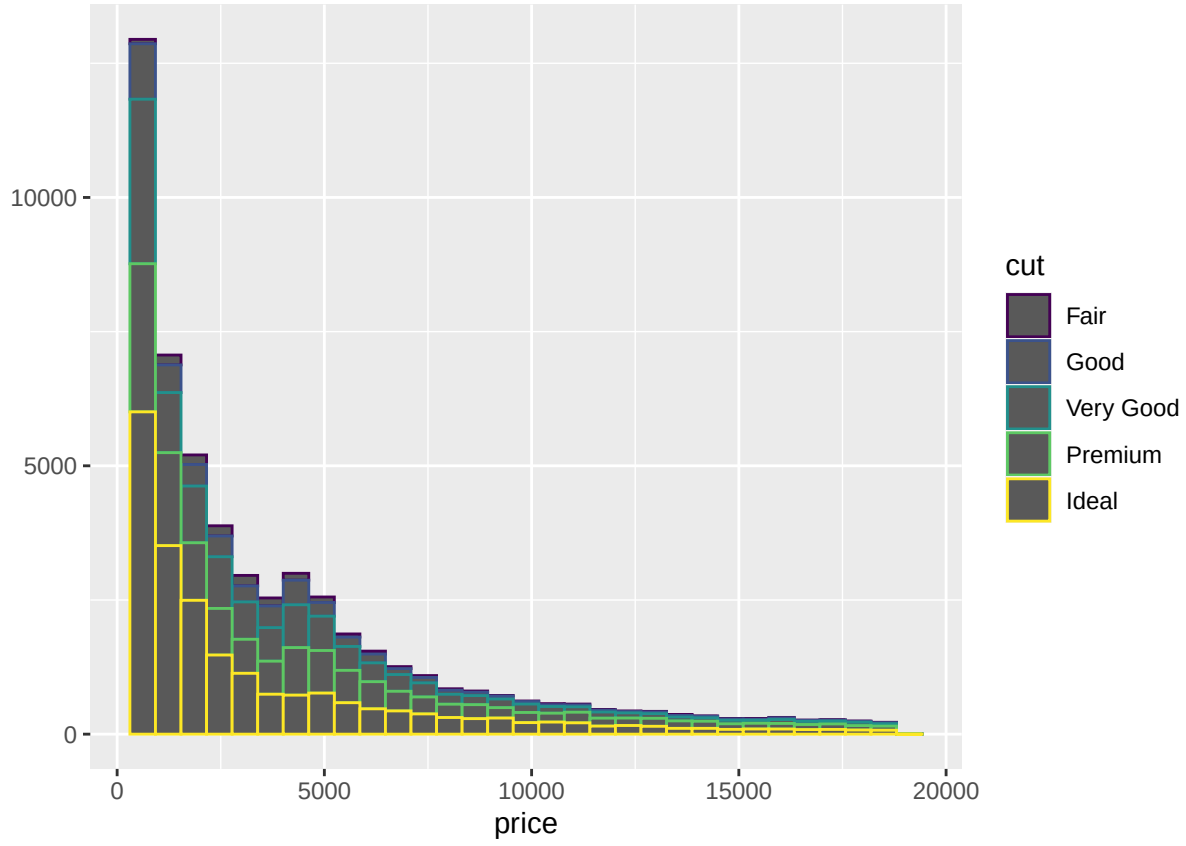
```
## `geom_smooth()` using formula 'y ~ x'
```



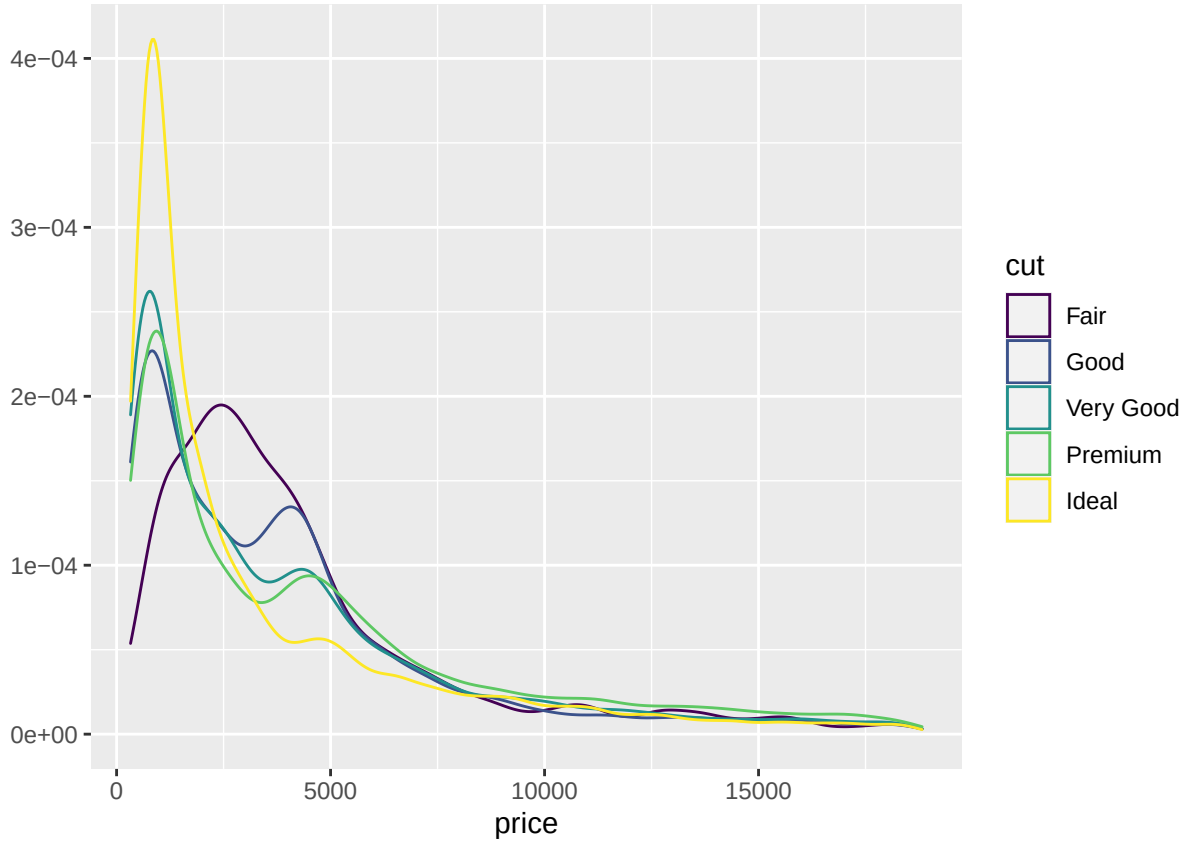

```
qplot(price, data = diamonds, binwidth = 18497/30, fill = cut)
```




```
qplot(price, data = diamonds, binwidth = 18497/30, color = cut)
