diabetesSEM

STAT 360, 4/8/22
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```
diabetesIndicators <- read_excel("diabetesIndicators.xlsx")
```

```
data <- diabetesIndicators %>%
  mutate(diabetesTF = as.numeric(ifelse(Diabetes_012 > 1, 1, 0)))
```

```
dataT <- data
dataT$BMI <- 1/data$BMI
dataT$Income <- data$Income^4
dataT$GenHlth <- sqrt(data$GenHlth)
dataT$Education <- data$Education^4
```

Because we only have one response variable, we cannot have any clusters, so we don't have any loading matrices/ calculations for that side of things. We remove two variable when we create the explanatory-variable-only matrix because we have two response variables (one generated by the other, we are only going to be using diabetesTF)

```
dat <- dataT[,c(2:22)]

R <- cor(dat)
eigenVal <- eigen(R)$values
eigenVec <- eigen(R)$vectors
d <- sum(eigenVal >= 1)
d
```

```
## [1] 7
```

Using Kaiser's criteria, we have 7 eigen values above the threshold. In other words, we have 7 factors. We chose Kaiser's criterion because this provided already a substantial number of factors. We did not pick a lower threshold like Joliffe's criterion because, according to Joliffe, there would be 15 factors. This is a massive jump especially since there are only 20 variables in the original dataset (for explanatory variables). To further this point, later in this analysis, adding additional factors was not helpful anyways. As a result, we used Kaiser's criteria.

```
L <- diag(eigenVal[c(1:d)])
V <- eigenVec[,c(1:d)]

A <- V %*% sqrt(L)
```

```
Z <- scale(dat)
inv <- solve(R)

rotOt <- pca(R, nfactors = d, rotate = "varimax")$loadings[]
rotOb <- pca(R, nfactors = d, rotate = "oblimin")$loadings[]

BOt <- inv %*% rotOt
FOt <- Z %*% BOt

BOb <- inv %*% rotOb
FOb <- Z %*% BOb

cor(FOb)
```

```
##              TC1          TC4         TC6         TC2          TC3          TC7
## TC1  1.000000000  0.212689547 -0.10075782  0.05959143  0.035249031 -0.032686255
## TC4  0.212689547  1.000000000  0.07184993  0.01842221  0.009035975  0.118137617
## TC6 -0.100757817  0.071849933  1.00000000 -0.02019743  0.109414310 -0.171523840
## TC2  0.059591430  0.018422210 -0.02019743  1.00000000 -0.139044115 -0.090739621
## TC3  0.035249031  0.009035975  0.10941431 -0.13904412  1.000000000  0.009541214
## TC7 -0.032686255  0.118137617 -0.17152384 -0.09073962  0.009541214  1.000000000
## TC5  0.009872553 -0.005397148 -0.01468315  0.01175614  0.023834122 -0.060587781
##              TC5
## TC1  0.009872553
## TC4 -0.005397148
## TC6 -0.014683154
## TC2  0.011756140
## TC3  0.023834122
## TC7 -0.060587781
## TC5  1.000000000
```

In class, we decided that if the correlation is above 0.3 or less than -0.3, this means there is a significant correlation between factors. After looking through the correlation matrix above of our loading matrix that has been altered using oblique rotation, there are no correlations that are less than -0.3 or greater than 0.3. Although there are correlations that are close to this threshold, none of them pass, so an oblique rotation is not needed.

```
d2 <- d + 2
rotOt1 <- pca(R, nfactors = d2, rotate = "varimax")$loadings[]
print("Orthogonally rotated loading matrix using 7 factors (as per Kaiser's criterion)")
```

```
## [1] "Orthogonally rotated loading matrix using 7 factors (as per Kaiser's criterion)"
```

```
rotOt
```

```
##                              RC1          RC6          RC4          RC3
## HighBP                0.08852025  0.686045289 -0.174682097  0.009717405
## HighChol              0.05959685  0.588903040 -0.059437429  0.056203091
## CholCheck             0.08963070  0.256238847 -0.004862112  0.072398869
## BMI                  -0.18809658 -0.629837271 -0.103994986  0.211821118
## Smoker                0.06699898  0.110510187 -0.150953589 -0.094850892
## Stroke                0.17518058 -0.056644497 -0.024787186 -0.023646107
```

