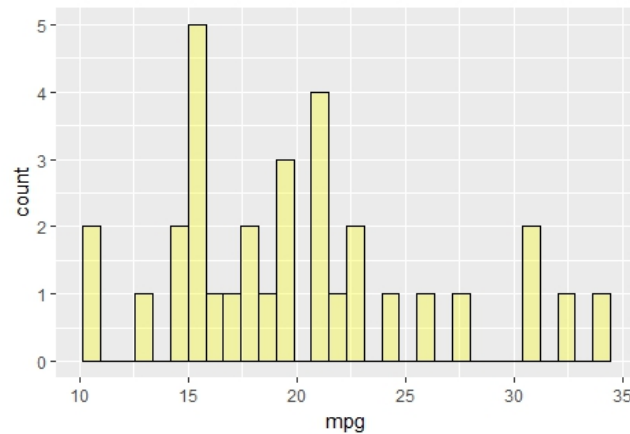


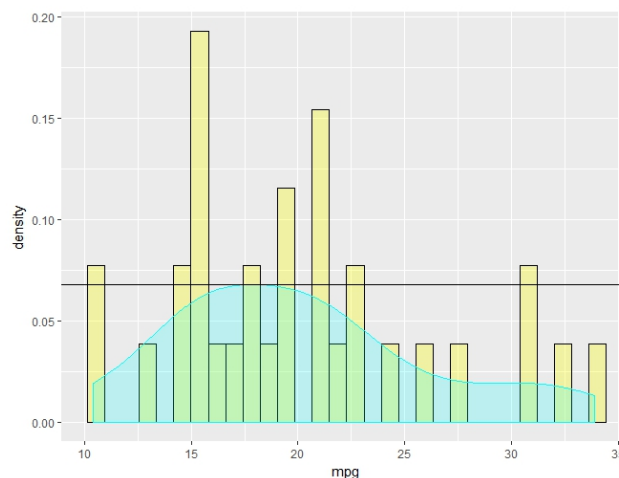
In this assignment, you will practice basic ggplot functionality using the `mtcars` database that we have been using in class plus a new database called `SnowGR` from the `mosaicData` package

Perform the following tasks:

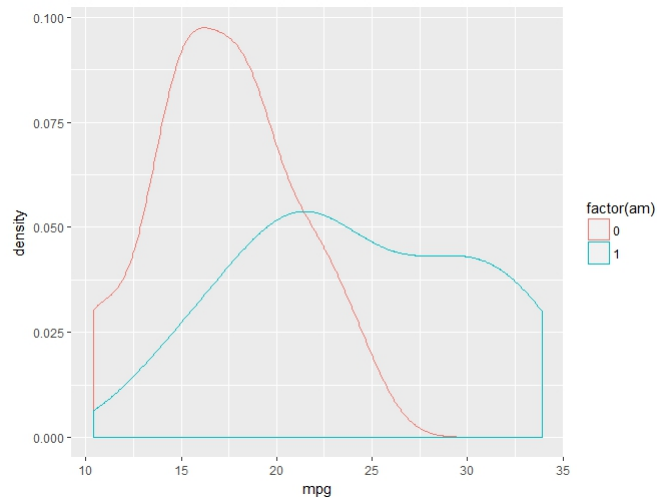
1. Using ggplot, create a histogram of the `mpg` variable. As shown in the following figure, set the outline color to be black, the fill to be yellow and the alpha (shading value) to be 0.3. Once you have this done, explore different options, e.g. size and linetype.