```

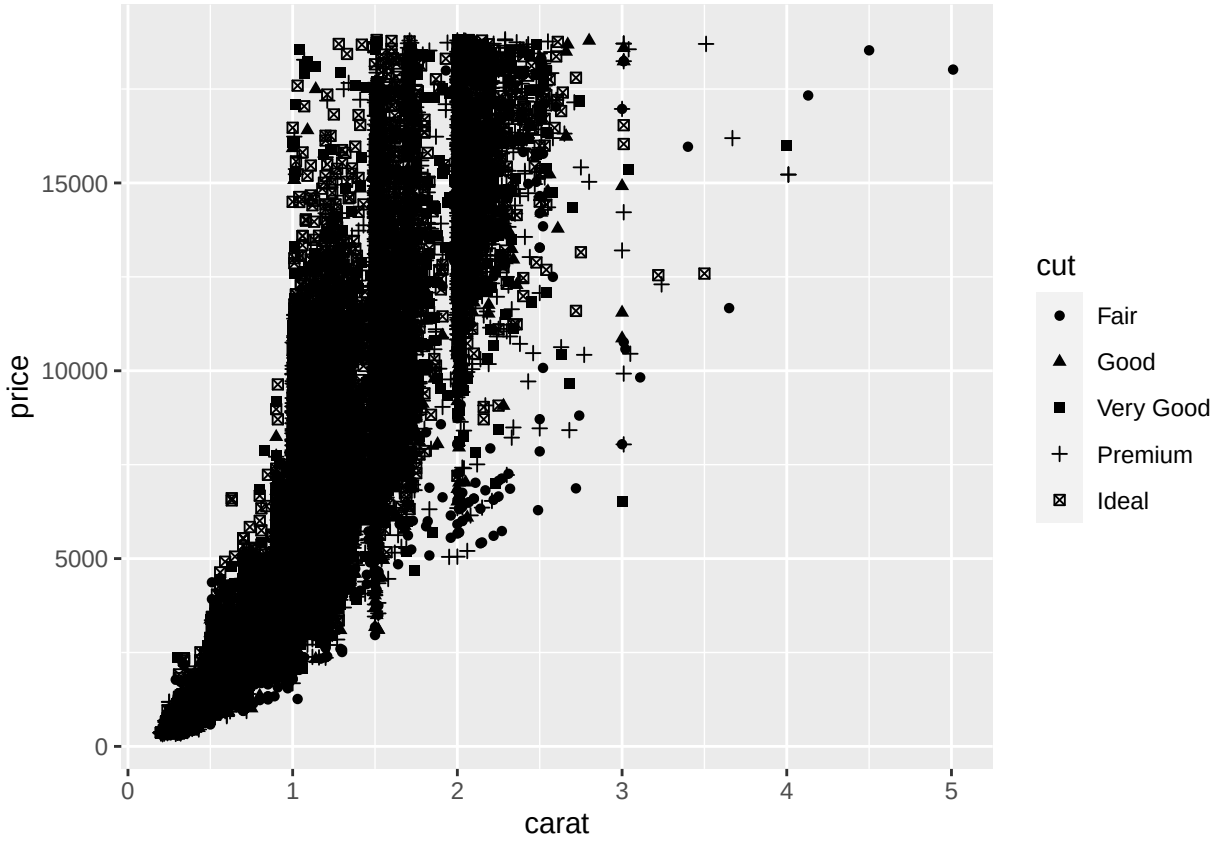



```
qplot(price, data = diamonds, geom = "density", color = cut)
```

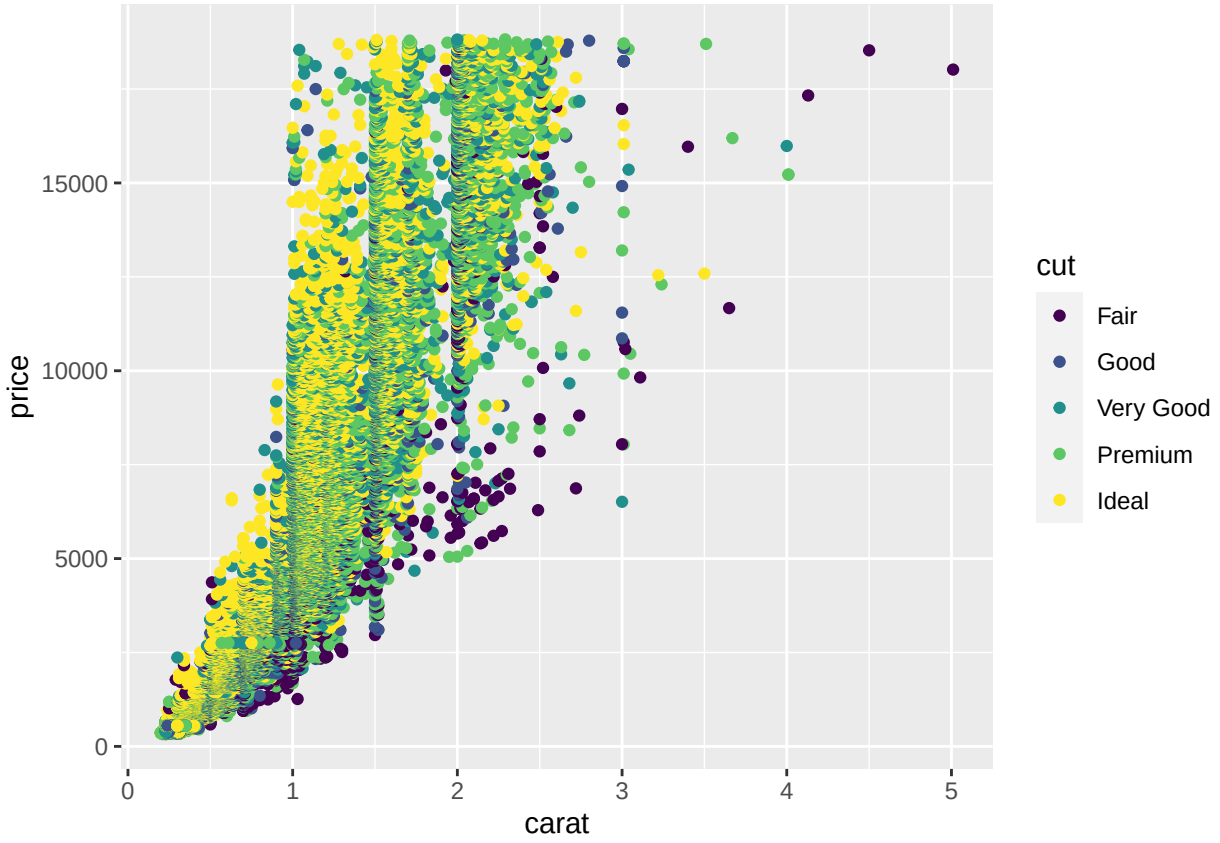



```
qplot(carat, price, data = diamonds, shape = cut)
