

Stats Modeling Project

Group 5: Xin Jin, Reid Ginoza, Heidi Lovejoy

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```
almost_sas <- function(aov.results){  
  par(mfrow=c(2,2))  
  plot(aov.results, which=1)  
  plot(aov.results, which=2)  
  aov_residuais <- residuals(aov.results)  
  plot(density(aov_residuais))  
  hist(aov_residuais)  
}
```

```
{r import data} # institution_data <- read_spss('InstLevel.sav')  
%>% # select( # TODO will change later when we decide what  
variables we want # -unitid, -addr1_txt, -addr2_txt, -city_txt,  
-zip_text, -sector_cd, # -ClassificationOther # ) %>% #  
filter(grepl('4-year', sector_name)) %>% # only 4-year Schools  
# filter(is.na(IL_PARTIC_COED_MEN) | IL_PARTIC_COED_MEN ==  
0 ) %>% # only schools with no male participants in coed #  
filter(is.na(IL_PARTIC_COED_WOMEN) | IL_PARTIC_COED_WOMEN ==  
0 ) %>% # only schools with no female participants in coed #  
select(-contains("COED")) %>% # ignore variables with the word  
"coed" # mutate(Grand.Total.Profits = GRND_TOTAL_REVENUE -  
GRND_TOTAL_EXPENSE) %>% # filter(!is.na(HDCOACH_SALARY_MEN))  
%>% # filter out NA # filter(!is.na(HDCOACH_SALARY_WOMEN))  
# filter out NA # ncaa.div.i_data <- institution_data %>% #  
filter(grepl('NCAA Division I-', classification_name)) # only  
NCAA division 1 #
```

```
institution_data <- read_spss('InstLevel.sav') %>%  
  select(institution_name, state_cd, ClassificationCode, Classification=classification_name, sector_cd,  
  filter(grepl('4-year', sector_name)) %>% # only 4-year Schools  
  filter(is.na(IL_PARTIC_COED_MEN) | IL_PARTIC_COED_MEN == 0 ) %>% # only schools with no male particip  
  filter(is.na(IL_PARTIC_COED_WOMEN) | IL_PARTIC_COED_WOMEN == 0 ) %>% # only schools with no female pa  
  select(-contains("COED")) %>% # ignore variables with the word "coed"  
  filter(!is.na(HDCOACH_SALARY_MEN)) %>% # filter out NA  
  filter(!is.na(HDCOACH_SALARY_WOMEN)) # filter out NA  
  
ncaa.div.i_data <- institution_data %>%  
  filter(grepl('NCAA Division I-', Classification)) # only NCAA division 1
```

```

men_data <- institution_data %>%
  select(-contains("WOMEN")) %>%
  rename(Salary = HDcoach_salary_men, IL_PARTIC = IL_PARTIC_men)

women_data <- institution_data %>%
  select(-contains("_MEN")) %>%
  rename(Salary = HDcoach_salary_women, IL_PARTIC = IL_PARTIC_women)

gender.separated_data <- bind_rows(
  men_data %>% add_column(Gender = "Men"),
  women_data %>% add_column(Gender = "Women")
)

```

Notes for Kruskal-Wallis posthoc comparison

```

classification.kw.posthoc <- gender.separated_data %$% kruskalmc(Salary ~ Classification)

```

Table 1: Table continues below

	obs.dif
Independent-NAIA Division I	860.3
Independent-NAIA Division II	648.1
Independent-NCAA Division I without football	2050
Independent-NCAA Division I-FBS	2367
Independent-NCAA Division I-FCS	2020
Independent-NCAA Division II with football	1410
Independent-NCAA Division II without football	1174
Independent-NCAA Division III with football	1014
Independent-NCAA Division III without football	616.2
Independent-NCCAA Division I	459.4
Independent-NCCAA Division II	187
Independent-NJCAA Division I	992.8
Independent-NJCAA Division II	252.6
Independent-NJCAA Division III	339.4
Independent-NWAC	13.42
Independent-Other	281
Independent-USCAA	160.3
NAIA Division I-NAIA Division II	212.2
NAIA Division I-NCAA Division I without football	1190
NAIA Division I-NCAA Division I-FBS	1506
NAIA Division I-NCAA Division I-FCS	1160
NAIA Division I-NCAA Division II with football	550.1
NAIA Division I-NCAA Division II without football	313.6
NAIA Division I-NCAA Division III with football	153.4
NAIA Division I-NCAA Division III without football	244.1
NAIA Division I-NCCAA Division I	400.9
NAIA Division I-NCCAA Division II	673.3
NAIA Division I-NJCAA Division I	132.5
NAIA Division I-NJCAA Division II	607.7

	obs.dif
NAIA Division I-NJCAA Division III	520.9
NAIA Division I-NWAC	873.7
NAIA Division I-Other	579.3
NAIA Division I-USCAA	700
NAIA Division II-NCAA Division I without football	1402
NAIA Division II-NCAA Division I-FBS	1719
NAIA Division II-NCAA Division I-FCS	1372
NAIA Division II-NCAA Division II with football	762.3
NAIA Division II-NCAA Division II without football	525.8
NAIA Division II-NCAA Division III with football	365.7
NAIA Division II-NCAA Division III without football	31.82
NAIA Division II-NCCAA Division I	188.6
NAIA Division II-NCCAA Division II	461.1
NAIA Division II-NJCAA Division I	344.7
NAIA Division II-NJCAA Division II	395.5
NAIA Division II-NJCAA Division III	308.6
NAIA Division II-NWAC	661.5
NAIA Division II-Other	367.1
NAIA Division II-USCAA	487.7
NCAA Division I without football-NCAA Division I-FBS	316.5
NCAA Division I without football-NCAA Division I-FCS	30.11
NCAA Division I without football-NCAA Division II with football	639.9
NCAA Division I without football-NCAA Division II without football	876.4
NCAA Division I without football-NCAA Division III with football	1037
NCAA Division I without football-NCAA Division III without football	1434
NCAA Division I without football-NCCAA Division I	1591
NCAA Division I without football-NCCAA Division II	1863
NCAA Division I without football-NJCAA Division I	1057
NCAA Division I without football-NJCAA Division II	1798
NCAA Division I without football-NJCAA Division III	1711
NCAA Division I without football-NWAC	2064
NCAA Division I without football-Other	1769
NCAA Division I without football-USCAA	1890
NCAA Division I-FBS-NCAA Division I-FCS	346.6
NCAA Division I-FBS-NCAA Division II with football	956.4
NCAA Division I-FBS-NCAA Division II without football	1193
NCAA Division I-FBS-NCAA Division III with football	1353
NCAA Division I-FBS-NCAA Division III without football	1751
NCAA Division I-FBS-NCCAA Division I	1907
NCAA Division I-FBS-NCCAA Division II	2180
NCAA Division I-FBS-NJCAA Division I	1374
NCAA Division I-FBS-NJCAA Division II	2114
NCAA Division I-FBS-NJCAA Division III	2027
NCAA Division I-FBS-NWAC	2380
NCAA Division I-FBS-Other	2086
NCAA Division I-FBS-USCAA	2206
NCAA Division I-FCS-NCAA Division II with football	609.8
NCAA Division I-FCS-NCAA Division II without football	846.3
NCAA Division I-FCS-NCAA Division III with football	1006
NCAA Division I-FCS-NCAA Division III without football	1404
NCAA Division I-FCS-NCCAA Division I	1561
NCAA Division I-FCS-NCCAA Division II	1833

	obs.dif
NCAA Division I-FCS-NJCAA Division I	1027
NCAA Division I-FCS-NJCAA Division II	1768
NCAA Division I-FCS-NJCAA Division III	1681
NCAA Division I-FCS-NWAC	2034
NCAA Division I-FCS-Other	1739
NCAA Division I-FCS-USCAA	1860
NCAA Division II with football-NCAA Division II without football	236.5
NCAA Division II with football-NCAA Division III with football	396.6
NCAA Division II with football-NCAA Division III without football	794.1
NCAA Division II with football-NCCAA Division I	951
NCAA Division II with football-NCCAA Division II	1223
NCAA Division II with football-NJCAA Division I	417.6
NCAA Division II with football-NJCAA Division II	1158
NCAA Division II with football-NJCAA Division III	1071
NCAA Division II with football-NWAC	1424
NCAA Division II with football-Other	1129
NCAA Division II with football-USCAA	1250
NCAA Division II without football-NCAA Division III with football	160.1
NCAA Division II without football-NCAA Division III without football	557.6
NCAA Division II without football-NCCAA Division I	714.4
NCAA Division II without football-NCCAA Division II	986.9
NCAA Division II without football-NJCAA Division I	181.1
NCAA Division II without football-NJCAA Division II	921.3
NCAA Division II without football-NJCAA Division III	834.4
NCAA Division II without football-NWAC	1187
NCAA Division II without football-Other	892.9
NCAA Division II without football-USCAA	1014
NCAA Division III with football-NCAA Division III without football	397.5
NCAA Division III with football-NCCAA Division I	554.3
NCAA Division III with football-NCCAA Division II	826.8
NCAA Division III with football-NJCAA Division I	20.96
NCAA Division III with football-NJCAA Division II	761.1
NCAA Division III with football-NJCAA Division III	674.3
NCAA Division III with football-NWAC	1027
NCAA Division III with football-Other	732.7
NCAA Division III with football-USCAA	853.4
NCAA Division III without football-NCCAA Division I	156.8
NCAA Division III without football-NCCAA Division II	429.3
NCAA Division III without football-NJCAA Division I	376.5
NCAA Division III without football-NJCAA Division II	363.6
NCAA Division III without football-NJCAA Division III	276.8
NCAA Division III without football-NWAC	629.7
NCAA Division III without football-Other	335.2
NCAA Division III without football-USCAA	455.9
NCCAA Division I-NCCAA Division II	272.5
NCCAA Division I-NJCAA Division I	533.3
NCCAA Division I-NJCAA Division II	206.8
NCCAA Division I-NJCAA Division III	120
NCCAA Division I-NWAC	472.9
NCCAA Division I-Other	178.4
NCCAA Division I-USCAA	299.1
NCCAA Division II-NJCAA Division I	805.8

	obs.dif
NCCAA Division II-NJCAA Division II	65.64
NCCAA Division II-NJCAA Division III	152.5
NCCAA Division II-NWAC	200.4
NCCAA Division II-Other	94.05
NCCAA Division II-USCAA	26.64
NJCAA Division I-NJCAA Division II	740.2
NJCAA Division I-NJCAA Division III	653.3
NJCAA Division I-NWAC	1006
NJCAA Division I-Other	711.8
NJCAA Division I-USCAA	832.5
NJCAA Division II-NJCAA Division III	86.83
NJCAA Division II-NWAC	266
NJCAA Division II-Other	28.41
NJCAA Division II-USCAA	92.28
NJCAA Division III-NWAC	352.9
NJCAA Division III-Other	58.42
NJCAA Division III-USCAA	179.1
NWAC-Other	294.4
NWAC-USCAA	173.8
Other-USCAA	120.7

Table 2: Table continues below

	critical.dif
Independent-NAIA Division I	1022
Independent-NAIA Division II	1019
Independent-NCAA Division I without football	1021
Independent-NCAA Division I-FBS	1017
Independent-NCAA Division I-FCS	1017
Independent-NCAA Division II with football	1012
Independent-NCAA Division II without football	1014
Independent-NCAA Division III with football	1009
Independent-NCAA Division III without football	1012
Independent-NCCAA Division I	1202
Independent-NCCAA Division II	1077
Independent-NJCAA Division I	1055
Independent-NJCAA Division II	1202
Independent-NJCAA Division III	1414
Independent-NWAC	1202
Independent-Other	1059
Independent-USCAA	1057
NAIA Division I-NAIA Division II	289.2
NAIA Division I-NCAA Division I without football	294.2
NAIA Division I-NCAA Division I-FBS	280.4
NAIA Division I-NCAA Division I-FCS	282
NAIA Division I-NCAA Division II with football	263.5
NAIA Division I-NCAA Division II without football	270.9
NAIA Division I-NCAA Division III with football	249.7
NAIA Division I-NCAA Division III without football	262.9
NAIA Division I-NCCAA Division I	699.1
NAIA Division I-NCCAA Division II	452.1

	critical.dif
NAIA Division I-NJCAA Division I	398.4
NAIA Division I-NJCAA Division II	699.1
NAIA Division I-NJCAA Division III	1022
NAIA Division I-NWAC	699.1
NAIA Division I-Other	406.9
NAIA Division I-USCAA	402.5
NAIA Division II-NCAA Division I without football	285.1
NAIA Division II-NCAA Division I-FBS	270.9
NAIA Division II-NCAA Division I-FCS	272.5
NAIA Division II-NCAA Division II with football	253.4
NAIA Division II-NCAA Division II without football	261.1
NAIA Division II-NCAA Division III with football	239
NAIA Division II-NCAA Division III without football	252.8
NAIA Division II-NCCAA Division I	695.4
NAIA Division II-NCCAA Division II	446.3
NAIA Division II-NJCAA Division I	391.7
NAIA Division II-NJCAA Division II	695.4
NAIA Division II-NJCAA Division III	1019
NAIA Division II-NWAC	695.4
NAIA Division II-Other	400.5
NAIA Division II-USCAA	396
NCAA Division I without football-NCAA Division I-FBS	276.2
NCAA Division I without football-NCAA Division I-FCS	277.8
NCAA Division I without football-NCAA Division II with football	259
NCAA Division I without football-NCAA Division II without football	266.6
NCAA Division I without football-NCAA Division III with football	245
NCAA Division I without football-NCAA Division III without football	258.4
NCAA Division I without football-NCCAA Division I	697.4
NCAA Division I without football-NCCAA Division II	449.5
NCAA Division I without football-NJCAA Division I	395.4
NCAA Division I without football-NJCAA Division II	697.4
NCAA Division I without football-NJCAA Division III	1021
NCAA Division I without football-NWAC	697.4
NCAA Division I without football-Other	404.1
NCAA Division I without football-USCAA	399.6
NCAA Division I-FBS-NCAA Division I-FCS	263.2
NCAA Division I-FBS-NCAA Division II with football	243.3
NCAA Division I-FBS-NCAA Division II without football	251.3
NCAA Division I-FBS-NCAA Division III with football	228.3
NCAA Division I-FBS-NCAA Division III without football	242.6
NCAA Division I-FBS-NCCAA Division I	691.7
NCAA Division I-FBS-NCCAA Division II	440.6
NCAA Division I-FBS-NJCAA Division I	385.3
NCAA Division I-FBS-NJCAA Division II	691.7
NCAA Division I-FBS-NJCAA Division III	1017
NCAA Division I-FBS-NWAC	691.7
NCAA Division I-FBS-Other	394.2
NCAA Division I-FBS-USCAA	389.6
NCAA Division I-FCS-NCAA Division II with football	245.1
NCAA Division I-FCS-NCAA Division II without football	253.1
NCAA Division I-FCS-NCAA Division III with football	230.2
NCAA Division I-FCS-NCAA Division III without football	244.5

	critical.dif
NCAA Division I-FCS-NCCAA Division I	692.4
NCAA Division I-FCS-NCCAA Division II	441.6
NCAA Division I-FCS-NJCAA Division I	386.4
NCAA Division I-FCS-NJCAA Division II	692.4
NCAA Division I-FCS-NJCAA Division III	1017
NCAA Division I-FCS-NWAC	692.4
NCAA Division I-FCS-Other	395.3
NCAA Division I-FCS-USCAA	390.8
NCAA Division II with football-NCAA Division II without football	232.3
NCAA Division II with football-NCAA Division III with football	207.2
NCAA Division II with football-NCAA Division III without football	222.9
NCAA Division II with football-NCCAA Division I	685.1
NCAA Division II with football-NCCAA Division II	430.1
NCAA Division II with football-NJCAA Division I	373.2
NCAA Division II with football-NJCAA Division II	685.1
NCAA Division II with football-NJCAA Division III	1012
NCAA Division II with football-NWAC	685.1
NCAA Division II with football-Other	382.3
NCAA Division II with football-USCAA	377.6
NCAA Division II without football-NCAA Division III with football	216.6
NCAA Division II without football-NCAA Division III without football	231.6
NCAA Division II without football-NCCAA Division I	688
NCAA Division II without football-NCCAA Division II	434.7
NCAA Division II without football-NJCAA Division I	378.5
NCAA Division II without football-NJCAA Division II	688
NCAA Division II without football-NJCAA Division III	1014
NCAA Division II without football-NWAC	688
NCAA Division II without football-Other	387.5
NCAA Division II without football-USCAA	382.9
NCAA Division III with football-NCAA Division III without football	206.4
NCAA Division III with football-NCCAA Division I	679.9
NCAA Division III with football-NCCAA Division II	421.8
NCAA Division III with football-NJCAA Division I	363.6
NCAA Division III with football-NJCAA Division II	679.9
NCAA Division III with football-NJCAA Division III	1009
NCAA Division III with football-NWAC	679.9
NCAA Division III with football-Other	373
NCAA Division III with football-USCAA	368.2
NCAA Division III without football-NCCAA Division I	684.8
NCAA Division III without football-NCCAA Division II	429.7
NCAA Division III without football-NJCAA Division I	372.7
NCAA Division III without football-NJCAA Division II	684.8
NCAA Division III without football-NJCAA Division III	1012
NCAA Division III without football-NWAC	684.8
NCAA Division III without football-Other	381.9
NCAA Division III without football-USCAA	377.2
NCCAA Division I-NCCAA Division II	777.3
NCCAA Division I-NJCAA Division I	747.4
NCCAA Division I-NJCAA Division II	942.7
NCCAA Division I-NJCAA Division III	1202
NCCAA Division I-NWAC	942.7
NCCAA Division I-Other	752

	critical.dif
NCCAA Division I-USCAA	749.6
NCCAA Division II-NJCAA Division I	523.6
NCCAA Division II-NJCAA Division II	777.3
NCCAA Division II-NJCAA Division III	1077
NCCAA Division II-NWAC	777.3
NCCAA Division II-Other	530.2
NCCAA Division II-USCAA	526.8
NJCAA Division I-NJCAA Division II	747.4
NJCAA Division I-NJCAA Division III	1055
NJCAA Division I-NWAC	747.4
NJCAA Division I-Other	485.2
NJCAA Division I-USCAA	481.5
NJCAA Division II-NJCAA Division III	1202
NJCAA Division II-NWAC	942.7
NJCAA Division II-Other	752
NJCAA Division II-USCAA	749.6
NJCAA Division III-NWAC	1202
NJCAA Division III-Other	1059
NJCAA Division III-USCAA	1057
NWAC-Other	752
NWAC-USCAA	749.6
Other-USCAA	488.7

	difference
Independent-NAIA Division I	FALSE
Independent-NAIA Division II	FALSE
Independent-NCAA Division I without football	TRUE
Independent-NCAA Division I-FBS	TRUE
Independent-NCAA Division I-FCS	TRUE
Independent-NCAA Division II with football	TRUE
Independent-NCAA Division II without football	TRUE
Independent-NCAA Division III with football	TRUE
Independent-NCAA Division III without football	FALSE
Independent-NCCAA Division I	FALSE
Independent-NCCAA Division II	FALSE
Independent-NJCAA Division I	FALSE
Independent-NJCAA Division II	FALSE
Independent-NJCAA Division III	FALSE
Independent-NWAC	FALSE
Independent-Other	FALSE
Independent-USCAA	FALSE
NAIA Division I-NAIA Division II	FALSE
NAIA Division I-NCAA Division I without football	TRUE
NAIA Division I-NCAA Division I-FBS	TRUE
NAIA Division I-NCAA Division I-FCS	TRUE
NAIA Division I-NCAA Division II with football	TRUE
NAIA Division I-NCAA Division II without football	TRUE
NAIA Division I-NCAA Division III with football	FALSE
NAIA Division I-NCAA Division III without football	FALSE
NAIA Division I-NCCAA Division I	FALSE
NAIA Division I-NCCAA Division II	TRUE

	difference
NAIA Division I-NJCAA Division I	FALSE
NAIA Division I-NJCAA Division II	FALSE
NAIA Division I-NJCAA Division III	FALSE
NAIA Division I-NWAC	TRUE
NAIA Division I-Other	TRUE
NAIA Division I-USCAA	TRUE
NAIA Division II-NCAA Division I without football	TRUE
NAIA Division II-NCAA Division I-FBS	TRUE
NAIA Division II-NCAA Division I-FCS	TRUE
NAIA Division II-NCAA Division II with football	TRUE
NAIA Division II-NCAA Division II without football	TRUE
NAIA Division II-NCAA Division III with football	TRUE
NAIA Division II-NCAA Division III without football	FALSE
NAIA Division II-NCCAA Division I	FALSE
NAIA Division II-NCCAA Division II	TRUE
NAIA Division II-NJCAA Division I	FALSE
NAIA Division II-NJCAA Division II	FALSE
NAIA Division II-NJCAA Division III	FALSE
NAIA Division II-NWAC	FALSE
NAIA Division II-Other	FALSE
NAIA Division II-USCAA	TRUE
NCAA Division I without football-NCAA Division I-FBS	TRUE
NCAA Division I without football-NCAA Division I-FCS	FALSE
NCAA Division I without football-NCAA Division II with football	TRUE
NCAA Division I without football-NCAA Division II without football	TRUE
NCAA Division I without football-NCAA Division III with football	TRUE
NCAA Division I without football-NCAA Division III without football	TRUE
NCAA Division I without football-NCCAA Division I	TRUE
NCAA Division I without football-NCCAA Division II	TRUE
NCAA Division I without football-NJCAA Division I	TRUE
NCAA Division I without football-NJCAA Division II	TRUE
NCAA Division I without football-NJCAA Division III	TRUE
NCAA Division I without football-NWAC	TRUE
NCAA Division I without football-Other	TRUE
NCAA Division I without football-USCAA	TRUE
NCAA Division I-FBS-NCAA Division I-FCS	TRUE
NCAA Division I-FBS-NCAA Division II with football	TRUE
NCAA Division I-FBS-NCAA Division II without football	TRUE
NCAA Division I-FBS-NCAA Division III with football	TRUE
NCAA Division I-FBS-NCAA Division III without football	TRUE
NCAA Division I-FBS-NCCAA Division I	TRUE
NCAA Division I-FBS-NCCAA Division II	TRUE
NCAA Division I-FBS-NJCAA Division I	TRUE
NCAA Division I-FBS-NJCAA Division II	TRUE
NCAA Division I-FBS-NJCAA Division III	TRUE
NCAA Division I-FBS-NWAC	TRUE
NCAA Division I-FBS-Other	TRUE
NCAA Division I-FBS-USCAA	TRUE
NCAA Division I-FCS-NCAA Division II with football	TRUE
NCAA Division I-FCS-NCAA Division II without football	TRUE
NCAA Division I-FCS-NCAA Division III with football	TRUE
NCAA Division I-FCS-NCAA Division III without football	TRUE

	difference
NCAA Division I-FCS-NCCAA Division I	TRUE
NCAA Division I-FCS-NCCAA Division II	TRUE
NCAA Division I-FCS-NJCAA Division I	TRUE
NCAA Division I-FCS-NJCAA Division II	TRUE
NCAA Division I-FCS-NJCAA Division III	TRUE
NCAA Division I-FCS-NWAC	TRUE
NCAA Division I-FCS-Other	TRUE
NCAA Division I-FCS-USCAA	TRUE
NCAA Division II with football-NCAA Division II without football	TRUE
NCAA Division II with football-NCAA Division III with football	TRUE
NCAA Division II with football-NCAA Division III without football	TRUE
NCAA Division II with football-NCCAA Division I	TRUE
NCAA Division II with football-NCCAA Division II	TRUE
NCAA Division II with football-NJCAA Division I	TRUE
NCAA Division II with football-NJCAA Division II	TRUE
NCAA Division II with football-NJCAA Division III	TRUE
NCAA Division II with football-NWAC	TRUE
NCAA Division II with football-Other	TRUE
NCAA Division II with football-USCAA	TRUE
NCAA Division II without football-NCAA Division III with football	FALSE
NCAA Division II without football-NCAA Division III without football	TRUE
NCAA Division II without football-NCCAA Division I	TRUE
NCAA Division II without football-NCCAA Division II	TRUE
NCAA Division II without football-NJCAA Division I	FALSE
NCAA Division II without football-NJCAA Division II	TRUE
NCAA Division II without football-NJCAA Division III	FALSE
NCAA Division II without football-NWAC	TRUE
NCAA Division II without football-Other	TRUE
NCAA Division II without football-USCAA	TRUE
NCAA Division III with football-NCAA Division III without football	TRUE
NCAA Division III with football-NCCAA Division I	FALSE
NCAA Division III with football-NCCAA Division II	TRUE
NCAA Division III with football-NJCAA Division I	FALSE
NCAA Division III with football-NJCAA Division II	TRUE
NCAA Division III with football-NJCAA Division III	FALSE
NCAA Division III with football-NWAC	TRUE
NCAA Division III with football-Other	TRUE
NCAA Division III with football-USCAA	TRUE
NCAA Division III without football-NCCAA Division I	FALSE
NCAA Division III without football-NCCAA Division II	FALSE
NCAA Division III without football-NJCAA Division I	TRUE
NCAA Division III without football-NJCAA Division II	FALSE
NCAA Division III without football-NJCAA Division III	FALSE
NCAA Division III without football-NWAC	FALSE
NCAA Division III without football-Other	FALSE
NCAA Division III without football-USCAA	TRUE
NCCAA Division I-NCCAA Division II	FALSE
NCCAA Division I-NJCAA Division I	FALSE
NCCAA Division I-NJCAA Division II	FALSE
NCCAA Division I-NJCAA Division III	FALSE
NCCAA Division I-NWAC	FALSE
NCCAA Division I-Other	FALSE

	difference
NCCAA Division I-USCAA	FALSE
NCCAA Division II-NJCAA Division I	TRUE
NCCAA Division II-NJCAA Division II	FALSE
NCCAA Division II-NJCAA Division III	FALSE
NCCAA Division II-NWAC	FALSE
NCCAA Division II-Other	FALSE
NCCAA Division II-USCAA	FALSE
NJCAA Division I-NJCAA Division II	FALSE
NJCAA Division I-NJCAA Division III	FALSE
NJCAA Division I-NWAC	TRUE
NJCAA Division I-Other	TRUE
NJCAA Division I-USCAA	TRUE
NJCAA Division II-NJCAA Division III	FALSE
NJCAA Division II-NWAC	FALSE
NJCAA Division II-Other	FALSE
NJCAA Division II-USCAA	FALSE
NJCAA Division III-NWAC	FALSE
NJCAA Division III-Other	FALSE
NJCAA Division III-USCAA	FALSE
NWAC-Other	FALSE
NWAC-USCAA	FALSE
Other-USCAA	FALSE

Counts of Divisions

```
institution_data %>%
  group_by(Classification) %>%
  summarize('Mean Men Head Coach Salary'=mean(HDCOACH_SALARY_MEN), 'SD Men'=sd(HDCOACH_SALARY_MEN),
            'Mean Woen Head Coach Salary'=mean(HDCOACH_SALARY_WOMEN), 'SD Women'=sd(HDCOACH_SALARY_WOMEN),
            'Mean Men Head Coach Salary'=mean(HDCOACH_SALARY_MEN), 'SD Men'=sd(HDCOACH_SALARY_MEN),
            'Mean Woen Head Coach Salary'=mean(HDCOACH_SALARY_WOMEN), 'SD Women'=sd(HDCOACH_SALARY_WOMEN))
  kable() %>%
  kable_styling(bootstrap_options = c("striped", "hover"),
                full_width = F,
                font_size = 14,
                position = "left")
```

Classification	Mean Men Head Coach Salary	SD Men	Mean
Independent	7843.750	3368.628	
NAIA Division I	32668.956	11988.474	
NAIA Division II	26677.559	11896.811	
NCAA Division I without football	154140.947	113510.725	
NCAA Division I-FBS	691848.778	460008.876	
NCAA Division I-FCS	132124.781	73211.986	
NCAA Division II with football	55094.100	19053.739	
NCAA Division II without football	43269.167	21391.554	
NCAA Division III with football	37806.229	13236.055	
NCAA Division III without football	25276.660	15453.066	
NCCAA Division I	22683.000	14696.931	
NCCAA Division II	13652.840	11260.258	
NJCAA Division I	37834.543	22880.751	
NJCAA Division II	14425.000	8128.600	
NJCAA Division III	18207.750	13436.158	
NWAC	7047.556	1379.605	
Other	21572.939	40636.305	
USCAA	12626.029	14537.566	

```
institution_data %>%
  select(ClassificationCode, Classification) %>%
  unique()
```

```
## # A tibble: 18 x 2
##   ClassificationCode Classification
##           <dbl> <chr>
## 1             2 NCAA Division I-FCS
## 2             5 NCAA Division II without football
## 3             1 NCAA Division I-FBS
## 4             6 NCAA Division III with football
## 5             9 NAIA Division I
## 6             4 NCAA Division II with football
## 7            20 USCAA
## 8             3 NCAA Division I without football
## 9             8 Other
## 10            12 NJCAA Division I
## 11            15 NCCAA Division I
## 12             7 NCAA Division III without football
## 13            10 NAIA Division II
## 14            16 NCCAA Division II
## 15            13 NJCAA Division II
## 16            14 NJCAA Division III
## 17            18 Independent
## 18            19 NWAC
```

```

institution_data %>%
  filter(ClassificationCode==9) %>%
  select(Classification, HDcoach_Salary_Women) %>%
  # summarize(mean=mean(HDcoach_Salary_Men)) # results in NA
summary()

## Classification      HDcoach_Salary_Women
## Length:90          Min.   : 4077
## Class :character    1st Qu.:22820
## Mode  :character    Median :27126
##                               Mean  :28453
##                               3rd Qu.:36206
##                               Max.   :58666

two.way.anova.attempt <- institution_data %>%
  select(Classification, HDcoach_Salary_Men, HDcoach_Salary_Women) %>%
  gather("Gender", "Salary", -Classification)

## Warning: attributes are not identical across measure variables;
## they will be dropped

two.way.anova.attempt$Gender %<>% recode(HDcoach_Salary_Men="Men", HDcoach_Salary_Women="Women")
two.way.anova.attempt

## # A tibble: 2,726 x 3
##   Classification      Gender Salary
##   <chr>              <chr>   <dbl>
## 1 NCAA Division I-FCS      Men    56920
## 2 NCAA Division II without football Men    73267
## 3 NCAA Division I-FCS      Men    84018
## 4 NCAA Division I-FBS      Men   1705741
## 5 NCAA Division II without football Men    37051
## 6 NCAA Division I-FBS      Men   1360838
## 7 NCAA Division III with football Men    44759
## 8 NAIA Division I         Men    59471
## 9 NCAA Division III with football Men    64314
## 10 NCAA Division II with football Men    56806
## # ... with 2,716 more rows

adv_aov.results <- aov(Salary ~ Classification*Gender, data = two.way.anova.attempt)
adv_aov.table <- adv_aov.results %>% summary()
adv_aov.table %>% pander(style = 'rmarkdown')

```

Table 4: Analysis of Variance Model (continued below)

	Df	Sum Sq	Mean Sq	F value
Classification	17	3.413e+13	2.008e+12	193.6
Gender	1	2.428e+12	2.428e+12	234.1
Classification:Gender	17	1.402e+13	8.245e+11	79.5
Residuals	2690	2.79e+13	1.037e+10	NA

	Pr(>F)
Classification	0
Gender	9.708e-51
Classification:Gender	9.674e-223
Residuals	NA

Introduction

This project examines NCAA Division I athletics. We used the data from the Equity in Athletics Survey, Year 2017-2018, from the U.S. Department of Education Office of Postsecondary Education (2018).

Hypotheses

Divisions and Profits

Head Coaches of Men's Teams and School Type

H_0 :

H_1 :

Head Coaches of Men's Teams and Participation

H_0 :

H_1 :

Difference in Classifications

There are 18 different classifications, including NCAA Division I-FCS, NCAA II without Football, and so forth. This question looks at the means of the profits for each classification. H_0 : $\mu_1 = \mu_2 = \dots = \mu_{18}$

H_1 : At least one is different

Difference in Classifications (Nonparametric)

Methods

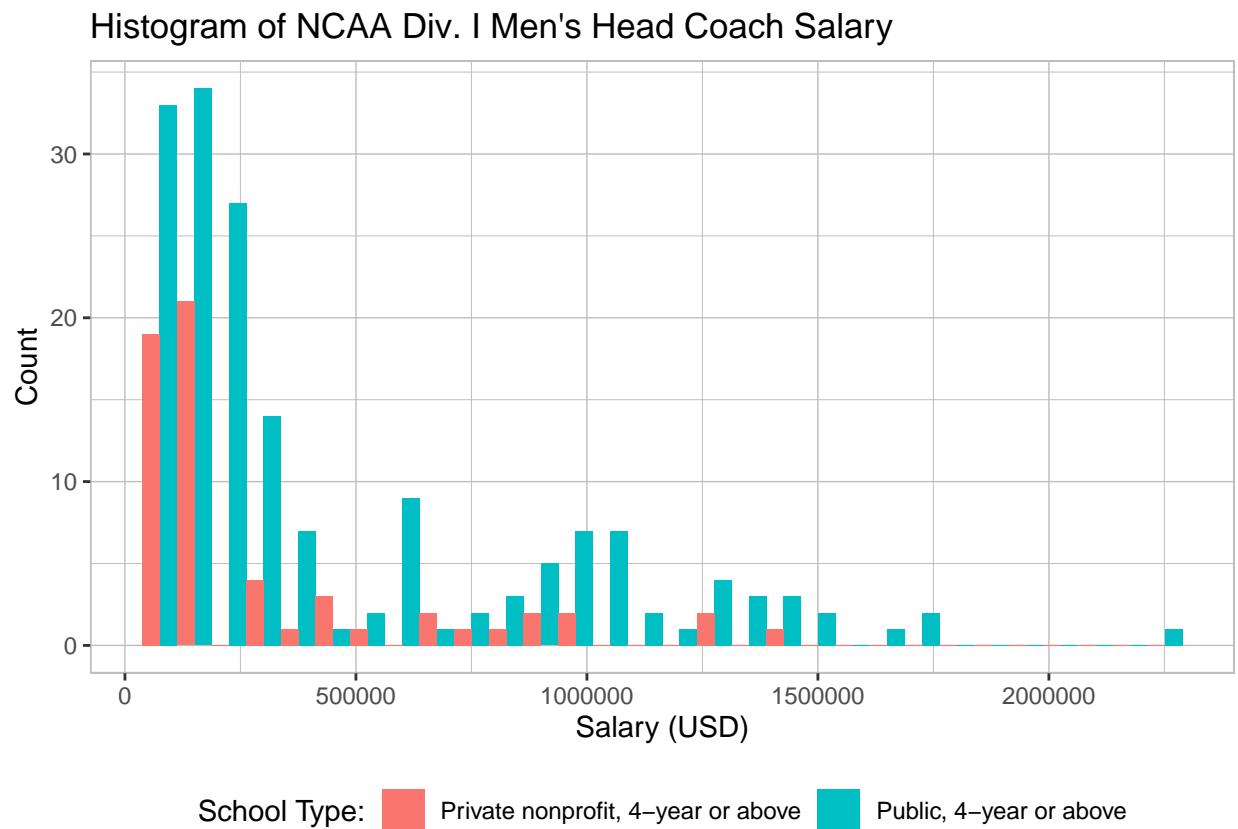
Results

Describing and Visualizing Head Coach data

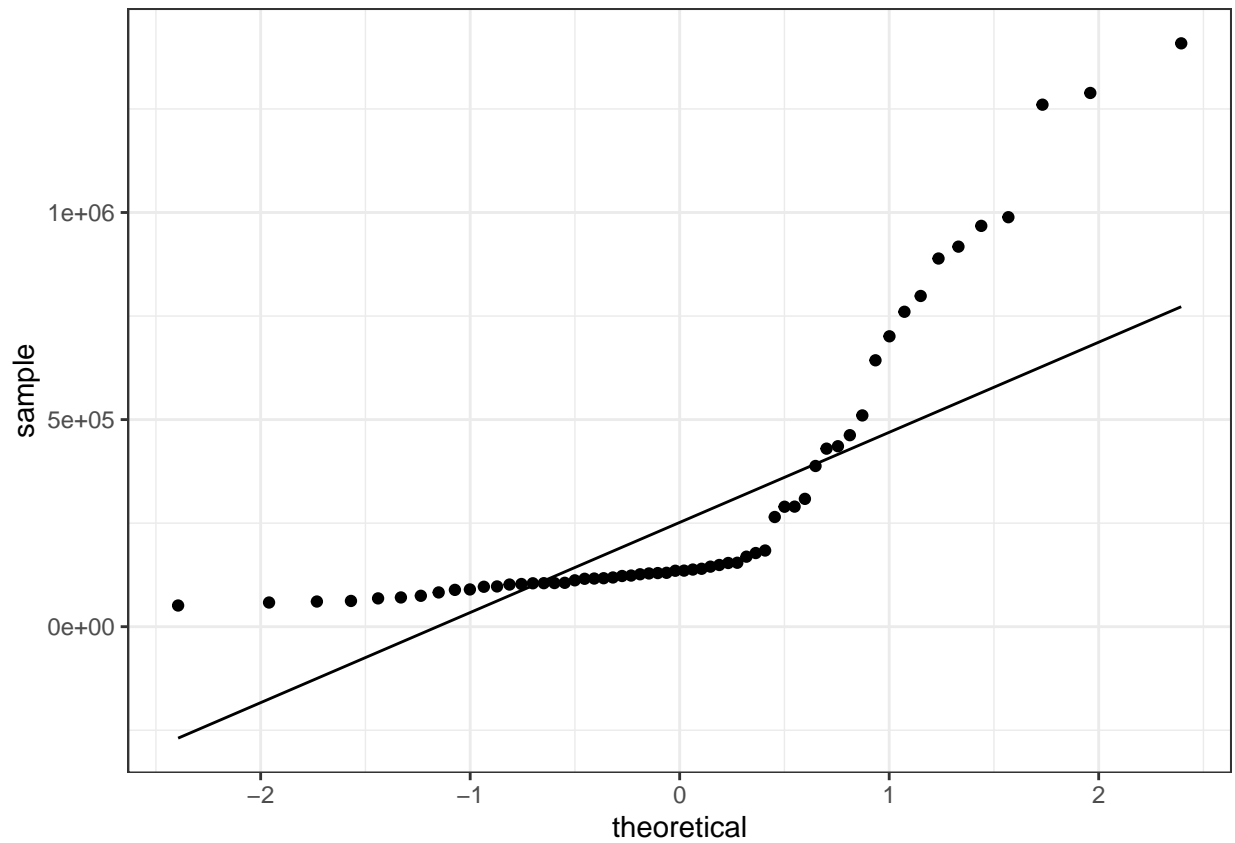
```
hd.coach.salary_data <- ncaa.div.i_data %>%
  select(sector_name, HDcoach_SALARY_MEN)

hd.coach.salary_data %>%
  ggplot(aes(x = HDcoach_SALARY_MEN, fill = sector_name)) +
```

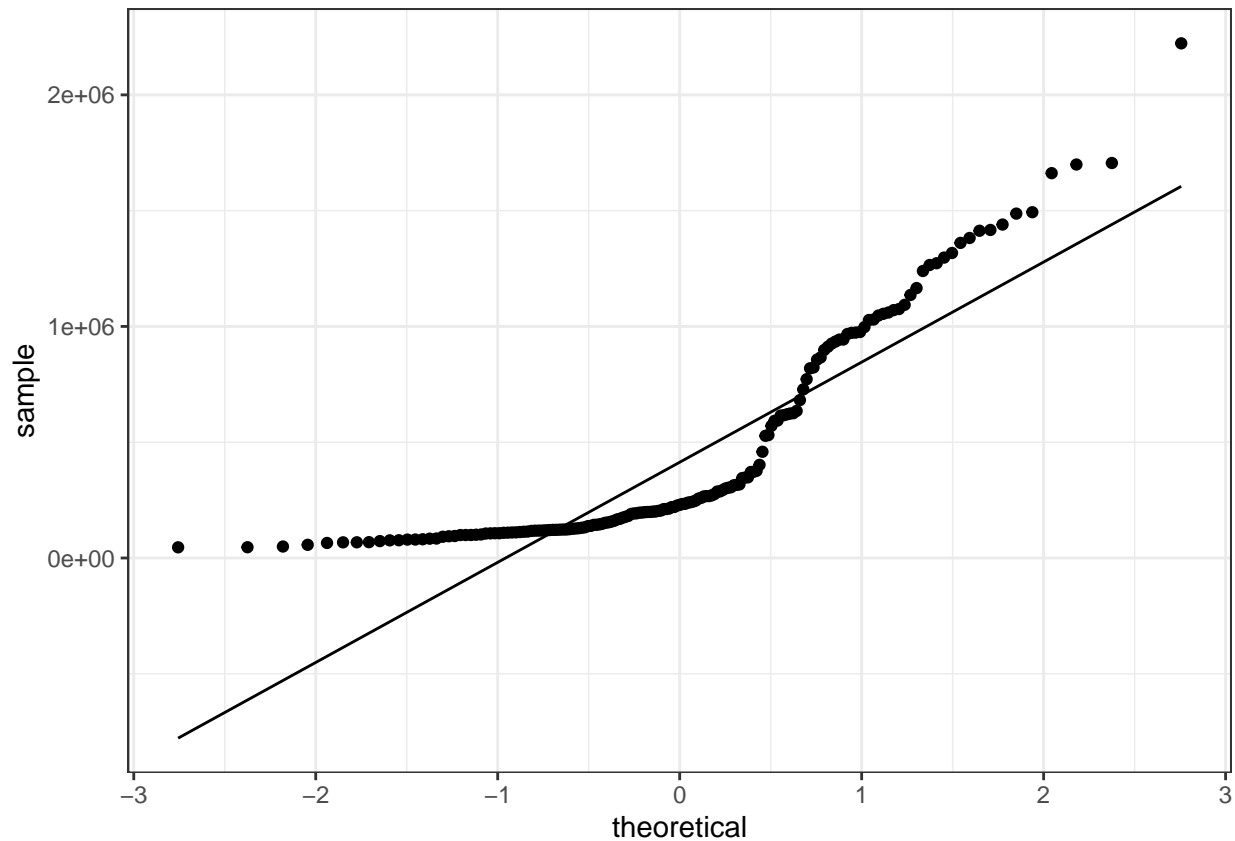
```
geom_histogram(position = "dodge") +
labs(title="Histogram of NCAA Div. I Men's Head Coach Salary", x = "Salary (USD)",
      y = "Count", fill = "School Type:") +
theme(
  legend.position="bottom",
  panel.background = element_rect(fill = 'white', color = 'grey'),
  panel.grid.major = element_line(size = 0.25, linetype = 'solid',
                                   color = "grey"),
  panel.grid.minor = element_line(size = 0.1, linetype = 'solid',
                                   color = "grey")
)
```



```
hd.coach.salary_data %>%
  filter(grepl('Private', sector_name)) %>%
  ggplot(aes(sample = HDcoach_salary_men)) +
  stat_qq() + stat_qq_line() + theme_bw()
```



```
hd.coach.salary_data %>%  
  filter(grepl('Public', sector_name)) %>%  
  ggplot(aes(sample = HDcoach_salary_men)) +  
  stat_qq() + stat_qq_line() + theme_bw()
```

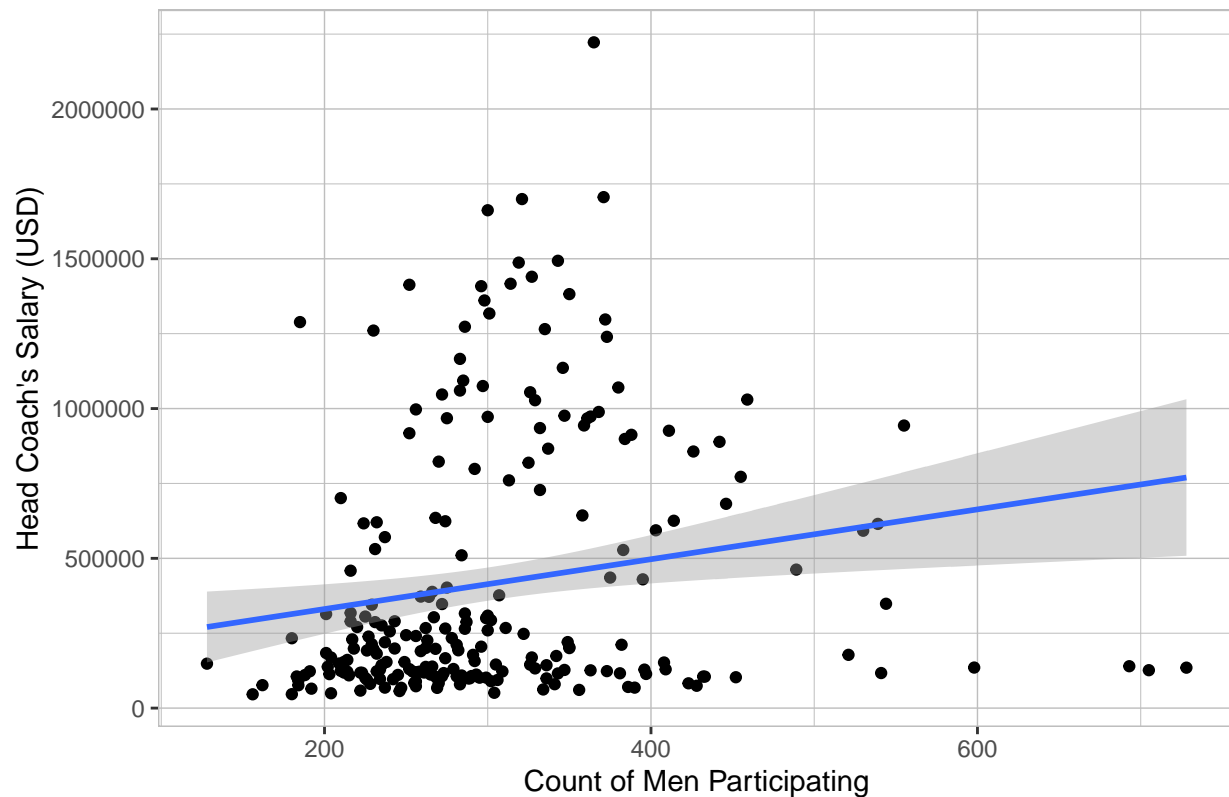



Describing and Visualizing Participation of Men and Head Coach Salaries

```
men.participation.data <- ncaa.div.i_data %>%
  select(IL_PARTIC_MEN, HDCOACH_SALARY_MEN)

men.participation.data %>% ggplot(aes(x=IL_PARTIC_MEN, y=HDCOACH_SALARY_MEN)) +
  geom_point() +
  geom_smooth(method = lm) +
  labs(title="Scatterplot of Men's Head Coach Salary by Men Particiation Counts", x = "Count of Men Par",
        y = "Head Coach's Salary (USD)") +
  theme(
    panel.background = element_rect(fill = 'white', color = 'grey'),
    panel.grid.major = element_line(size = 0.25, linetype = 'solid',
                                     color = "grey"),
    panel.grid.minor = element_line(size = 0.1, linetype = 'solid',
                                     color = "grey")
  )
```

Scatterplot of Men's Head Coach Salary by Men Participation Counts



Results of Head Coach data

Results of Participation of Men and Head Coach Salaries

Conclusion

Session Info

```
sessionInfo()
```

```
## R version 3.6.1 (2019-07-05)
## Platform: x86_64-apple-darwin15.6.0 (64-bit)
## Running under: macOS High Sierra 10.13.6
##
## Matrix products: default
## BLAS:   /Library/Frameworks/R.framework/Versions/3.6/Resources/lib/libRblas.0.dylib
## LAPACK: /Library/Frameworks/R.framework/Versions/3.6/Resources/lib/libRlapack.dylib
##
## locale:
##  [1] en_US.UTF-8/en_US.UTF-8/en_US.UTF-8/C/en_US.UTF-8/en_US.UTF-8
##
## attached base packages:
```

```
## [1] stats      graphics  grDevices  utils      datasets  methods   base
##
## other attached packages:
## [1] haven_2.1.1      magrittr_1.5      kableExtra_1.1.0  knitr_1.24
## [5] forcats_0.4.0    stringr_1.4.0     dplyr_0.8.3       purrr_0.3.2
## [9] readr_1.3.1      tidyr_0.8.3       tibble_2.1.3      ggplot2_3.2.1
## [13] tidyverse_1.2.1  pander_0.6.3      pgirmess_1.6.9
##
## loaded via a namespace (and not attached):
## [1] httr_1.4.1        viridisLite_0.3.0  jsonlite_1.6
## [4] splines_3.6.1     modelr_0.1.5        gtools_3.8.1
## [7] assertthat_0.2.1  expm_0.999-4        sp_1.3-1
## [10] cellranger_1.1.0  yaml_2.2.0          LearnBayes_2.15.1
## [13] pillar_1.4.2      backports_1.1.4     lattice_0.20-38
## [16] glue_1.3.1        digest_0.6.20       rvest_0.3.4
## [19] colorspace_1.4-1  htmltools_0.4.0     Matrix_1.2-17
## [22] pkgconfig_2.0.2   broom_0.5.2         gmodels_2.18.1
## [25] webshot_0.5.1     scales_1.0.0        gdata_2.18.0
## [28] generics_0.0.2    withr_2.1.2         lazyeval_0.2.2
## [31] cli_1.1.0         crayon_1.3.4        readxl_1.3.1
## [34] deldir_0.1-23     maptools_0.9-8      evaluate_0.14
## [37] fansi_0.4.0       nlme_3.1-140        MASS_7.3-51.4
## [40] xml2_1.2.2        foreign_0.8-71      class_7.3-15
## [43] tools_3.6.1       hms_0.5.1           munsell_0.5.0
## [46] compiler_3.6.1    e1071_1.7-2         rlang_0.4.0
## [49] classInt_0.4-2    units_0.6-5         grid_3.6.1
## [52] rstudioapi_0.10   labeling_0.3         rmarkdown_1.15
## [55] boot_1.3-22       gtable_0.3.0        DBI_1.0.0
## [58] R6_2.4.0          splancs_2.01-40     lubridate_1.7.4
## [61] rgdal_1.4-6       utf8_1.1.4          rgeos_0.5-2
## [64] zeallot_0.1.0     spdep_1.1-3         KernSmooth_2.23-15
## [67] stringi_1.4.3     Rcpp_1.0.2          vctrs_0.2.0
## [70] sf_0.8-0          spData_0.3.2        tidyselect_0.2.5
## [73] xfun_0.9          coda_0.19-3
```

References

Office of Postsecondary Education. 2018. “Equity in Athletics Data Analysis.” U.S. Department of Education. <https://ope.ed.gov/athletics/#/datafile/list>.

R Core Team. 2019. *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing. <https://www.R-project.org/>.