```
## HeartDiseaseorAttack  0.13843656  0.230649896 -0.004722441 -0.009345548
## PhysActivity         -0.31740655 -0.089597764  0.294237509  0.361988128
## Fruits               -0.05966460 -0.012171188 -0.016584071  0.720539050
## Veggies              -0.02119845  0.041636368  0.173613387  0.701681742
## HvyAlcoholConsump     0.04029255 -0.048758162  0.093286973  0.033022560
## AnyHealthcare         0.06221350 -0.004470572  0.168419302 -0.028597741
## NoDocbcCost           0.29320118  0.028509248 -0.086046032  0.093508465
## GenHlth               0.59693544  0.347182582 -0.215989214 -0.133955151
## MentHlth              0.69162626 -0.067889832  0.035107507 -0.024923564
## PhysHlth              0.76437092  0.075374833 -0.070806261 -0.022799960
## DiffWalk              0.62677443  0.186803379 -0.217369434 -0.037452079
## Sex                  -0.21470183  0.283107600  0.464397706 -0.342683883
## Age                  -0.09603335  0.368460377 -0.371734013  0.157641575
## Education            -0.05778701 -0.132403265  0.673588885  0.239583564
## Income               -0.21368805 -0.098200011  0.721285442  0.086626957
##                             RC2         RC7          RC5
## HighBP                0.08978591  0.15785970  0.052385599
## HighChol              0.09857905  0.14991066  0.105489020
## CholCheck             0.39285125 -0.15513519 -0.067195130
## BMI                   0.14773303  0.24734074  0.200694301
## Smoker               -0.08130963  0.18542771  0.648190894
## Stroke               -0.00474838  0.65959069 -0.062519266
## HeartDiseaseorAttack -0.02530557  0.64309613  0.038294117
## PhysActivity         -0.08634954  0.02074129  0.011397249
## Fruits                0.01817828  0.04821077 -0.118044001
## Veggies              -0.04380348 -0.06970281  0.076926418
## HvyAlcoholConsump     0.03831142 -0.18935796  0.767478195
## AnyHealthcare         0.72965494  0.02912816  0.004509130
## NoDocbcCost          -0.60542107 -0.05501506  0.003546362
## GenHlth              -0.07449888  0.17466919  0.015831049
## MentHlth             -0.13620648 -0.06477537  0.112377186
## PhysHlth              0.01472056  0.18922633  0.017685028
## DiffWalk              0.07580036  0.22092070 -0.031884824
## Sex                  -0.23367106  0.26895963  0.130851592
## Age                   0.38086617  0.39186222  0.103292932
## Education             0.18342794 -0.01223731 -0.095031039
## Income                0.21239849 -0.10274809  0.006436500
```

```
print("Orthogonally rotated loading matrix using 9 factors")
```

```
## [1] "Orthogonally rotated loading matrix using 9 factors"
```

```
rotOt1
```

```
##                             RC1         RC8         RC4          RC2
## HighBP                0.14270945  0.73289946 -0.12233981  0.016871740
## HighChol              0.06509643  0.70677749  0.05400438 -0.052208125
## CholCheck             0.01910859  0.11105054 -0.02954135  0.114339485
## BMI                  -0.27208773 -0.41518781 -0.01340410  0.101631354
## Smoker                0.14515570 -0.02371331 -0.43843703  0.087807771
## Stroke                0.15651951  0.07919454  0.02479704 -0.057579691
## HeartDiseaseorAttack  0.18436155  0.26046116 -0.07169564  0.005211554
## PhysActivity         -0.37756479 -0.11592857  0.25079741 -0.150446984
```

