P8130_hw3_wl2829

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10/15/2021

Problem 1

Read the dataset and save the sample.

```
population = read.csv("./ce8130entire.csv")
library(dplyr)
```

```
##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##     filter, lag

## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
set.seed(1000)
A = population %>%
  group_by(sex) %>%
  sample_n(100)
```

Problem 2

Save a separate sample.

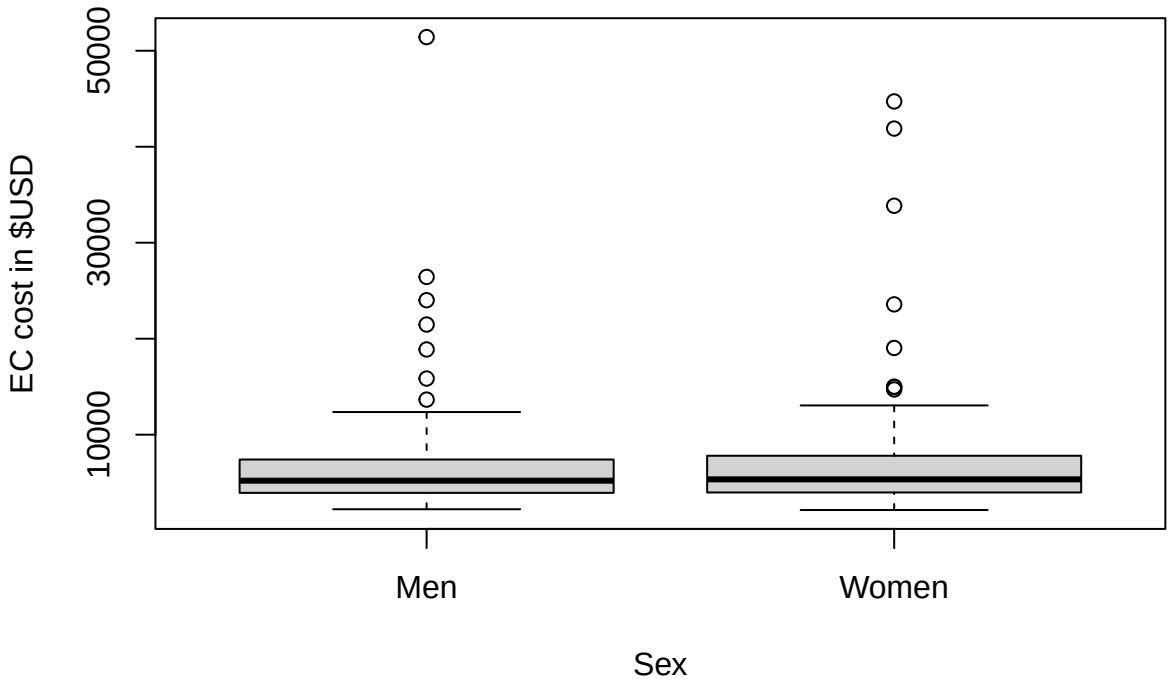
```
set.seed(1000)
B = population %>%
  group_by(sex) %>%
  sample_n(30)
```

Problem 3

Display the distribution of CE cost in $USD separately for men and women using side-by-side boxplots and histograms.

