Data Wrangling

2024-08-02

```r
library (tidyverse)
```

```
## -- Attaching core tidyverse packages ------------------------ tidyverse 2.0.0 --
## v dplyr     1.1.4     v readr     2.1.5
## v forcats   1.0.0     v stringr   1.5.1
## v ggplot2   3.5.1     v tibble    3.2.1
## v lubridate 1.9.3     v tidyr     1.3.1
## v purrr     1.0.2
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become error
```

```r
library(ggplot2)
```

```r
# Set a random seed for reproducibility
set.seed(42)

# Number of samples
n <- 10000

# Generate data frame for required variables
randomdata <- data.frame(
  'Age' = trunc(runif(n, min = 18, max = 36)),  # Age uniformly distributed between 18 and 35
  'InfantSex' = factor(rbinom(n, size = 1, prob = 0.5), labels = c("Male", "Female"))  # Infant sex wit
)

# Generate Glucose1 and Glucose2 based on InfantSex
randomdata$Glucose1 <- ifelse(randomdata$InfantSex == "Male",
                        rnorm(n, mean = 85, sd = 6), #normalized distribution
                        rnorm(n, mean = 80, sd = 6))

randomdata$Glucose2 <- ifelse(randomdata$InfantSex == "Male",
                        rnorm(n, mean = 165, sd = 9),
                        rnorm(n, mean = 155, sd = 9))

# Define Diagnosis based on Glucose1 and Glucose2
randomdata$Diagnosis <- ifelse(randomdata$Glucose1 > 95 | randomdata$Glucose2 > 180, #define diagnosis
