YRBS Statistical Appendix

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# Libraries

library(mosaic)  
library(readstata13)  
library(arm)  
library(table1)  
#library(tab)  
library(faraway)  
options(digits=3)

yrbs=read.dta13("~/Documents/yrbs/yrbs2021.dta")

# Bivariate analysis

## Outcome

Outcome: Past-Month Frequency of Poor Mental Health (Q85):

yrbs$Poor.Mental.Health.Often=factor(yrbs$QN85==1, levels=c(T, F), labels=c("Frequent Poor Mental Health in Past Month", "Infrequent Poor Mental Health in Past Month"))  
label(yrbs$Poor.Mental.Health.Often)="Frequency of Poor Mental Health in Past Month"  
tally(Q85 ~ Poor.Mental.Health.Often , data=yrbs)

## Poor.Mental.Health.Often  
## Q85 Frequent Poor Mental Health in Past Month  
## Never 0  
## Rarely 0  
## Sometimes 0  
## Most of the time 2545  
## Always 1184  
## <NA> 0  
## Poor.Mental.Health.Often  
## Q85 Infrequent Poor Mental Health in Past Month <NA>  
## Never 2893 0  
## Rarely 2648 0  
## Sometimes 3525 0  
## Most of the time 0 0  
## Always 0 0  
## <NA> 0 4437

tally(~ Poor.Mental.Health.Often , format = "percent", data=yrbs, useNA="no")

## Poor.Mental.Health.Often  
## Frequent Poor Mental Health in Past Month   
## 29.1   
## Infrequent Poor Mental Health in Past Month   
## 70.9

## Predictor

Predictor: Past-Month Cigarette Smoking (Q32):

yrbs$Cigarette.Smoking = factor(yrbs$QN32==1, levels=c(T, F), labels=c("Smoked Cigarettes in Past Month", "Didn't Smoke Cigarettes in Past Month"))  
label(yrbs$Cigarette.Smoking)="Any Cigarette Smoking in Past Month"  
tally(Q32 ~ Cigarette.Smoking , data=yrbs)

## Cigarette.Smoking  
## Q32 Smoked Cigarettes in Past Month  
## 0 days 0  
## 1 or 2 days 302  
## 3 to 5 days 111  
## 6 to 9 days 45  
## 10 to 19 days 72  
## 20 to 29 days 25  
## All 30 days 104  
## <NA> 0  
## Cigarette.Smoking  
## Q32 Didn't Smoke Cigarettes in Past Month <NA>  
## 0 days 16253 0  
## 1 or 2 days 0 0  
## 3 to 5 days 0 0  
## 6 to 9 days 0 0  
## 10 to 19 days 0 0  
## 20 to 29 days 0 0  
## All 30 days 0 0  
## <NA> 0 320

tally(~ Cigarette.Smoking , format = "percent", data=yrbs, useNA="no")

## Cigarette.Smoking  
## Smoked Cigarettes in Past Month Didn't Smoke Cigarettes in Past Month   
## 3.9 96.1

## Covariates

Control variables: age (Q1), sex (Q2), electronic vaping (Q35), alcohol use (Q41), marijuana use (Q47).

Age:

yrbs$Age = as.numeric(yrbs$Q1)+11  
label(yrbs$Age)="Age in years"  
tally(Q1~Age, data=yrbs)

## Age  
## Q1 12 13 14 15 16 17 18 <NA>  
## 12 years old or younger 39 0 0 0 0 0 0 0  
## 13 years old 0 62 0 0 0 0 0 0  
## 14 years old 0 0 3403 0 0 0 0 0  
## 15 years old 0 0 0 4427 0 0 0 0  
## 16 years old 0 0 0 0 4276 0 0 0  
## 17 years old 0 0 0 0 0 3904 0 0  
## 18 years old or older 0 0 0 0 0 0 1023 0  
## <NA> 0 0 0 0 0 0 0 98

favstats(yrbs$Age)

## min Q1 median Q3 max mean sd n missing  
## 12 15 16 17 18 15.7 1.22 17134 98

Sex:

yrbs$Sex= factor(yrbs$Q2=="Female", levels=c(T, F), labels=c("Female", "Male"))  
label(yrbs$Sex)="Sex"  
tally(Q2~Sex, data=yrbs)