```

```
## Warning: Using shapes for an ordinal variable is not advised
```

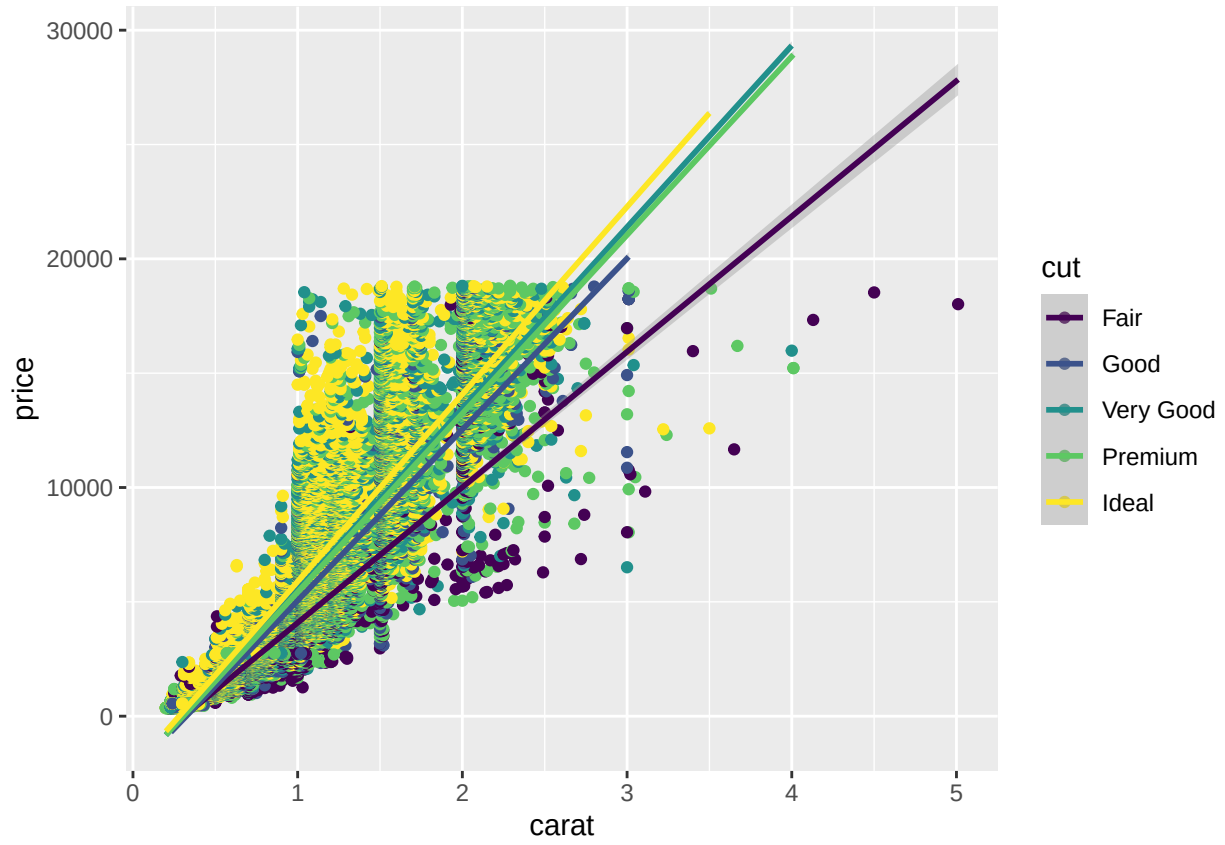



```
qplot(carat, price, data = diamonds, color = cut)
```



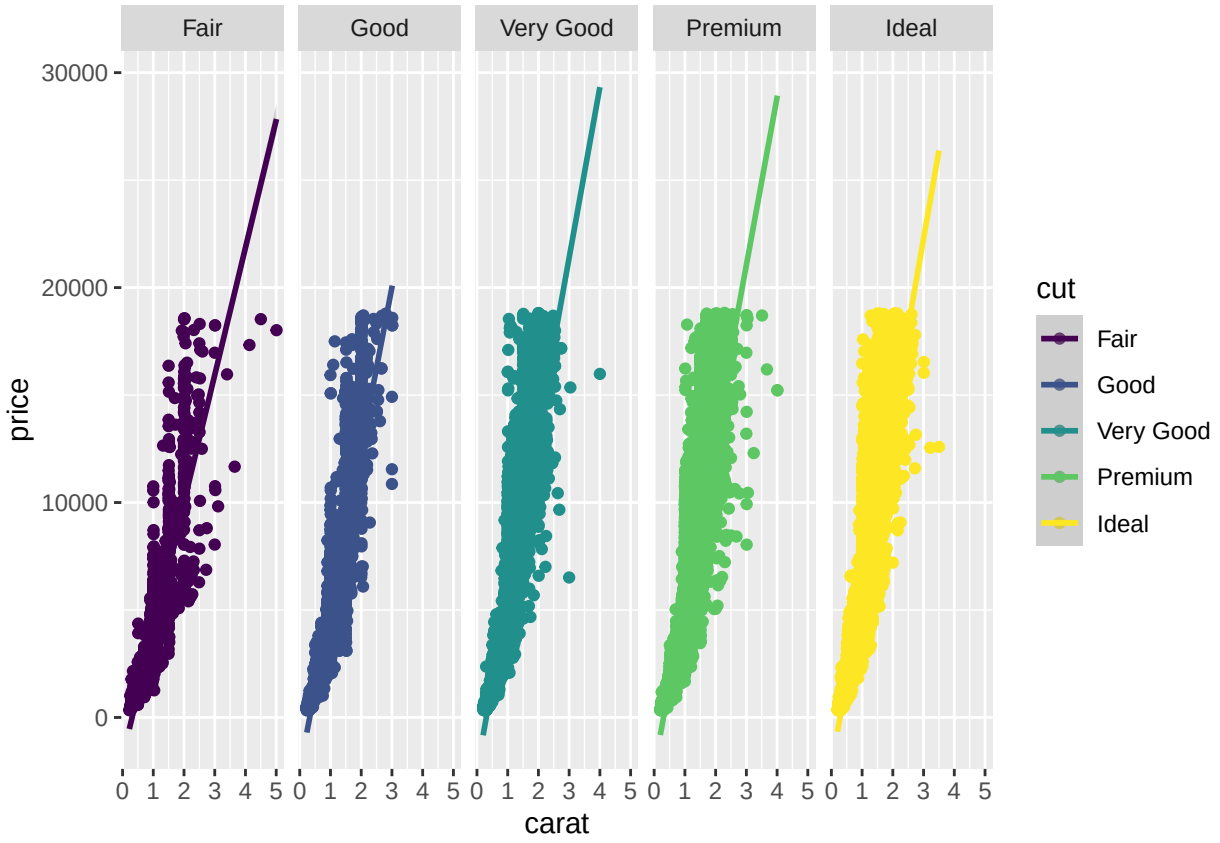

```