                          "Gestational Diabetes", "Healthy")
```

```r
# Subset the data for male infants
# Subset using https://www.statmethods.net/management/subset.html
male_data <- subset(randomdata, InfantSex == "Male")
```

```
# Subset the data for female infants
female_data <- subset(randomdata, InfantSex == "Female")

# Print summary for male infants
print("Summary for Male Infants")
```

```
## [1] "Summary for Male Infants"
```

```
summary(male_data)
```

```
##       Age          InfantSex       Glucose1         Glucose2
##  Min.   :18.00   Male  :5000   Min.   : 64.28   Min.   :132.4
##  1st Qu.:22.00   Female:   0   1st Qu.: 80.91   1st Qu.:158.7
##  Median :27.00                 Median : 85.02   Median :165.0
##  Mean   :26.47                 Mean   : 85.01   Mean   :164.9
##  3rd Qu.:31.00                 3rd Qu.: 89.08   3rd Qu.:171.1
##  Max.   :35.00                 Max.   :106.22   Max.   :199.9
##   Diagnosis
##  Length:5000
##  Class :character
##  Mode  :character
##
##
##
```

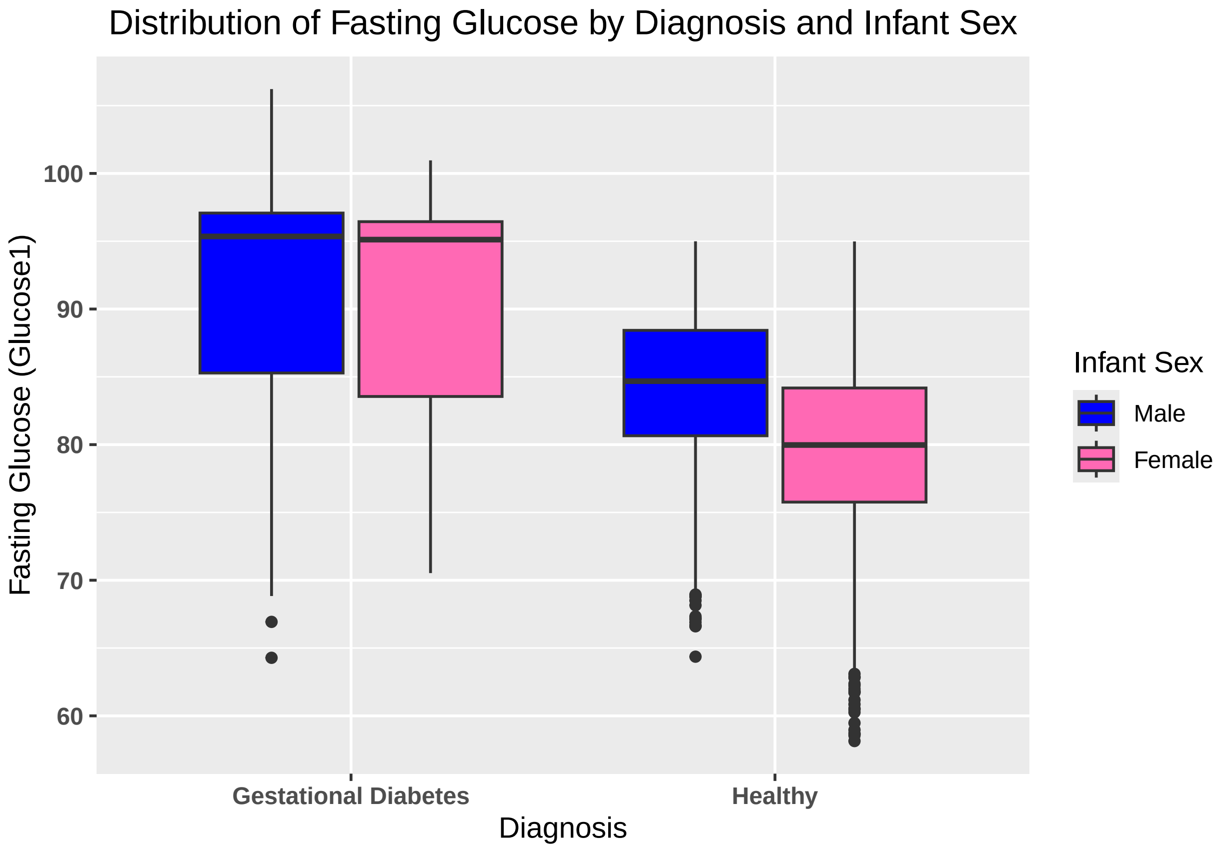
```
# Print summary for female infants
print("Summary for Female Infants")
```

```
## [1] "Summary for Female Infants"
```

```
summary(female_data)
```

```
##       Age         InfantSex       Glucose1         Glucose2
##  Min.   :18.0   Male  :   0   Min.   : 58.14   Min.   :123.2
##  1st Qu.:22.0   Female:5000   1st Qu.: 75.78   1st Qu.:148.9
##  Median :26.0                 Median : 80.01   Median :154.9
##  Mean   :26.5                 Mean   : 79.95   Mean   :154.9
##  3rd Qu.:31.0                 3rd Qu.: 84.24   3rd Qu.:160.9
##  Max.   :35.0                 Max.   :100.96   Max.   :187.6
##   Diagnosis
##  Length:5000
##  Class :character
##  Mode  :character
##
##
##
```

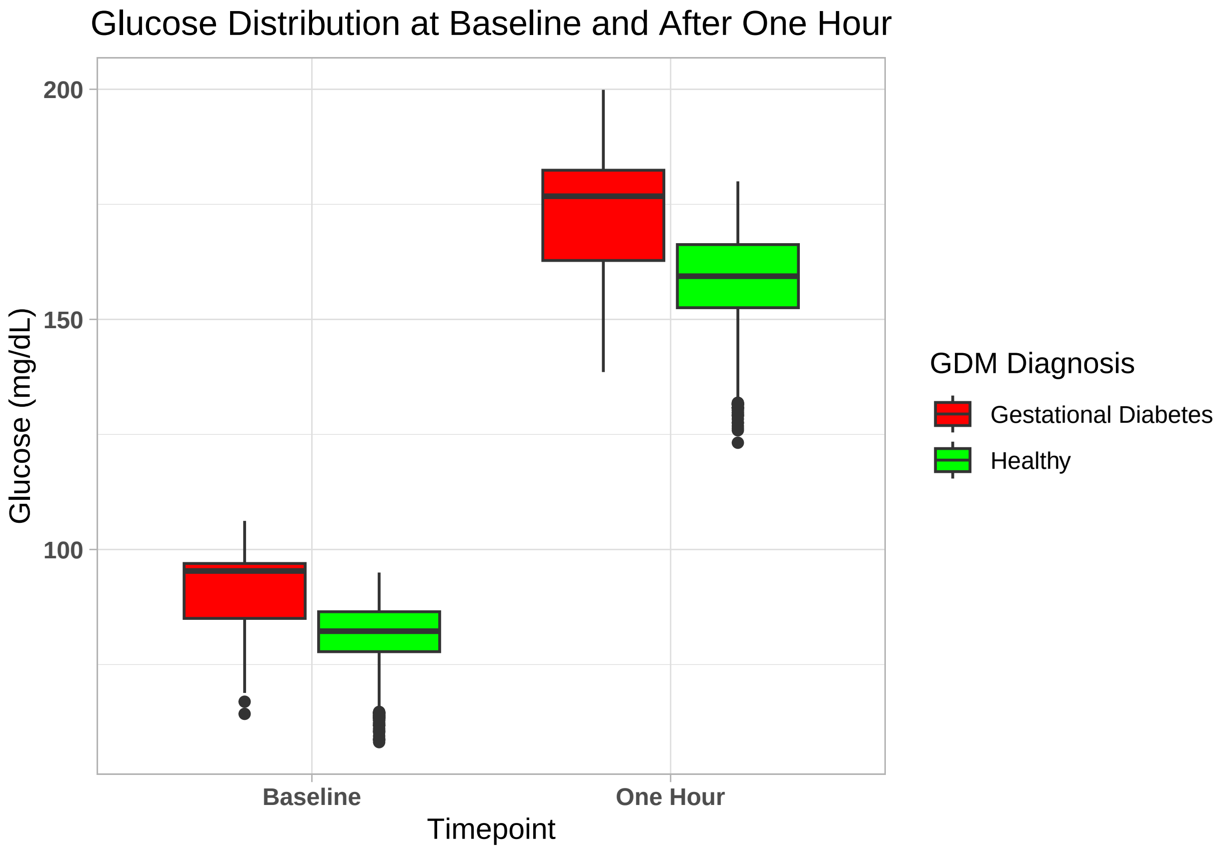
```
color_palette <- c("Male" = "blue", "Female" = "hotpink")

ggplot(randomdata, aes(x = Diagnosis, y = Glucose1, fill = InfantSex)) +
  geom_boxplot() +
  scale_fill_manual(values = color_palette) + # Apply the custom color palette
  labs(title = "Distribution of Fasting Glucose by Diagnosis and Infant Sex",
       x = "Diagnosis",
       y = "Fasting Glucose (Glucose1)",
       fill = "Infant Sex") +
  theme_gray() +
  theme(
    plot.title = element_text(hjust = 0.5),
    axis.text = element_text(face = "bold"))
```



```
randomdata$Subject <- 1:n #adding in Subject to call

longData <- randomdata %>%
  pivot_longer( #https://tidyr.tidyverse.org/reference/pivot_longer.html - additional explanation
    cols = c(Glucose1, Glucose2),
    names_to = "Timepoint",
    values_to = "Glucose") %>%
  mutate(Timepoint = ifelse(Timepoint == "Glucose1", "Baseline", "One Hour"))

print(longData[longData$Subject == 1, ]) #will have 2 outputs, one for Baseline (baseline) and one for
```

```
## # A tibble: 2 x 6
##     Age InfantSex Diagnosis Subject Timepoint Glucose
##   <dbl> <fct>     <chr>       <int> <chr>       <dbl>
## 1     34 Female     Healthy          1 Baseline     76.4
## 2     34 Female     Healthy          1 One Hour    157.
```

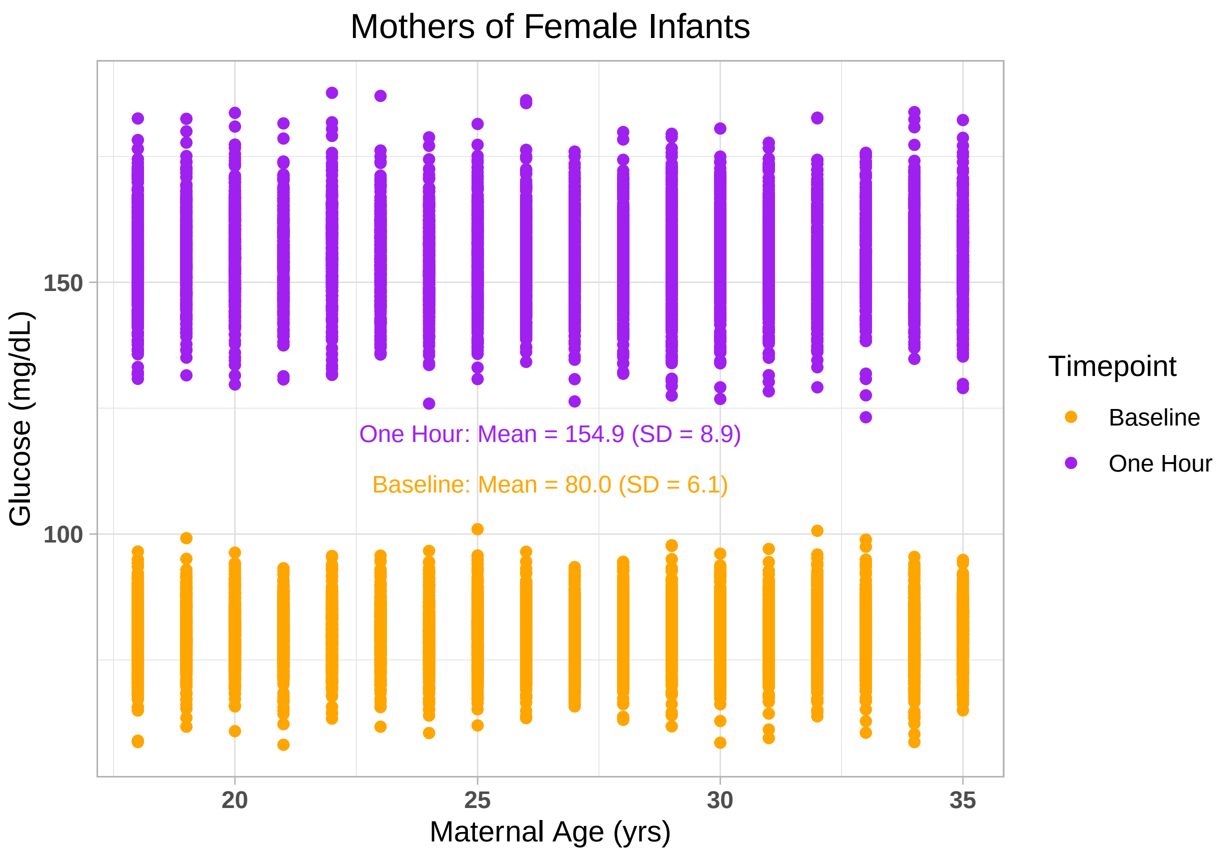
```
color_scale <- c("Healthy" = "green", "Gestational Diabetes" = "red") #another color pallette

ggplot(longData, aes(x = Timepoint, y = Glucose, fill = Diagnosis)) +
  geom_boxplot() +
  scale_fill_manual(values = color_scale) + # Apply the custom color palette
  labs(
    x = "Timepoint",
    y = "Glucose (mg/dL)",
    fill = "GDM Diagnosis",
    title = "Glucose Distribution at Baseline and After One Hour") +
  theme_light() +
  theme(
    plot.title = element_text(hjust = 0.5),
    axis.text = element_text(face = "bold"))
```



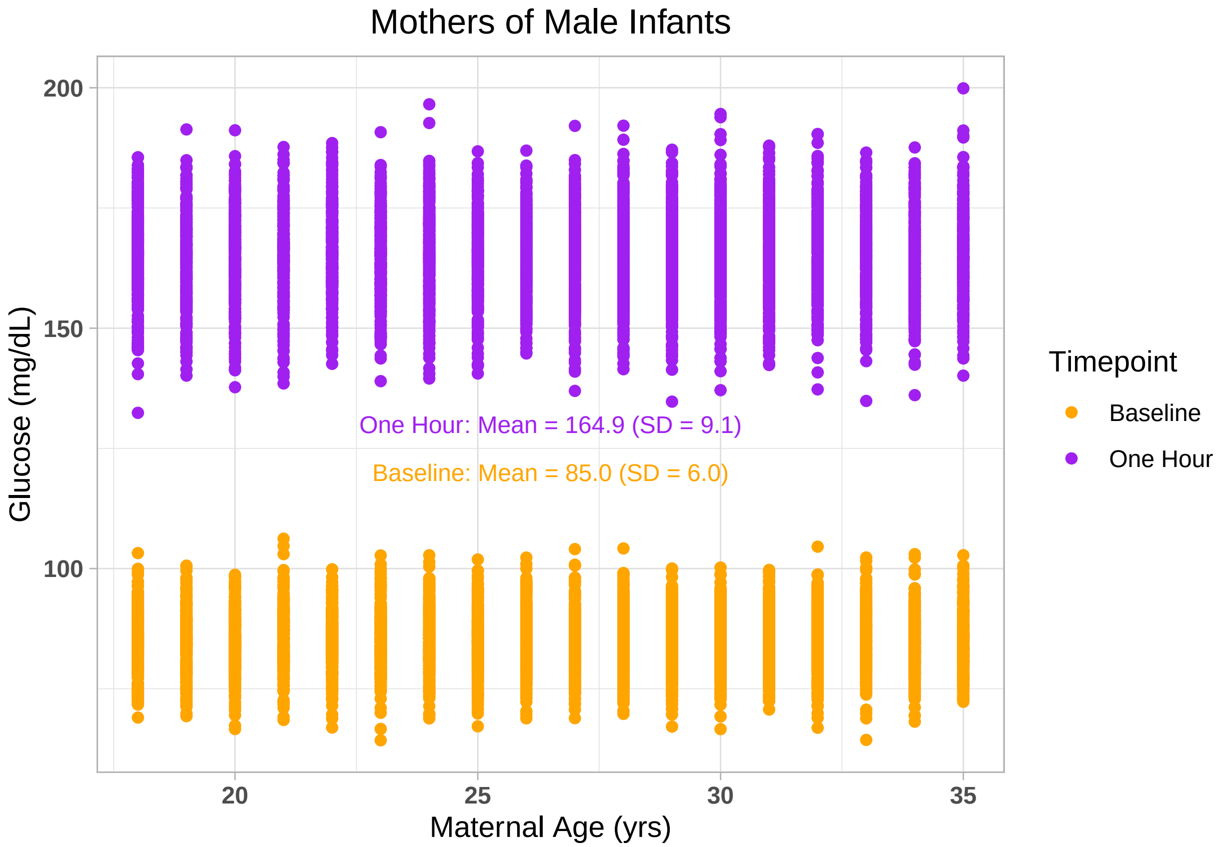
```
library(ggpubr)
```

```
# Define color palette
color_plot <- c("Baseline" = "orange", "One Hour" = "purple")

# Function to calculate mean and standard deviation for each group
# used https://www.carlislerainey.com/teaching/pols-209/files/notes-10-average-sd-r.pdf
```

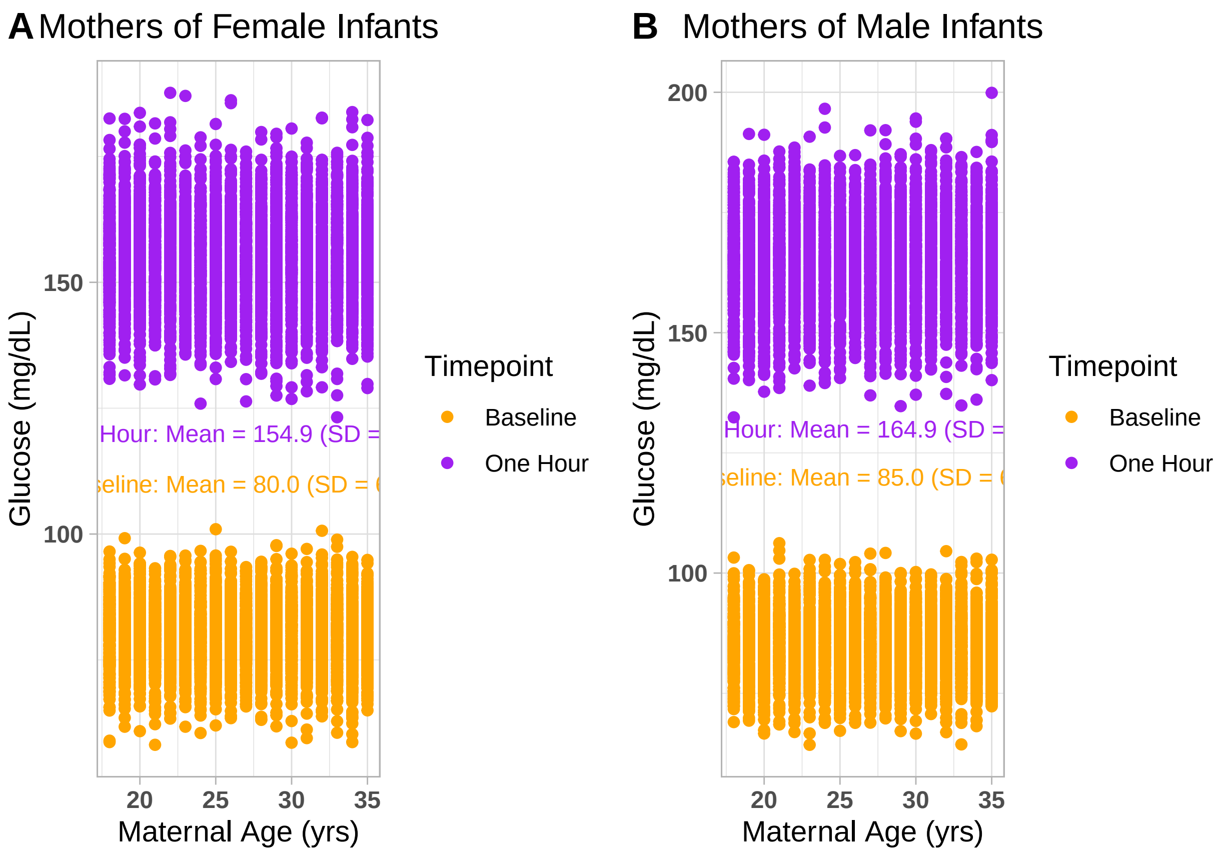
```r
calc_stats <- function(data) {
  data %>%
    group_by(Timepoint) %>% #find groups of interest
    summarise(
      Mean = mean(Glucose),
      SD = sd(Glucose)
    )
}

# Calculate statistics for female and male infants
female_stats <- calc_stats(subset(longData, InfantSex == "Female")) #store statistics for female
male_stats <- calc_stats(subset(longData, InfantSex == "Male")) #store statistics for male


# Add text annotation for female_plot
female_plot <- ggplot(subset(longData, InfantSex == "Female"), aes(x = Age, y = Glucose, color = Timepo
  geom_point() +
  scale_color_manual(values = color_plot) +
  labs(
    title = "Mothers of Female Infants",
    x = "Maternal Age (yrs)",
    y = "Glucose (mg/dL)",
    color = "Timepoint"
  ) +
  theme_light() +
  theme(
    plot.title = element_text(hjust = 0.5),
    axis.text = element_text(face = "bold")
  ) +
#How to label plots:
  #https://ggplot2.tidyverse.org/reference/geom_text.html
  #https://www.rdocumentation.org/packages/ggplot2/versions/0.9.1/topics/geom_text
  #https://r-graph-gallery.com/275-add-text-labels-with-ggplot2.html
  geom_text(data = female_stats %>% filter(Timepoint == "Baseline"),
            aes(x = position_Baseline_female[1], y = position_Baseline_female[2], #defining so the move
                label = sprintf("Baseline: Mean = %.1f (SD = %.1f)", Mean, SD)), #label is what text yo
            color = color_plot["Baseline"],
            size = 3) + #have to make text smaller to be seen on combined graph
  geom_text(data = female_stats %>% filter(Timepoint == "One Hour"),
            aes(x = position_onehour_female[1], y = position_onehour_female[2],
                label = sprintf("One Hour: Mean = %.1f (SD = %.1f)", Mean, SD)),
            color = color_plot["One Hour"],
            size = 3)

# How you move the annotation around the graph, adjusted to the VALUES on the table, not pixels
position_Baseline_female <- c(x = 26.5, y = 110)
position_onehour_female <- c(x = 26.5, y = 120)

