Assignment_10

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(1) Summarize the data by whether children participated in the meal preparation or not. Use an appropriately labelled table to show the results. Also include a graphical presentation that shows the distribution of calories for participants vs. non-participants. Describe the shape of each distribution and comment on the similarity (or lack thereof) between the distributions in each population.

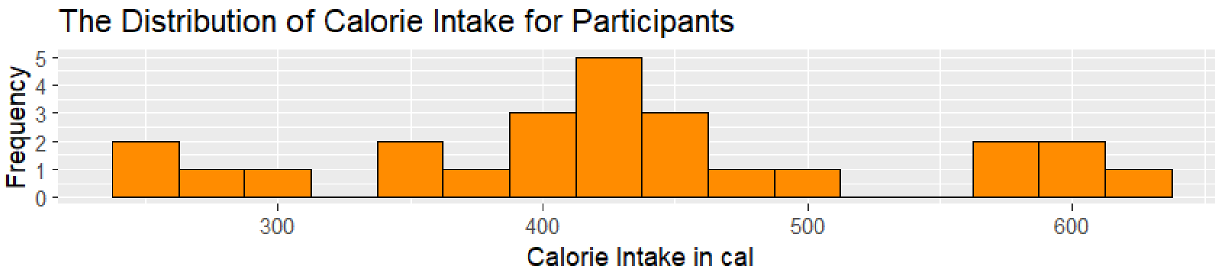
>>> The code:

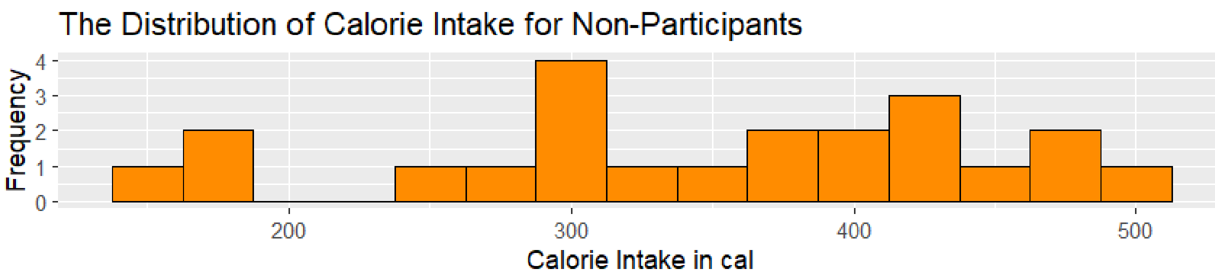
```
participant <- data %>%
  filter(Participant == "1")
non_participant <- data %>%
  filter(Participant == "0")

aggregate(CalorieIntake ~ Participant, data, summary)

p1 <- ggplot(participant, aes(x = CalorieIntake)) +
  geom_histogram(binwidth = 25, fill = "darkorange", color = "black") +
  labs(
    title = "The Distribution of Calorie Intake for Participants",
    x = "Calorie Intake in cal",
    y = "Frequency"
  )

p2 <- ggplot(non_participant, aes(x = CalorieIntake)) +
  geom_histogram(binwidth = 25, fill = "darkorange", color = "black") +
  labs(
    title = "The Distribution of Calorie Intake for Non-Participants",
    x = "Calorie Intake in cal",
    y = "Frequency"
  )

grid.arrange(p1, p2, ncol = 1)
```

>>> The output:

```
 Participant CalorieIntake.Min. CalorieIntake.1st Qu. CalorieIntake.Median
CalorieIntake.Mean
1           0           139.6900              290.3975              361.0200
346.7991
2           1           249.8600              368.5100              428.7400
431.3996
  CalorieIntake.3rd Qu. CalorieIntake.Max.
1              422.5675           503.4600
2              477.9600           635.2100
```

>>> The graph:





According to the histogram presented above, we can see that the distribution of calorie intake for participants is higher in average than non-participants, the maximum is higher than non-participant and the minimum is lower than non-participants. In addition, the mean and the median of participants are higher than non-participants.