qplot(carat, price, data = diamonds, color = cut) + geom_smooth(method = "lm")
```

```
## `geom_smooth()` using formula 'y ~ x'
```

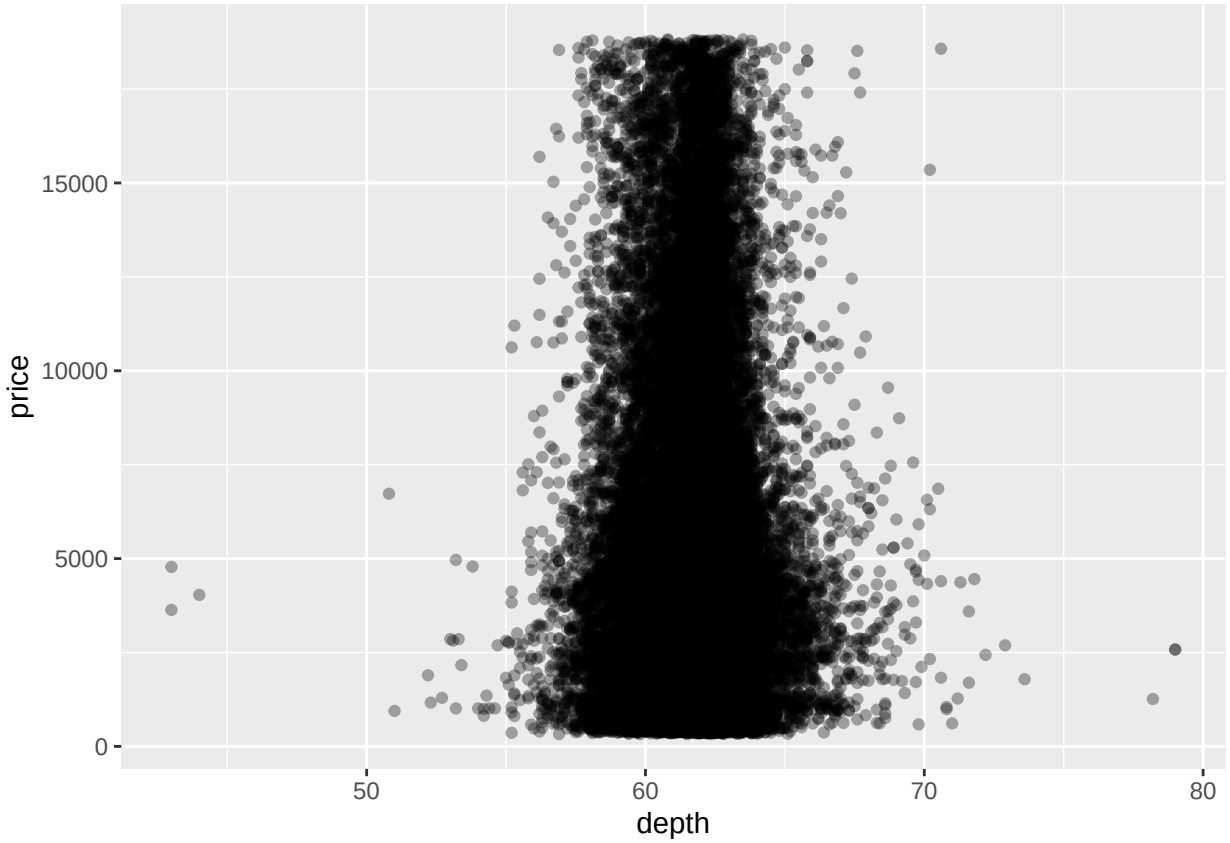



```
qplot(carat, price, data = diamonds, color = cut, facets = .~cut) + geom_smooth(method = "lm")