## Sex  
## Q2 Female Male <NA>  
## Female 8152 0 0  
## Male 0 8816 0  
## <NA> 0 0 264

tally(~ Sex , format = "percent", data=yrbs, useNA="no")

## Sex  
## Female Male   
## 48 52

Past month electronic vaping:

yrbs$Vaping = factor(yrbs$QN35==1, levels=c(T, F), labels=c("Vaped in Past Month", "Didn't Vape in Past Month"))  
label(yrbs$Vaping)="Any Electronic Vapor Use in Past Month"  
tally(Q35 ~ Vaping , data=yrbs)

## Vaping  
## Q35 Vaped in Past Month Didn't Vape in Past Month <NA>  
## 0 days 0 13155 0  
## 1 or 2 days 674 0 0  
## 3 to 5 days 373 0 0  
## 6 to 9 days 266 0 0  
## 10 to 19 days 394 0 0  
## 20 to 29 days 334 0 0  
## All 30 days 881 0 0  
## <NA> 0 0 1155

Past month alcohol use:

yrbs$Alcohol.Drinking = factor(yrbs$QN41==1, levels=c(T, F), labels=c("Drank Alcohol in Past Month", "Didn't Drink Alcohol in Past Month"))  
label(yrbs$Alcohol.Drinking)="Any Alcohol Consumption in Past Month"  
tally(Q41 ~ Alcohol.Drinking , data=yrbs)

## Alcohol.Drinking  
## Q41 Drank Alcohol in Past Month Didn't Drink Alcohol in Past Month  
## 0 days 0 12586  
## 1 or 2 days 1991 0  
## 3 to 5 days 850 0  
## 6 to 9 days 441 0  
## 10 to 19 days 220 0  
## 20 to 29 days 54 0  
## All 30 days 92 0  
## <NA> 0 0  
## Alcohol.Drinking  
## Q41 <NA>  
## 0 days 0  
## 1 or 2 days 0  
## 3 to 5 days 0  
## 6 to 9 days 0  
## 10 to 19 days 0  
## 20 to 29 days 0  
## All 30 days 0  
## <NA> 998

Past month marijuana use:

yrbs$Marijuana.Use = factor(yrbs$QN47==1, levels=c(T, F), labels=c("Used Marijuana in Past Month", "Didn't Use Marijuana in Past Month"))  
label(yrbs$Marijuana.Use)="Any Marijuana Consumption in Past Month"  
tally(Q47 ~ Marijuana.Use , data=yrbs)

## Marijuana.Use  
## Q47 Used Marijuana in Past Month  
## 0 times 0  
## 1 or 2 times 875  
## 3 to 9 times 529  
## 10 to 19 times 353  
## 20 to 39 times 315  
## 40 or more times 575  
## <NA> 0  
## Marijuana.Use  
## Q47 Didn't Use Marijuana in Past Month <NA>  
## 0 times 14250 0  
## 1 or 2 times 0 0  
## 3 to 9 times 0 0  
## 10 to 19 times 0 0  
## 20 to 39 times 0 0  
## 40 or more times 0 0  
## <NA> 0 335

## Survey Weighted Association

library(survey)

## Loading required package: grid

## Loading required package: survival

##   
## Attaching package: 'survival'

## The following objects are masked from 'package:faraway':  
##   
## rats, solder

##   
## Attaching package: 'survey'

## The following object is masked from 'package:graphics':  
##   
## dotchart

yrbsdes <- svydesign(id=~PSU, weight=~WEIGHT, strata=~STRATUM,data=yrbs, nest=T)

svyby(~Poor.Mental.Health.Often, ~Cigarette.Smoking, design=yrbsdes, svymean, na.rm=T)