(2) Does the mean calorie consumption for those who participated in the meal preparation differ from 425? Formally test at the level using the 5 steps outlined in the module.

>>> The code:

```
# Step 1: State the hypothesis:
# H0: mu = 425 (calorie intake for participants in the meal preparation is 425)
# H1: mu != 425 (calorie intake for participants in the meal preparation isn't 425)

# Step 2: Choose the significance level:
# alpha = 0.05

# Step 3: Compute the test statistic:
# Perform one-sample t-test:
t.test(data$CalorieIntake[data$Participant == 1], mu = 425)

# Step 4: Decision rule:
# Compare the p_value with the alpha
```

Step 5: Conclusion:
Failed to reject the null hypothesis!
print(
 "There is insufficient evidence to conclude that the mean calorie intake differs from 425."
)

>>> The output:

```
> t.test(data$CalorieIntake[data$Participant == 1], mu = 425)

      One Sample t-test

data:  data$CalorieIntake[data$Participant == 1]
t = 0.30272, df = 24, p-value = 0.7647
alternative hypothesis: true mean is not equal to 425
95 percent confidence interval:
 387.7683 475.0309
sample estimates:
mean of x
 431.3996

[1] "There is insufficient evidence to conclude that the mean calorie intake differs from 425."
```

>>> The conclusion:

There is insufficient evidence to conclude that the mean calorie consumption for those who participated in the meal preparation differ from 425.

(3) Calculate a 90% confidence interval for the mean calorie intake for participants in the meal preparation. Interpret the confidence interval.

>>> The code:

```
sample_mean = mean(participant$CalorieIntake)
sample_sd = sd(participant$CalorieIntake)
sample_size = nrow(participant)
df <- sample_size - 1
t_critical <- qt(0.95, df)
margin_error <- t_critical * (sample_sd / sqrt(sample_size))

CI_lower <- sample_mean - margin_error
CI_upper <- sample_mean + margin_error
```

c(CI_lower, CI_upper)

cat(
  "We are 90% confident that the true mean calorie intake for participants in the",
  "meal preparation falls between",
  CI_lower, "and", CI_upper, "calories."
)

>>> The output:

```
> c(CI_lower, CI_upper)
[1] 395.2311 467.5681
```

>>> The interpretation from the output:

```
We are 90% confident that the true mean calorie intake for participants in the
meal preparation falls between 395.2311 and 467.5681 calories.
```

(4) Formally test whether or not participants consumed more calories than non-participants at the level using the 5 steps outlined in the module.

(5) Are the assumptions of the test used in (4) met? How do you know?

>>> The code:

Step 1: State the hypothesis:
H0: mu1 = mu2 (the mean of calorie intake for both categories are the same)
H0: mu1 > mu2 (the mean of participant is bigger than non-participant)

Step 2: Choose the significance level:
alpha = 0.05

# Step 3: Compute the test statistic:
t.test(participant, non_participant, alternative = "greater", var.equal = FALSE)

Step 4: Decision rule:
Compare the p_value with alpha

Conclusion:
Failed to reject the null hypothesis!
cat(
  "At the 0.05 significance level, we failed to reject the null hypothesis.",

```
  "The p-value was greater than 0.05, indicating that the observed difference",
  "in calorie intake between participants and non-participants is not",
  "statistically significant. Thus, we do not have sufficient evidence to",
  "conclude that participants consumed more calories than non-participants."
)
```

>>> The output:

```
At the 0.05 significance level, we failed to reject the null hypothesis. The
p-value was greater than 0.05, indicating that the observed difference in
calorie intake between participants and non-participants is not statistically
significant. Thus, we do not have sufficient evidence to conclude that
participants consumed more calories than non-participants.
```

>>> Conclusion:

The assumption in task 4 does not meet! The p_value is 0.99 and the alpha is 0.05, and it is obvious that 0.99 > 0.05. Therefore, we failed to reject the null hypothesis. Thus, we do not have sufficient evidence to conclude that participants consumed more calories than non-participants.