```

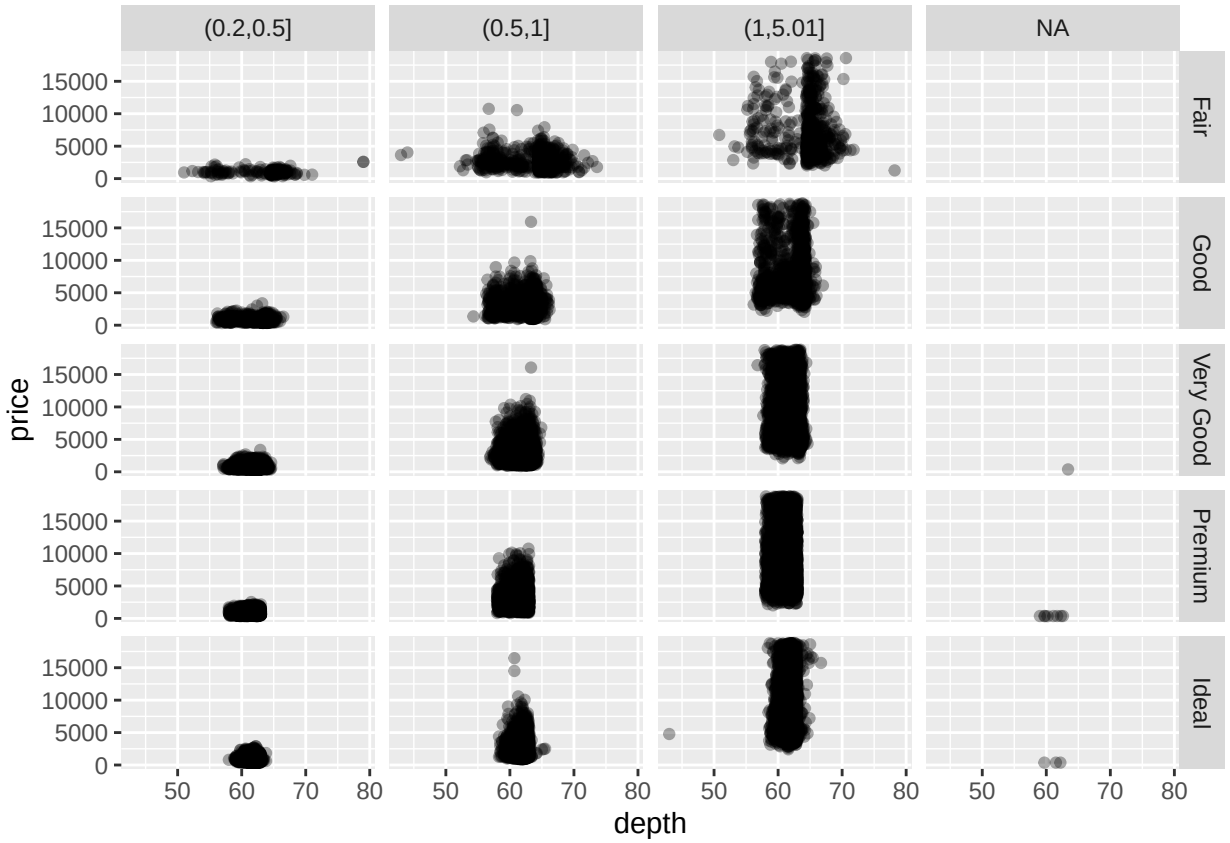
```
## `geom_smooth()` using formula 'y ~ x'
```




```
g <- ggplot(diamonds, aes(depth, price))
g + geom_point(alpha = 1/3)
```

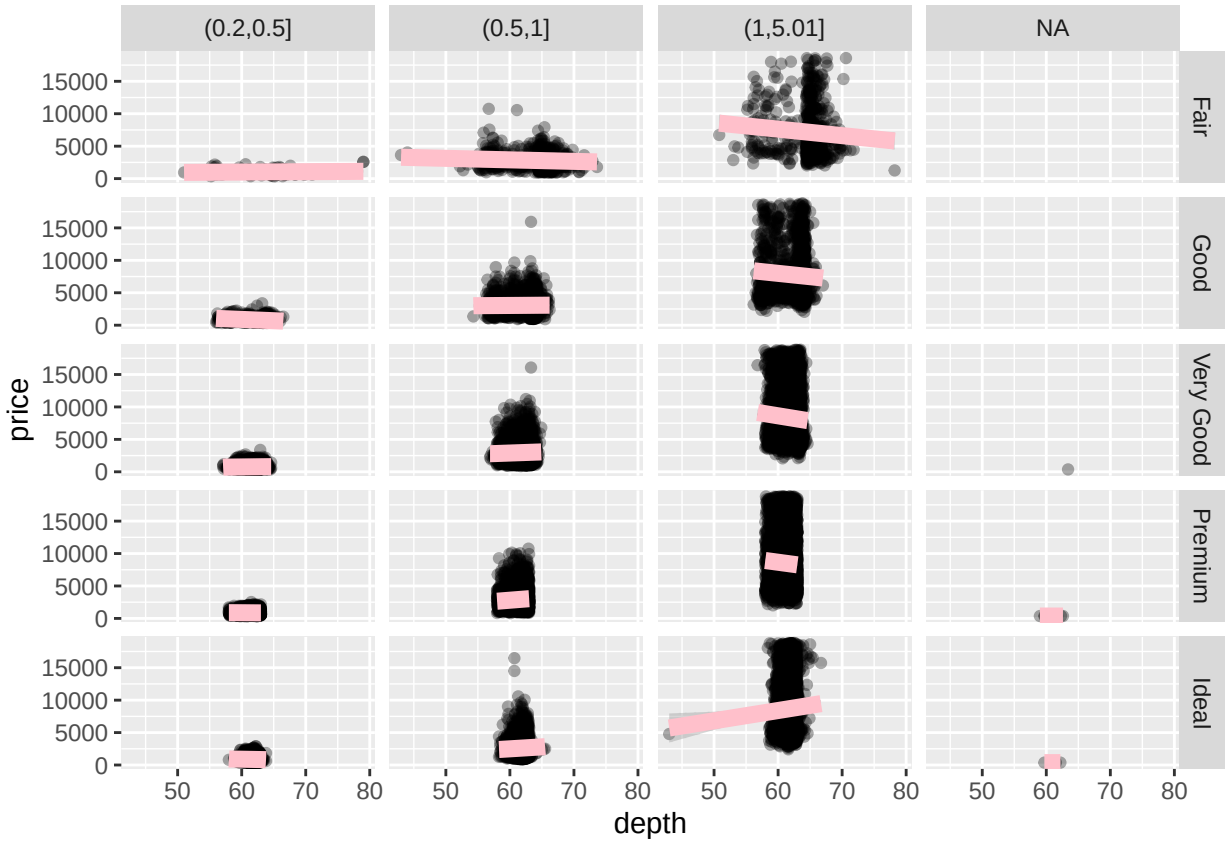



```
cutpoints <- quantile(diamonds$carat, seq(0,1,length = 4), na.rm = TRUE)
diamonds$car2 <- cut(diamonds$carat, cutpoints)
g <- ggplot(diamonds, aes(depth, price))
g + geom_point(alpha = 1/3) + facet_grid(cut~car2)
```



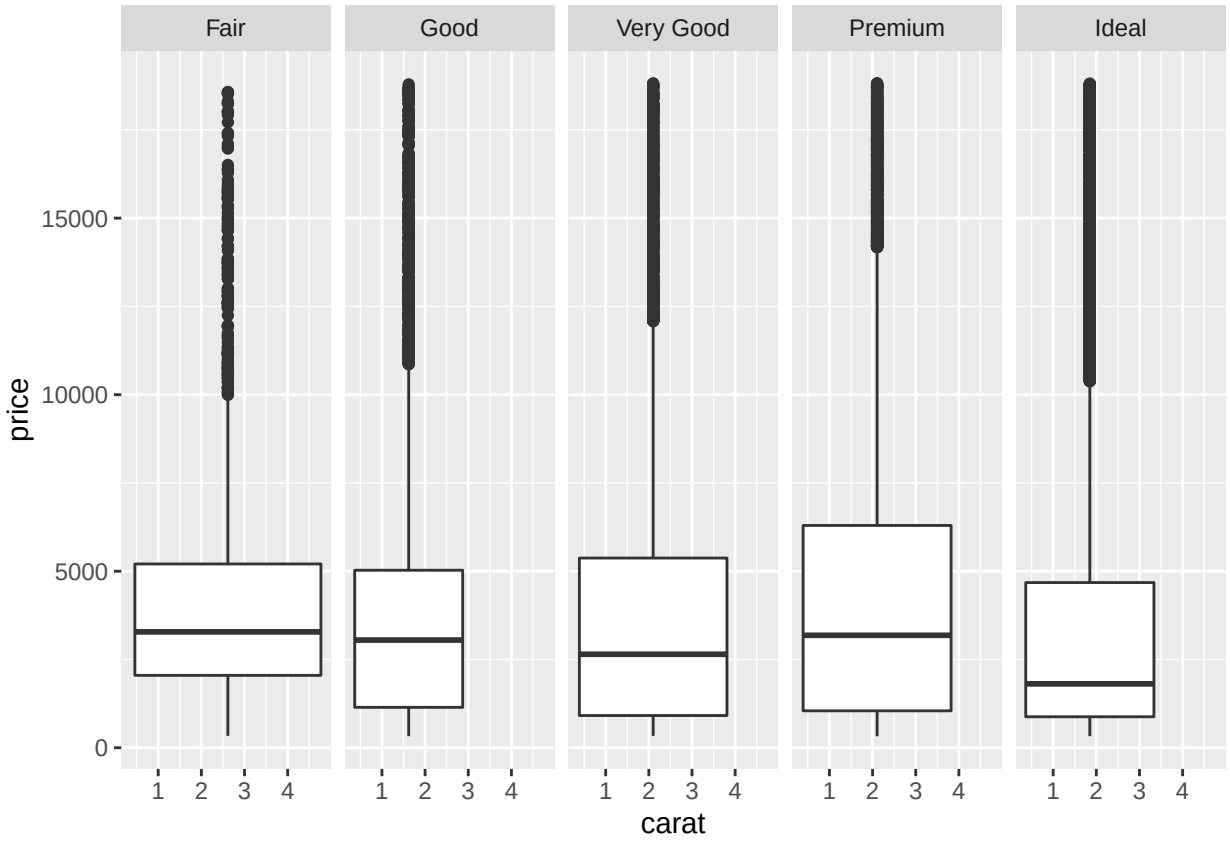

```
g + geom_point(alpha = 1/3) + facet_grid(cut~car2) + geom_smooth(method = "lm", size = 3, color = "pink
```

```
## `geom_smooth()` using formula 'y ~ x'
```




```
ggplot(diamonds, aes(carat, price)) + geom_boxplot() + facet_grid(. ~ cut)
```