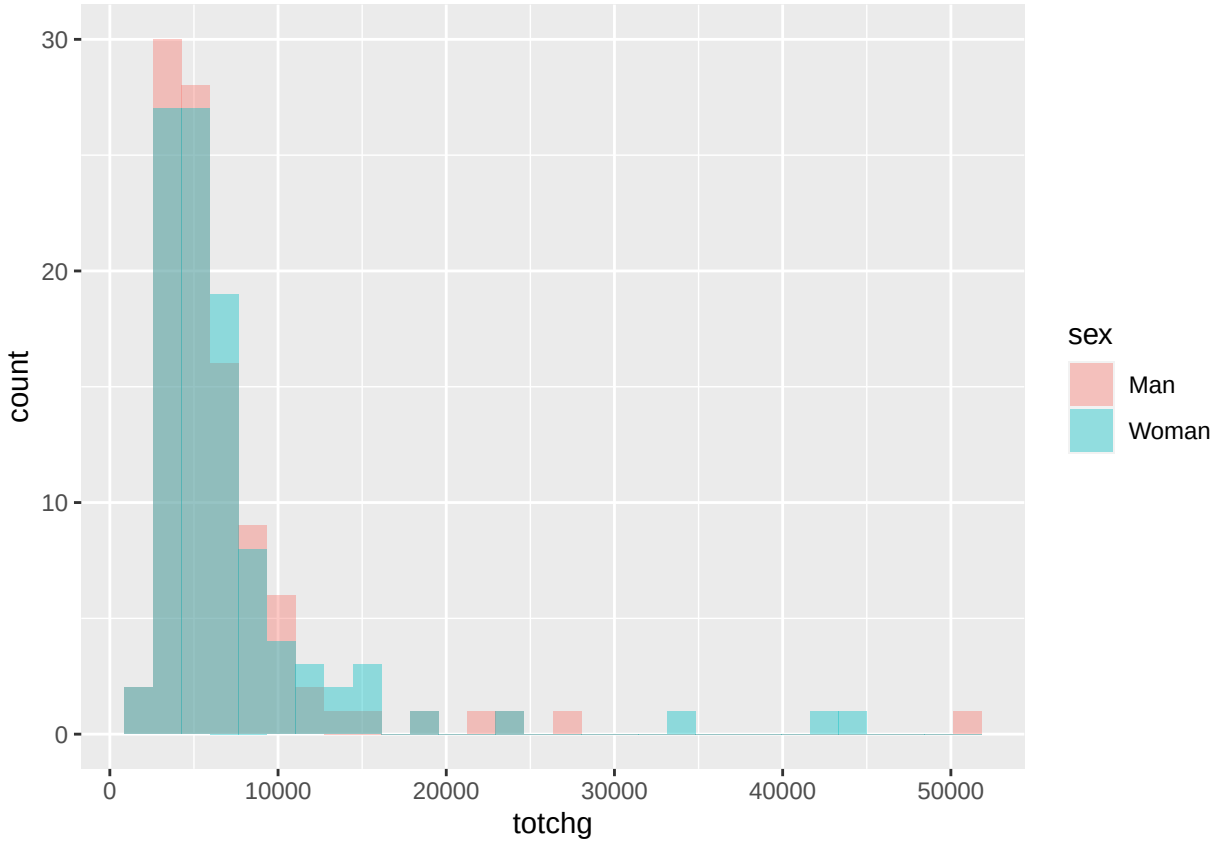
Side-by-side box plots

```
boxplot(A$totchg ~ A$sex, names=c("Men","Women"), ylab ="EC cost in $USD", xlab ="Sex")
```



Histograms

```
library(ggplot2)
A %>%
  mutate(sex = recode(sex, `1` = "Man", `2` = "Woman")) %>%
  ggplot(aes(x = totchg, fill = sex)) +
  geom_histogram(position = "identity", bins = 30, alpha = 0.4)
```



Problem 4

Calculate the mean CE cost and 95% confidence interval separately for men and women in sample "A" as well as sample "B".

```
A$sample = "Sample A"
B$sample = "Sample B"
A_B = rbind(A, B)

library(Rmisc)
```

```
## Loading required package: lattice
```

```
## Loading required package: plyr
```

```
## ------------------------------------------------------------------------------
```

```
## You have loaded plyr after dplyr - this is likely to cause problems.
## If you need functions from both plyr and dplyr, please load plyr first, then dplyr:
## library(plyr); library(dplyr)
```