# Add text annotation for male_plot, similar plot and notes to above just altered for male infant sex
male_plot <- ggplot(subset(longData, InfantSex == "Male"), aes(x = Age, y = Glucose, color = Timepoint)
  geom_point() +
  scale_color_manual(values = color_plot) +
  labs(
    title = "Mothers of Male Infants",
    x = "Maternal Age (yrs)",
    y = "Glucose (mg/dL)",
    color = "Timepoint"
  ) +
  theme_light() +
  theme(
    plot.title = element_text(hjust = 0.5),
    axis.text = element_text(face = "bold")
  ) +
  geom_text(data = male_stats %>% filter(Timepoint == "Baseline"),
            aes(x = position_Baseline_male[1], y = position_Baseline_male[2],
                label = sprintf("Baseline: Mean = %.1f (SD = %.1f)", Mean, SD)),
            color = color_plot["Baseline"],
            size = 3) +
  geom_text(data = male_stats %>% filter(Timepoint == "One Hour"),
            aes(x = position_onehour_male[1], y = position_onehour_male[2],
                label = sprintf("One Hour: Mean = %.1f (SD = %.1f)", Mean, SD)),
            color = color_plot["One Hour"],
            size = 3)

# How you move the annotation around the graph, adjusted to the VALUES on the table, not pixels
position_Baseline_male <- c(x = 26.5, y = 120)
position_onehour_male <- c(x = 26.5, y = 130)

# Print plots
print(female_plot)
```



```
print(male_plot)
```



```
# Arrange the plots using https://www.rdocumentation.org/packages/ggpubr/versions/0.6.0/topics/ggarrang
ggarrange(female_plot, male_plot,
          labels = c("A", "B"),
          ncol = 2, nrow = 1) #two plots right next to each other, makes 2 columns and 1 row
```



```r
table_wide <- randomdata %>%
  group_by(InfantSex, Diagnosis) %>% #Healthy Female/Gestational Diabetes Female