```
## Warning: Continuous x aesthetic -- did you forget aes(group=...)?
```



COLORS

```
library(grDevices)
sample(colors(), 20)
```

```
##  [1] "grey43"          "chocolate3"      "cadetblue4"      "darkslateblue"
##  [5] "gray11"          "navy"            "steelblue2"      "darkolivegreen4"
##  [9] "grey3"           "green2"          "thistle"         "thistle1"
## [13] "royalblue3"      "khaki2"          "grey62"          "violetred3"
## [17] "gray39"          "lavenderblush3"  "red4"            "grey13"
```

```
pal <- colorRamp(c("red", "blue"))
pal(0) #red
```

```
##      [,1] [,2] [,3]
## [1,]  255    0    0
```

```
pal(1) #blue
```

```
##      [,1] [,2] [,3]
## [1,]    0    0  255
```

```
pal(0.5) #50% each
```

```
##       [,1] [,2]  [,3]
## [1,] 127.5    0 127.5
```

```
pal(seq(0,1, len=6))
```

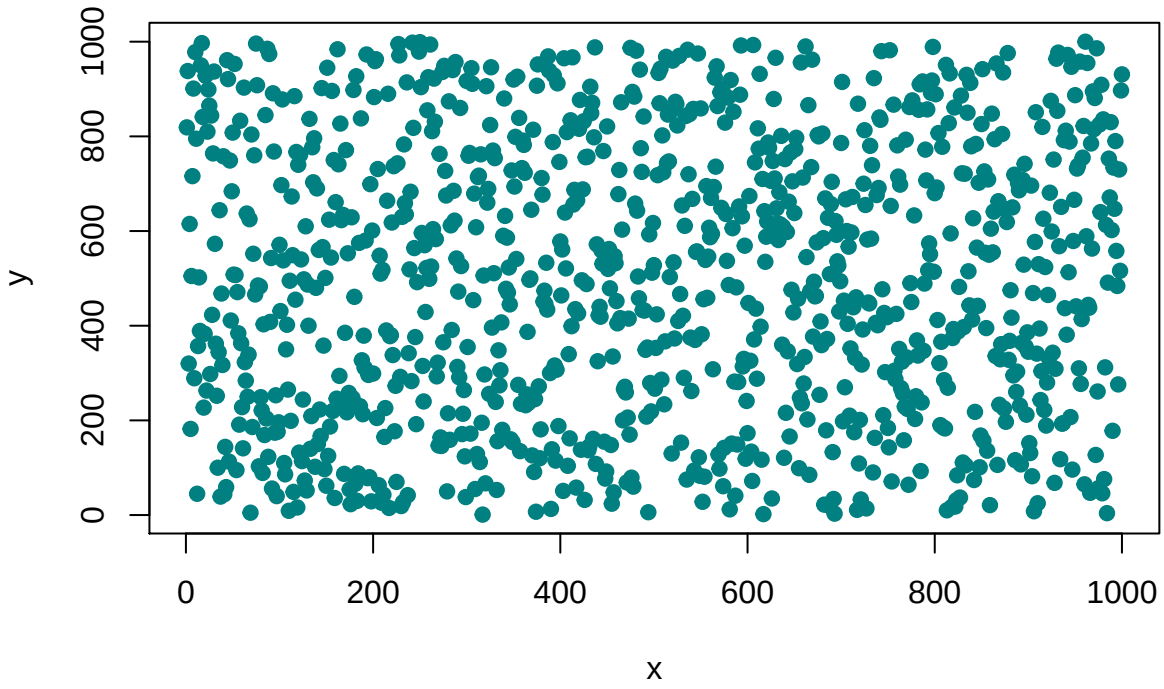
```
##      [,1] [,2] [,3]
```

```
## [1,]  255    0    0
## [2,]  204    0   51
## [3,]  153    0  102
## [4,]  102    0  153
## [5,]   51    0  204
## [6,]    0    0  255
```

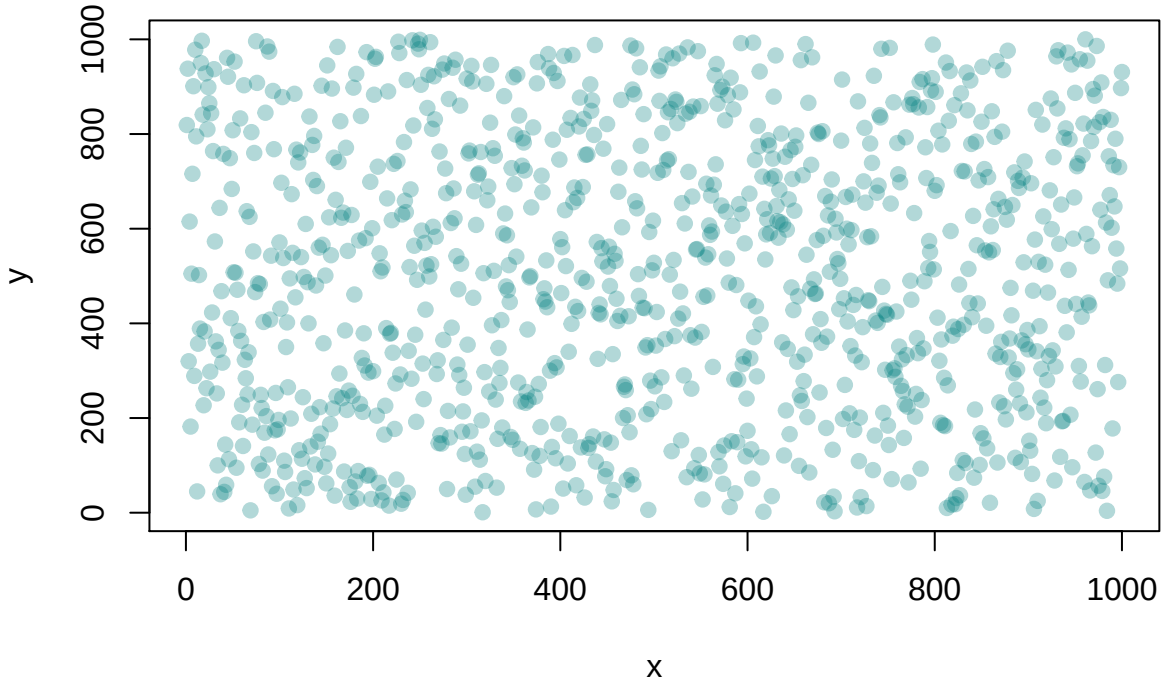
```
p1 <- colorRampPalette(c("red", "blue"))
p1(2)
```

```
## [1] "#FF0000" "#0000FF"
```

```
x <- sample(1000)
y <- sample(1000)
plot(x,y, pch=19, col = rgb(0, .5, .5))
```




```
plot(x,y, pch=19, col = rgb(0, .5, .5, .3))
```




```
library(RColorBrewer)
cols <- brewer.pal(3, "BuGn")
```