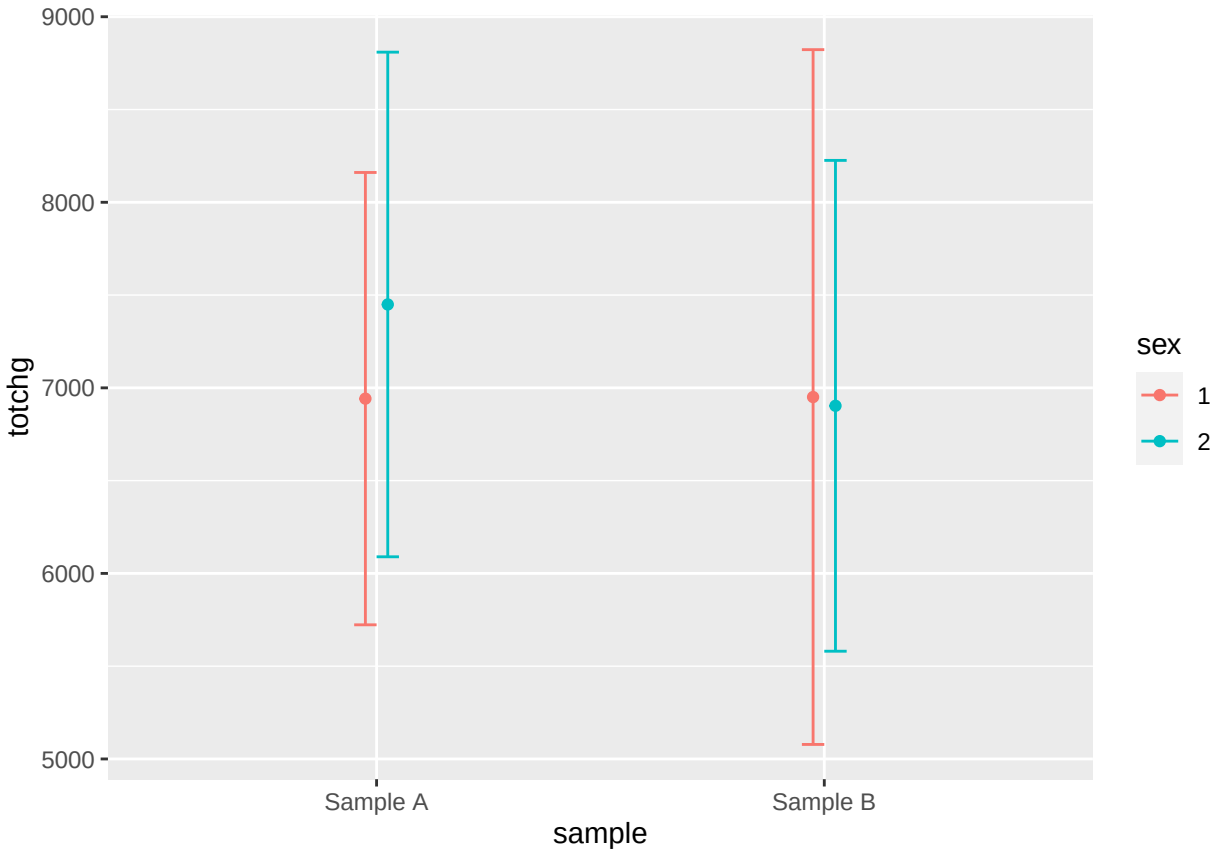
```
## ------------------------------------------------------------------------------
```

```
##
## Attaching package: 'plyr'

## The following objects are masked from 'package:dplyr':
##
##     arrange, count, desc, failwith, id, mutate, rename, summarise,
##     summarize
```

```
A_B_summary <- summarySE(A_B, measurevar="totchg", groupvars=c("sex","sample"))
A_B_summary$sex <- as.factor(A_B_summary$sex)
p_dodge = position_dodge(0.1) # move them .05 to the left and right
plot = ggplot(A_B_summary, aes(x=sample, y=totchg, colour=sex)) +
geom_errorbar(aes(ymin=totchg-ci, ymax=totchg+ci), width=.1, position=p_dodge) +
geom_point(position=p_dodge)

plot
```



The confidence interval of B is wider especially man, considering it has a smaller sample.

Problem 5

Conduct test of equality of variance of CE cost among men vs women in sample A

```
var.test(totchg ~ sex, data = A)
```

```
##
##  F test to compare two variances
##
## data:  totchg by sex
## F = 0.80342, num df = 99, denom df = 99, p-value = 0.2779
## alternative hypothesis: true ratio of variances is not equal to 1
## 95 percent confidence interval:
##  0.540577 1.194076
## sample estimates:
## ratio of variances
##          0.8034238
```

p-value = 0.2797 > 0.05 We cannot reject the null hypothesis at significance level 0.05. Thus, two samples have equal variance.

Problem 6

Using sample "A", calculate the difference between the mean CE costs for men and women.

```
A_men =
  A %>%
  filter(sex == 1)

A_women =
  A %>%
  filter(sex == 2)

t.test(A_men$totchg, A_women$totchg, alternative = "two.sided", var.equal = TRUE)
```

```
##
##  Two Sample t-test
##
## data:  A_men$totchg and A_women$totchg
## t = -0.55142, df = 198, p-value = 0.582
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -2322.415  1307.435
## sample estimates:
## mean of x mean of y
##   6941.84   7449.33
```

The difference between the means is 7449.33 - 6941.84 = 507.49 The 95% confidence interval is (-2322.547, 1307.567)

Problem 7

```
res <- t.test(totchg ~ sex, data = A, var.equal = TRUE)
res
```

```
##
##  Two Sample t-test
##
## data:  totchg by sex
## t = -0.55142, df = 198, p-value = 0.582
## alternative hypothesis: true difference in means between group 1 and group 2 is not equal to 0
## 95 percent confidence interval:
##  -2322.415  1307.435
## sample estimates:
## mean in group 1 mean in group 2
##         6941.84         7449.33
```

Problem 8

Problem 9

```
population_man =
  population %>%
  filter(sex == 1)

population_woman =
  population %>%
  filter(sex == 2)
man_mean = mean(population_man$totchg)
woman_mean = mean(population_woman$totchg)
mean_dif = man_mean - woman_mean
```

The mean for men is 6890.8719691 and for women is 7014.3766205. The difference is -123.5046513.

Problem 10

This question could be regarded as a binomial distribution. The number of the intervals which contain true mean difference is equal to the expectation of the binomial distribution. E = np = 140 x 0.95 = 133 About 133 students' intervals contain the true population mean difference.

```
p140 = dbinom(140, size=140, prob=0.95)
```

the probability that all 140 will contain the true population mean difference is 7.6085998×10^{-4}