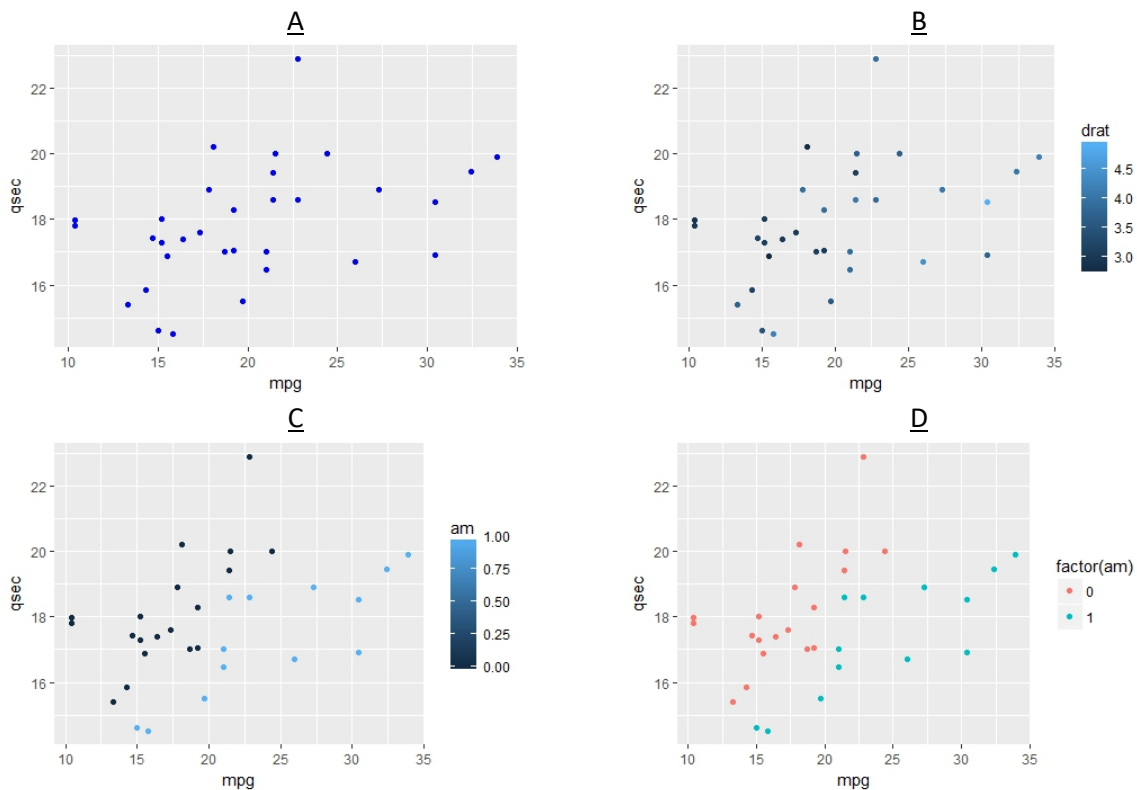
2. Update your figure from #2 to show density rather than raw counts on the y-axis. Add a density distribution to this histogram by adding a `geom_density` layer. Make this density have a cyan color and cyan fill with alpha = 0.2. Can you also add a horizontal line with an intercept equal to the mode of the density. (Don't calculate the location of the mode, just estimate the value).



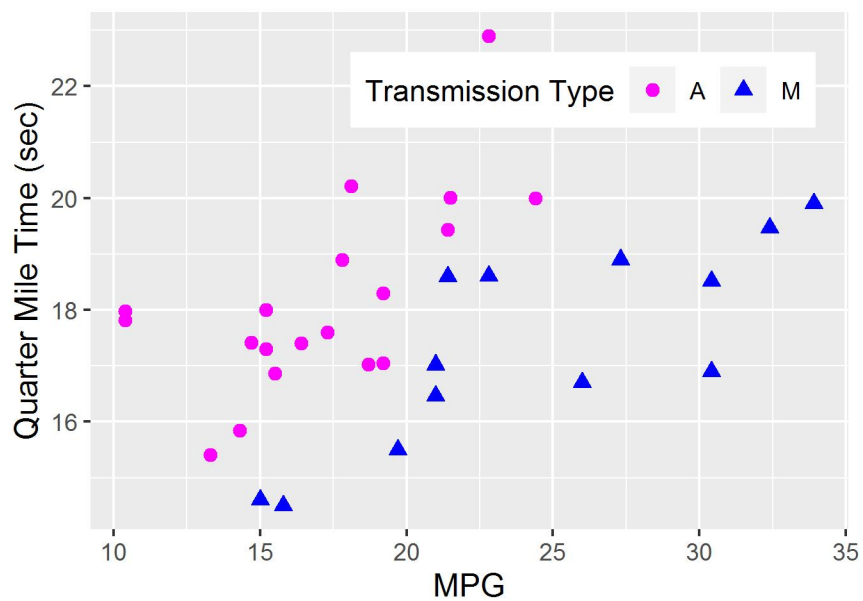
3. Create a density plot where a different color is used for automatic versus manual transmissions (`am`), as shown below. What happens when you map the fill aesthetic by `am` as well. What effect does setting (not mapping) alpha have on this process. (*Note: For this problem, it is important to convert the `am` variable to a factor, which can be done either inside or outside of the ggplot call).*