## Cigarette.Smoking  
## Smoked Cigarettes in Past Month Smoked Cigarettes in Past Month  
## Didn't Smoke Cigarettes in Past Month Didn't Smoke Cigarettes in Past Month  
## Poor.Mental.Health.OftenFrequent Poor Mental Health in Past Month  
## Smoked Cigarettes in Past Month 0.465  
## Didn't Smoke Cigarettes in Past Month 0.283  
## Poor.Mental.Health.OftenInfrequent Poor Mental Health in Past Month  
## Smoked Cigarettes in Past Month 0.535  
## Didn't Smoke Cigarettes in Past Month 0.717  
## se.Poor.Mental.Health.OftenFrequent Poor Mental Health in Past Month  
## Smoked Cigarettes in Past Month 0.05142  
## Didn't Smoke Cigarettes in Past Month 0.00683  
## se.Poor.Mental.Health.OftenInfrequent Poor Mental Health in Past Month  
## Smoked Cigarettes in Past Month 0.05142  
## Didn't Smoke Cigarettes in Past Month 0.00683

svychisq(~Poor.Mental.Health.Often + Cigarette.Smoking, design=yrbsdes)

##   
## Pearson's X^2: Rao & Scott adjustment  
##   
## data: svychisq(~Poor.Mental.Health.Often + Cigarette.Smoking, design = yrbsdes)  
## F = 17, ndf = 1, ddf = 41, p-value = 2e-04

Among adolescents who have smoked in the past month, 46.5% have had frequent poor mental health; among adolescents who have not smoked in the past month, 28.3% have had frequent poor mental health, which is significantly lower (p<0.001).

# Table 1

#tabmulti.svy(Poor.Mental.Health.Often + Age + Sex + Vaping + Alcohol.Drinking + Marijuana.Use ~ Cigarette.Smoking , design = yrbsdes)

# Survey Weighted Poisson Regression

Releveling the variables for our analysis:

yrbs$Cigarette.Smoking <- relevel(yrbs$Cigarette.Smoking, ref = "Didn't Smoke Cigarettes in Past Month")  
yrbs$Poor.Mental.Health.Often <- relevel(yrbs$Poor.Mental.Health.Often, ref = "Infrequent Poor Mental Health in Past Month")  
yrbs$Alcohol.Drinking <- relevel(yrbs$Alcohol.Drinking, ref = "Didn't Drink Alcohol in Past Month")  
yrbs$Marijuana.Use <- relevel(yrbs$Marijuana.Use, ref = "Didn't Use Marijuana in Past Month")  
yrbs$Vaping <- relevel(yrbs$Vaping, ref = "Didn't Vape in Past Month")

library(survey)  
yrbsdes <- svydesign(id=~PSU, weight=~WEIGHT, strata=~STRATUM,data=yrbs, nest=T)  
  
model=svyglm(as.numeric(Poor.Mental.Health.Often) ~ Cigarette.Smoking + Age + Sex + Alcohol.Drinking + Vaping + Marijuana.Use, family = poisson, design = yrbsdes)  
summary(model)

##   
## Call:  
## svyglm(formula = as.numeric(Poor.Mental.Health.Often) ~ Cigarette.Smoking +   
## Age + Sex + Alcohol.Drinking + Vaping + Marijuana.Use, design = yrbsdes,   
## family = poisson)  
##   
## Survey design:  
## svydesign(id = ~PSU, weight = ~WEIGHT, strata = ~STRATUM, data = yrbs,   
## nest = T)  
##   
## Coefficients:  
## Estimate Std. Error t value  
## (Intercept) 0.32164 0.06070 5.30  
## Cigarette.SmokingSmoked Cigarettes in Past Month 0.06505 0.02677 2.43  
## Age -0.00105 0.00385 -0.27  
## SexMale -0.16684 0.00879 -18.99  
## Alcohol.DrinkingDrank Alcohol in Past Month 0.04329 0.01437 3.01  
## VapingVaped in Past Month 0.02155 0.01472 1.46  
## Marijuana.UseUsed Marijuana in Past Month 0.08714 0.01139 7.65  
## Pr(>|t|)   
## (Intercept) 8.3e-06 \*\*\*  
## Cigarette.SmokingSmoked Cigarettes in Past Month 0.021 \*   
## Age 0.787   
## SexMale < 2e-16 \*\*\*  
## Alcohol.DrinkingDrank Alcohol in Past Month 0.005 \*\*   
## VapingVaped in Past Month 0.153   
## Marijuana.UseUsed Marijuana in Past Month 1.0e-08 \*\*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## (Dispersion parameter for poisson family taken to be 0.173)  
##   
## Number of Fisher Scoring iterations: 4

cbind(exp(coef(model)), exp(confint(model)))

## 2.5 % 97.5 %  
## (Intercept) 1.379 1.219 1.561  
## Cigarette.SmokingSmoked Cigarettes in Past Month 1.067 1.011 1.127  
## Age 0.999 0.991 1.007  
## SexMale 0.846 0.831 0.862  
## Alcohol.DrinkingDrank Alcohol in Past Month 1.044 1.014 1.075  
## VapingVaped in Past Month 1.022 0.992 1.053  
## Marijuana.UseUsed Marijuana in Past Month 1.091 1.066 1.117

Cigarette smoking in past month was associated with 7% higher prevalence of frequent poor mental health (APR = 1.07, 95% CI (1.01, 1.13)), adjusting for age, sex, and past-month alcohol, marijuana, and vaping product use. Adolescents who consumed alcohol or marijuana in the past month were more likely to experience frequent poor mental health than those who did not consume these substances, while male adolescents were less likely to experience frequent poor mental health than female adolescents. Age and usage of vaping products did not seem to impact the likelihood of frequent poor mental health.

## Effect Modification by Sex:

library(survey)  
yrbsdes <- svydesign(id=~PSU, weight=~WEIGHT, strata=~STRATUM,data=yrbs, nest=T)  
  
model4=svyglm(as.numeric(Poor.Mental.Health.Often) ~ Cigarette.Smoking + Age + Sex + Alcohol.Drinking + Vaping + Marijuana.Use + Cigarette.Smoking\*Sex, family = poisson, design = yrbsdes)  
summary(model4)

##   
## Call:  
## svyglm(formula = as.numeric(Poor.Mental.Health.Often) ~ Cigarette.Smoking +   
## Age + Sex + Alcohol.Drinking + Vaping + Marijuana.Use + Cigarette.Smoking \*   
## Sex, design = yrbsdes, family = poisson)  
##   
## Survey design:  
## svydesign(id = ~PSU, weight = ~WEIGHT, strata = ~STRATUM, data = yrbs,   
## nest = T)  
##   
## Coefficients:  
## Estimate Std. Error  
## (Intercept) 0.32075 0.06166  
## Cigarette.SmokingSmoked Cigarettes in Past Month 0.07258 0.02661  
## Age -0.00101 0.00389  
## SexMale -0.16620 0.00943  
## Alcohol.DrinkingDrank Alcohol in Past Month 0.04339 0.01421  
## VapingVaped in Past Month 0.02157 0.01472  
## Marijuana.UseUsed Marijuana in Past Month 0.08703 0.01145  
## Cigarette.SmokingSmoked Cigarettes in Past Month:SexMale -0.01538 0.04965  
## t value Pr(>|t|)   
## (Intercept) 5.20 1.2e-05 \*\*\*  
## Cigarette.SmokingSmoked Cigarettes in Past Month 2.73 0.0104 \*   
## Age -0.26 0.7958   
## SexMale -17.62 < 2e-16 \*\*\*  
## Alcohol.DrinkingDrank Alcohol in Past Month 3.05 0.0046 \*\*   
## VapingVaped in Past Month 1.47 0.1529   
## Marijuana.UseUsed Marijuana in Past Month 7.60 1.4e-08 \*\*\*  
## Cigarette.SmokingSmoked Cigarettes in Past Month:SexMale -0.31 0.7589   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## (Dispersion parameter for poisson family taken to be 0.173)  
##   
## Number of Fisher Scoring iterations: 4

cbind(exp(coef(model4)), exp(confint(model4)))

## 2.5 % 97.5 %  
## (Intercept) 1.378 1.215 1.563  
## Cigarette.SmokingSmoked Cigarettes in Past Month 1.075 1.018 1.135  
## Age 0.999 0.991 1.007  
## SexMale 0.847 0.831 0.863  
## Alcohol.DrinkingDrank Alcohol in Past Month 1.044 1.015 1.075  
## VapingVaped in Past Month 1.022 0.992 1.053  
## Marijuana.UseUsed Marijuana in Past Month 1.091 1.066 1.117  
## Cigarette.SmokingSmoked Cigarettes in Past Month:SexMale 0.985 0.890 1.090

No effect modification by sex.