  summarise( #calculations
    Mean_Age = mean(Age),
    Mean_Fasting_Glucose = mean(Glucose1),
    SD_Fasting_Glucose = sd(Glucose1),
    Mean_One_Hour_Glucose = mean(Glucose2),
    SD_One_Hour_Glucose = sd(Glucose2),
  ) %>%
  # Combine Diagnosis and Infant sex
  mutate(Group = paste(Diagnosis, InfantSex)) %>%
  # Ensure the rows are in the required order

#https://www.rdocumentation.org/packages/dplyr/versions/1.0.10/topics/arrange
  arrange(factor(Group, levels = c(
    "Healthy Female",
    "Gestational Diabetes Female",
    "Healthy Male",
    "Gestational Diabetes Male"
  ))) %>%
  # Select and rename columns for clarity
  select(
    Group,
    Mean_Age,
    Mean_Fasting_Glucose,
    SD_Fasting_Glucose,
    Mean_One_Hour_Glucose,
    SD_One_Hour_Glucose
  )
```

```
## ‘summarise()‘ has grouped output by ’InfantSex’. You can override using the
## ‘.groups‘ argument.
## Adding missing grouping variables: ‘InfantSex‘
```

```
# Print the summary table
print(table_wide)
```

```
## # A tibble: 4 x 7
## # Groups:   InfantSex [2]
##   InfantSex Group               Mean_Age Mean_Fasting_Glucose SD_Fasting_Glucose
##   <fct>     <chr>                  <dbl>                <dbl>              <dbl>
## 1 Female    Healthy Female          26.5                 79.9               6.03
## 2 Female    Gestational Diabet~     26.4                 89.8               8.72
## 3 Male      Healthy Male            26.5                 84.4               5.43
## 4 Male      Gestational Diabet~     26.5                 91.5               7.81
## # i 2 more variables: Mean_One_Hour_Glucose <dbl>, SD_One_Hour_Glucose <dbl>
```