4. Plot a scatter plot of `mpg` versus `qsec`. Set the aesthetic to make the points green and then make them blue. This is shown in Figure A below. Now map the `drat` variable to be the color aesthetic (Figure B). Note that there is a color gradient based on `drat`, which makes sense for a continuous variable. Now map to the binary `am` variable (Figure C). Note that since `am` is an integer it tries the same continuous mapping as was done for `drat`. Figure D shows the correct way of stratifying by `am` by converting it to a factor variable. Replicate Figure D and then explore mapping to a different aesthetic, e.g. shape.

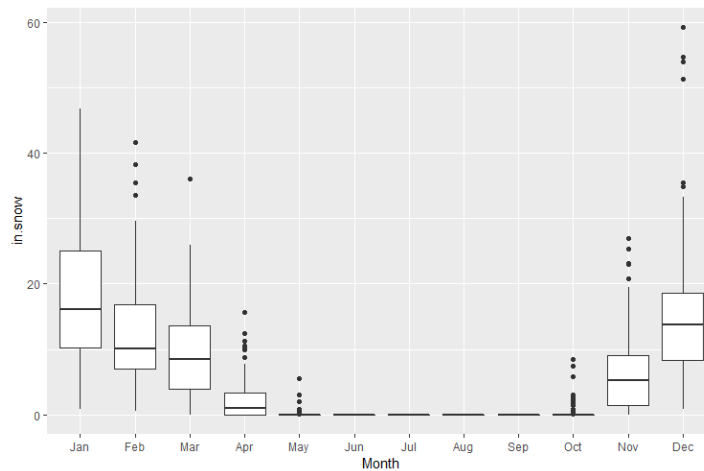


5. Revisit your figure from Figure 4D. We'll practice making it journal ready by performing the following steps:
- Make the markers be filled magenta circles for automatic transmission ( $am=0$ ) and filled blue triangles for manuals. This will require you to map the color, shape and fill aesthetics to  $am$  and use `scale_XXXXX_manual` for  $XXXXX$  = color, shape, and fill.
  - Set the point size to be 2.
  - Move the legend inside the plot area, in the upper right corner and use the `legend.direction` option to make give the legend a horizontal orientation.
  - Give the legend the title "Transmission Type" with levels "A" and "M".
  - Label the x-axis "MPG" and the y axis "Quarter Mile Time (sec)" and set the axis titles to have text size =12.
  - Save your figure use `ggsave()`.



## mosaicData::SnowGR

6. The `SnowGR` data is in wide format. It shows the number of inches of monthly snow totals measured in Grand Rapids, MI for every year from 1893-2012. Use the `melt()` command to place this data in long format required to use `ggplot`. Once you do this, it's important to update the levels of the month variable so that the months are in the right order.
7. Using `ggplot`, create a boxplot of snow in each month. It should look as follows.



8. Lastly, we want to create plot the yearly trajectory of snow fall, stratified by month. To do this use, `geom_line`, `geom_point`, `geom_smooth`, and `facet_wrap`. The outcome should look as follows:

