Lying with Statistics Project

Contents

Statistician State University

In recognition of successful completion of the requisite
course of study and upon certified nomination of Faculty.

The Board of Regents has conferred upon

Sara Huston & Alexa Almond

in recognition of the satisfactory fulfillment of the prescribed requirements
for the degree of

Doctorate of Statistics

with the rights, honors, and privileges thereunto appertaining
Dated this first of January, two thousand and nine

Robert Miller
Chairman of the Board of Trustees

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1 Data manipulation

1.1 Cleans up the RMD output and files by ensuring they don't fall off the page

```r
options(tinytex.verbose = TRUE)
options(digits = 5)

#Load Libraries
Libraries <- c("knitr", "readr")
for (p in Libraries) {
  library(p, character.only = TRUE)
}

opts_chunk$set(fig.align='center',
               external=TRUE,
               echo=TRUE,
               warning=FALSE,
               fig.pos='H',
               tidy.opts=list(width.cutoff=60),
               tidy=TRUE,
               warning = FALSE
)
```

1.2 Install and load all required packages (Don't install in rmd)

```r
# install.packages('dplyr') install.packages('tidyverse')
# install.packages('knitr') install.packages('readr')
# install.packages('plotrix')

library("tidyverse")
library("dplyr")
library("knitr")
library("readr")
library("plotrix")
```

1.3 Read in files based on type, headers, and with specific NA values accounted for

```r
setwd("./Data")
w1_child <- read.csv("w1_child.csv", header = TRUE, na.strings = c("9",
    "8", "98", "99"))
w2_child <- read.table("w2_child.dat", header = TRUE, , na.strings = c("-999"))
w3_child <- read.csv("w3_child.csv", header = TRUE, na.strings = c("9",
    "8", "98", "99"))
w4_child <- read.csv("w4_child.csv", header = FALSE, na.strings = c("9",
    "8", "98", "99"))
```

```
names_w4_child <- read.table("names_w4_child.txt")
educinc <- read.csv("educinc.csv", header = TRUE, na.strings = c("."))
```

1.4 Add transposed variable names to w4_child based off of the provided text file

```
names(w4_child) <- t(names_w4_child)
```

1.5 Make all headers into lower case for easier merging

```
names(w1_child) <- tolower(names(w1_child))
names(w2_child) <- tolower(names(w2_child))
names(w3_child) <- tolower(names(w3_child))
names(w4_child) <- tolower(names(w4_child))
names(educinc) <- tolower(names(educinc))
```

1.6 Merge files by famid and select specified variables

```
w1234 <- (list(w1_child, w2_child, w3_child, w4_child, educinc) %>%
    reduce(full_join, by = "famid")) %>%
    dplyr::select(famid, c01cohort, c01gender, c01school, c01sibli,
        contains("atts"), contains("pcmp"), contains("attt"),
        contains("dscr"), contains("atod"), fameduc, income,
        c01sibli, contains("edex"))
```

1.7 Reverse code for pcmp 1 and 2

```
pcmp_01_02_cols <- c(grep("pcmp01", names(w1234)), grep("pcmp02",
    names(w1234)))
w1234[, pcmp_01_02_cols] <- 5 - w1234[, pcmp_01_02_cols]
```

1.8 Compute averages based on sets of columns for variable sets and place average into a new variable

```
w1234$c01attt <- rowMeans(w1234[c(grep("c01attt", names(w1234)))],
    na.rm = TRUE)
w1234$c04attt <- rowMeans(w1234[c(grep("c04attt", names(w1234)))],
    na.rm = TRUE)

w1234$c01pcmp <- rowMeans(w1234[c(grep("c01pcmp", names(w1234)))],
    na.rm = TRUE)
w1234$c04pcmp <- rowMeans(w1234[c(grep("c04pcmp", names(w1234)))],
    na.rm = TRUE)

w1234$c01dscr <- rowMeans(w1234[c("c01dscr07", "c01dscr08", "c01dscr09",
    "c01dscr10")], na.rm = TRUE)
w1234$c04dscr <- rowMeans(w1234[c("c04dscr07", "c04dscr08", "c04dscr09",
    "c04dscr10")], na.rm = TRUE)

w1234$c01atts <- rowMeans(w1234[c("c01atts03", "c01atts07", "c01atts08",
    "c01atts10")], na.rm = TRUE)
w1234$c02atts <- rowMeans(w1234[c("c02atts03", "c02atts07", "c02atts08",
    "c02atts10")], na.rm = TRUE)
w1234$c03atts <- rowMeans(w1234[c("c03atts03", "c03atts07", "c03atts08",
    "c03atts10")], na.rm = TRUE)
w1234$c04atts <- rowMeans(w1234[c("c01atts03", "c04atts07", "c04atts08",
    "c04atts10")], na.rm = TRUE)

w1234$c01atod <- rowSums(w1234[c("c01atod01", "c01atod02", "c01atod03",
    "c01atod04", "c01atod05", "c01atod06", "c01atod07", "c01atod08",
    "c01atod09")], na.rm = TRUE)
w1234$c04atod <- rowSums(w1234[c("c04atod01", "c04atod02", "c04atod03",
    "c04atod04", "c04atod05", "c04atod06", "c04atod07", "c04atod08",
    "c04atod09")], na.rm = TRUE)
```

1.9 Create difference scores between Waves 1 and 4

```
score_variables <- c("atts", "pcmp", "attt", "dscr", "atod")
w1234[paste("difference_", score_variables, sep = "")] <- w1234[paste("c01",
    score_variables, sep = "")] - w1234[paste("c04", score_variables,
    sep = "")]
ave_abs_change <- abs(colMeans(w1234[, c("difference_atts", "difference_pcmp",
    "difference_attt", "difference_dscr", "difference_atod")],
    na.rm = TRUE))

atts <- abs(mean(w1234$c01atts - w1234$c04atts, na.rm = TRUE))
pcmp <- abs(mean(w1234$c01pcmp - w1234$c04pcmp, na.rm = TRUE))
attt <- abs(mean(w1234$c01attt - w1234$c04attt, na.rm = TRUE))
dscr <- abs(mean(w1234$c01dscr - w1234$c04dscr, na.rm = TRUE))
atod <- abs(mean(w1234$c01atod - w1234$c04atod, na.rm = TRUE))
```

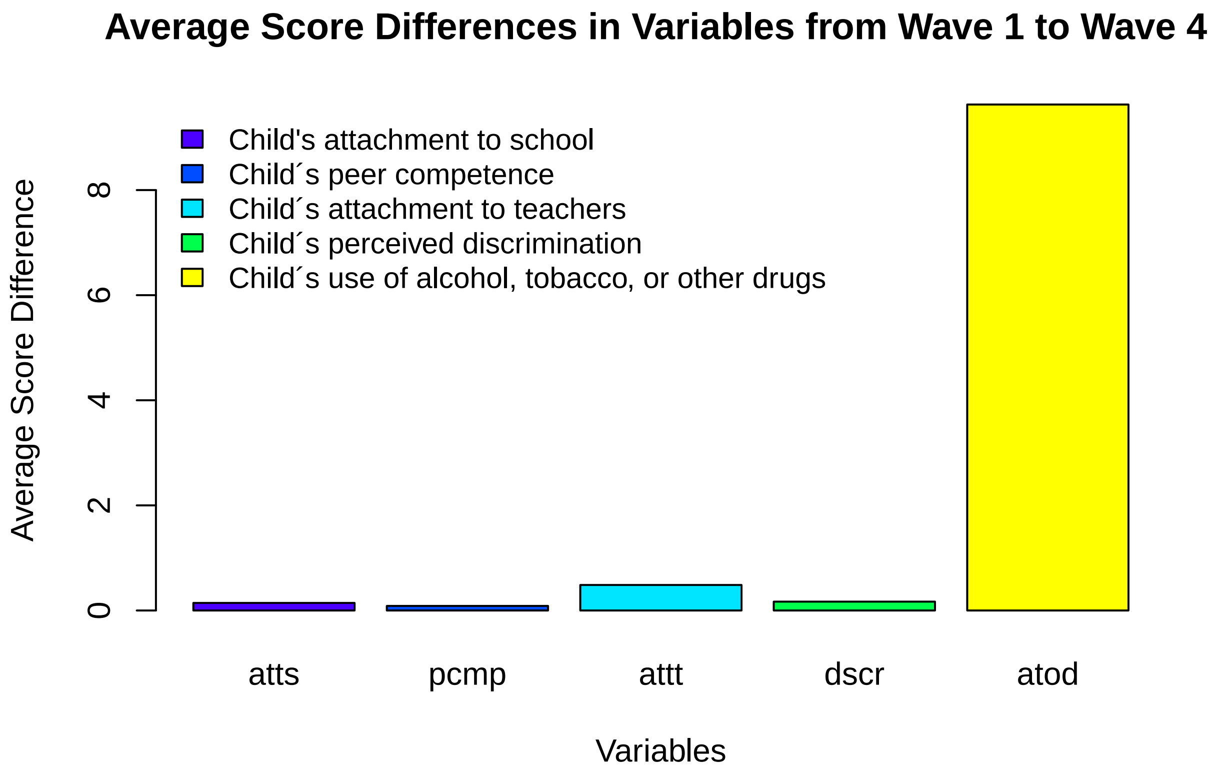
1.10 Function to generate a random vector of colors in order from

```
color_vector <- function(num) {
    return(topo.colors(num))
}
```

2 A fair figure depicting data

```r
average_change <- c(atts, pcmp, attt, dscr, atod)
barplot(average_change, main = "Average Score Differences in Variables from Wave 1 to Wave 4 ",
    xlab = "Variables", ylab = "Average Score Difference", names.arg = c("atts",
        "pcmp", "attt", "dscr", "atod"), col = color_vector(5))

legend("topleft", c("Child's attachment to school", "Child’s peer competence",
    "Child’s attachment to teachers", "Child’s perceived discrimination",
    "Child’s use of alcohol, tobacco, or other drugs"), cex = 0.9,
    bty = "n", fill = color_vector(5))
```



3 Conducting a statistical test such as t-squared test on girls vs boys

3.1 Recode girls and boys

```r
w1234$c01gender[w1234$c01gender == 1] = "girl"
w1234$c01gender[w1234$c01gender == 2] = "boy"
```

4 Compare differences across genders by creating a t-test for genders function

```
t_test_gender <- function(score_var) {
    return(t.test(score_var ~ c01gender, paired = FALSE, data = w1234))
}

tatod <- t_test_gender(w1234$difference_atod)
tattt <- t_test_gender(w1234$difference_attt)
tatts <- t_test_gender(w1234$difference_atts)
tdscr <- t_test_gender(w1234$difference_dscr)
tpcmp <- t_test_gender(w1234$difference_pcmp)

tatod
```

```
##
##  Welch Two Sample t-test
##
## data:  score_var by c01gender
## t = -0.122, df = 669, p-value = 0.9
## alternative hypothesis: true difference in means between group boy and group girl is not equal to 0
## 95 percent confidence interval:
##  -0.87090  0.76865
## sample estimates:
##  mean in group boy mean in group girl
##            -9.6409            -9.5898
```

```
tattt
```

```
##
##  Welch Two Sample t-test
##
## data:  score_var by c01gender
## t = 1.32, df = 581, p-value = 0.19
## alternative hypothesis: true difference in means between group boy and group girl is not equal to 0
## 95 percent confidence interval:
##  -0.043818  0.221895
## sample estimates:
##  mean in group boy mean in group girl
##            0.52987            0.44083
```

```
tatts
```

```
##
##  Welch Two Sample t-test
##
## data:  score_var by c01gender
## t = 0.055, df = 666, p-value = 0.96
## alternative hypothesis: true difference in means between group boy and group girl is not equal to 0
## 95 percent confidence interval:
##  -0.087517  0.092561
## sample estimates:
##  mean in group boy mean in group girl
##            0.14484            0.14232
```

```
tdscr
```

```
##
##  Welch Two Sample t-test
##
## data:  score_var by c01gender
## t = 0.0432, df = 572, p-value = 0.97
## alternative hypothesis: true difference in means between group boy and group girl is not equal to 0
## 95 percent confidence interval:
##  -0.077353  0.080834
## sample estimates:
##  mean in group boy mean in group girl
##            0.16956            0.16782
```

```
tpcmp
```

```
##
##  Welch Two Sample t-test
##
## data:  score_var by c01gender
## t = 1.19, df = 579, p-value = 0.23
## alternative hypothesis: true difference in means between group boy and group girl is not equal to 0
## 95 percent confidence interval:
##  -0.031859  0.130578
## sample estimates:
##  mean in group boy mean in group girl
##           0.111693           0.062333
```

5 Display statistical analysis results of gender variances across score differences

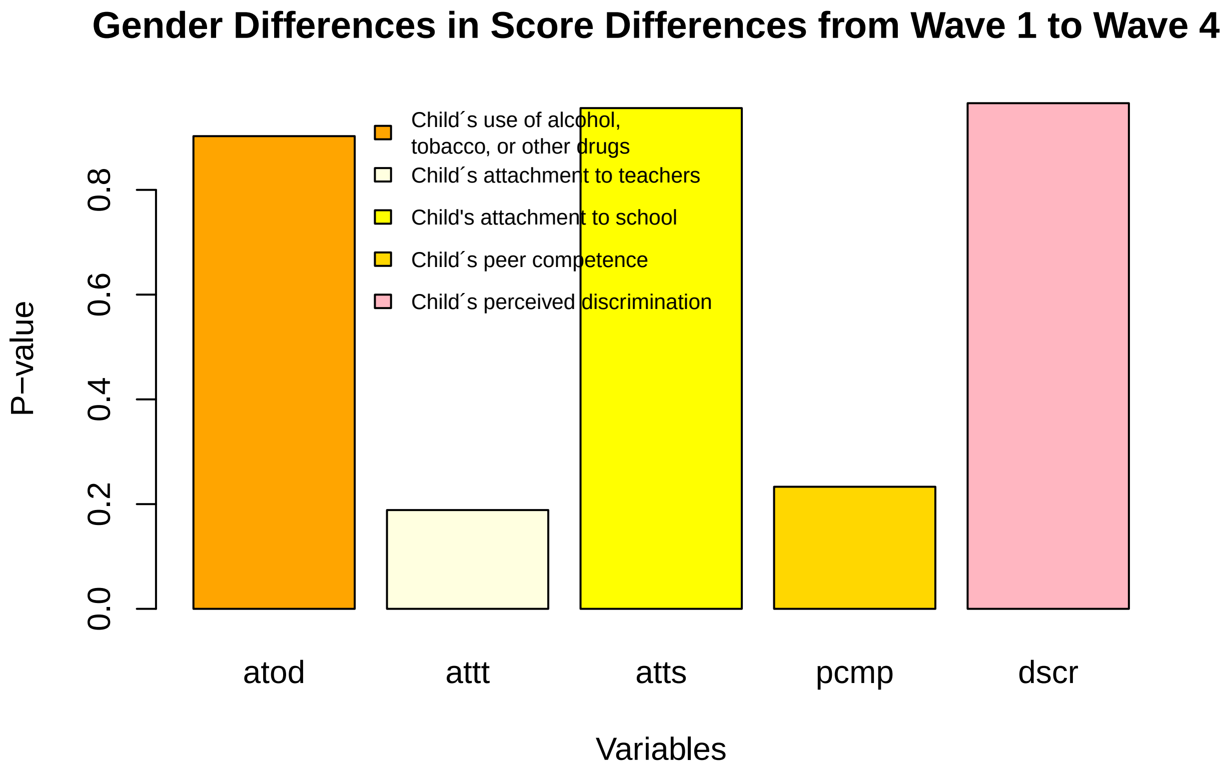
5.1 Function to extract p values from t-test result text

```
extract_pval <- function(ttest) {
    return(ttest$p.value)
}
```

5.2 Graph p values

```
p_values <- c(extract_pval(tatod), extract_pval(tattt), extract_pval(tatts),
    extract_pval(tpcmp), extract_pval(tdscr))
barplot(p_values, main = "Gender Differences in Score Differences from Wave 1 to Wave 4 ",
    xlab = "Variables", ylab = "P-value", names.arg = c("atod",
        "attt", "atts", "pcmp", "dscr"), col = c("orange", "lightyellow",
        "yellow", "gold", "lightpink"))

legend(1.2, 0.99, c("Child’s use of alcohol,\ntobacco, or other drugs",
    "Child’s attachment to teachers", "Child's attachment to school",
    "Child’s peer competence", "Child’s perceived discrimination"),
    cex = 0.7, bty = "n", fill = c("orange", "lightyellow", "yellow",
        "gold", "lightpink"))
```



6 Interpretation of results

6.1 S

7 Figure and analysis that provides a distorted version of what we actually would find in the data.

7.1 Code to determine which p_values are stastically significant i.e., <0.05

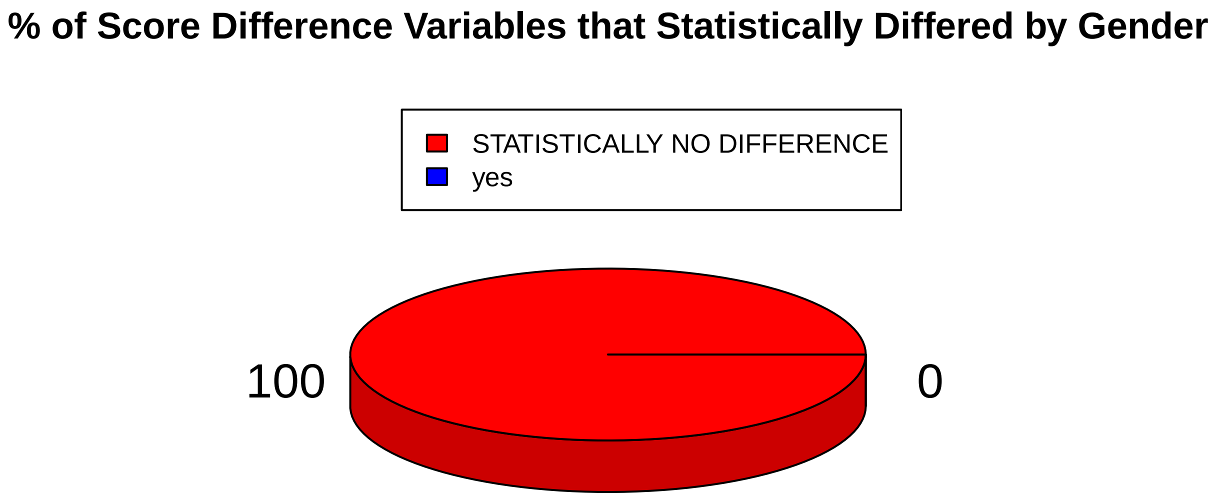
```
p_values[p_values < 0.05] = "yes"
p_values[p_values > 0.05] = "ABSOLUTELY NO CHANGE"
```

```
percent_not_significant <- c(length(p_values[p_values > 0.05])/5 *
    100, (length(p_values[p_values < 0.05])/5 * 100) + 0.01)
```

8 Figure that significantly simplies the data

```
pie3D(percent_not_significant, col = c("red", "blue"), labels = c(percent_not_significant[1],
    "0"), main = "% of Score Difference Variables that Statistically Differed by Gender")

legend(-0.8, 1.05, c("STATISTICALLY NO DIFFERENCE", "yes"), cex = 0.8,
    fill = c("red", "blue"))
```


% of Score Difference Variables that Statistically Differed by Gender
🟥 STATISTICALLY NO DIFFERENCE
🟦 yes