```
## Fruits               -0.05356347 -0.01108549  0.01345132  0.038975770
## Veggies              -0.01100364 -0.01168856  0.13801486 -0.004289220
## HvyAlcoholConsump    -0.01632793  0.09105835  0.12183398 -0.051439152
## AnyHealthcare         0.10718167  0.02150934  0.20001002  0.712010415
## NoDocbcCost           0.20311135  0.01218712 -0.04701914 -0.727415375
## GenHlth               0.64733525  0.27468956 -0.24476955 -0.078313028
## MentHlth              0.64137596 -0.11276392  0.06241112 -0.239072753
## PhysHlth              0.78773157  0.03094379 -0.06505575 -0.001214180
## DiffWalk              0.67529897  0.18354119 -0.18205665  0.078197020
## Sex                  -0.10331733  0.01909606  0.09861330  0.003667330
## Age                  -0.03140443  0.55083605 -0.27349561  0.362128852
## Education            -0.11060916 -0.04764983  0.77740565  0.091852574
## Income               -0.22854922 -0.11419016  0.69935942  0.205502803
##                             RC3          RC7          RC6          RC5
## HighBP               -0.017519281  0.042117787  0.071926044 -0.013928224
## HighChol             -0.053060207  0.108978872 -0.020821632  0.095210351
## CholCheck            -0.006286401 -0.004757031 -0.028608631 -0.043879322
## BMI                   0.098879481  0.437536005 -0.335912229  0.283380769
## Smoker                0.088689309  0.093800129  0.425158948  0.505729305
## Stroke               -0.093230603  0.703540178 -0.012752391 -0.067458810
## HeartDiseaseorAttack  0.025511590  0.574532135  0.237780765 -0.044943989
## PhysActivity          0.319854740  0.116772948  0.074790253  0.045974438
## Fruits                0.750002462  0.032796248 -0.128590829 -0.119400233
## Veggies               0.760490252 -0.104974701  0.022218567  0.073751142
## HvyAlcoholConsump    -0.068992291 -0.100788443 -0.069842903  0.831365165
## AnyHealthcare        -0.002948904 -0.001450823 -0.053730492  0.020718585
## NoDocbcCost          -0.004870303  0.044092011 -0.066217220  0.042817524
## GenHlth              -0.077236781  0.077802847  0.099104629 -0.053545809
## MentHlth             -0.062630705 -0.001026385 -0.077481881  0.162104839
## PhysHlth              0.017477105  0.143853587 -0.005649783  0.001439319
## DiffWalk              0.002932505  0.137496513 -0.046151642 -0.071803381
## Sex                  -0.104934153  0.080773882  0.833361007 -0.025753374
## Age                   0.128686576  0.309238120 -0.132292310  0.039823333
## Education             0.141819521  0.044971100 -0.031904391  0.024098208
## Income                0.077712155 -0.093699591  0.176973116  0.076610608
##                             RC9
## HighBP                0.038049353
## HighChol              0.072984620
## CholCheck             0.938136904
## BMI                  -0.004293975
## Smoker                0.036714719
## Stroke                0.005712239
## HeartDiseaseorAttack  0.002805088
## PhysActivity          0.235320610
## Fruits               -0.002442106
## Veggies              -0.014597471
## HvyAlcoholConsump    -0.048936948
## AnyHealthcare         0.173318380
## NoDocbcCost           0.041761089
## GenHlth               0.022407109
## MentHlth              0.107408990
## PhysHlth              0.003395973
## DiffWalk             -0.060864460
## Sex                  -0.029506297
```

```
## Age                  -0.047601474
## Education            -0.026705790
## Income                0.014189784
```

After performing an orthogonal rotation to get our optimal rotated loading matrix, we found that we had several variables that were complex. We partially resolved this by adding 2 additional factors. After this, we still had four variables that load onto more than one factor. These four variables are BMI, Smoker, PhysActivity, and Age. We were unable to find an amount of factors (within reason) that could contain more variables without complexity, therefore, we decided to retain the mentioned complex variables as individual measured variables for further analysis.

```
rotOtTrim <- rotOt1[c(1,2,3,6,7,8,9,10,11,12,13,14,15,16,17,18,20,21),]
rotOtTrim2 <- rotOtTrim^2
var <- 0
vec <- c()
for(i in 1:d2)
{
  vec <- append(vec, ((sum(rotOtTrim2[,i]) + (4/d2)) / 21))
  var <- var + ((sum(rotOtTrim2[,i]) + (4/d2)) / 21)

}
varOt <- pca(R, nfactors = d2, rotate = "varimax")$Vaccounted

varOt[2,]
```

```
##        RC1        RC8        RC4        RC2        RC3        RC7        RC6
## 0.11239037 0.08383690 0.07787031 0.06436187 0.06390579 0.05882900 0.05494351
##        RC5        RC9
## 0.05295542 0.04751719
```

```
vec
```

```
## [1] 0.12897877 0.08231694 0.08631021 0.07842225 0.08344109 0.06590424 0.06129332
## [8] 0.05804074 0.06850825
```

```
var
```

```
## [1] 0.7132158
```

Because we removed some of our variables from our set of factors, we manually calculated the variance retained. Above you can see the original variance, variance with the 4 removed variables accounted for, and the sum of variance explained with our manual calculation. With our 9 factors and 4 individual variables, we account for ~71.32% of the variance within our original variables.

```
commOt <- pca(R, nfactors = d2, rotate = "varimax")$communality
commOt
```

```
##               HighBP             HighChol            CholCheck
##            0.5816552            0.5389312            0.9095504
##                  BMI               Smoker               Stroke
##            0.6512963            0.6761042            0.5431071
## HeartDiseaseorAttack         PhysActivity               Fruits
```

```
##           0.4963022           0.4205542           0.5990692
##              Veggies    HvyAlcoholConsump        AnyHealthcare
##           0.6148353           0.7394069           0.5922797
##          NoDocbcCost             GenHlth            MentHlth
##           0.5826765           0.5857521           0.5328715
##            PhysHlth            DiffWalk                 Sex
##           0.6467571           0.5588795           0.7343372
##                 Age           Education              Income
##           0.6438852           0.6517483           0.6488179
```

58.17% of the variance in HighBP is retained with our dimensionality reduction 53.89% of the variance in HighChol is retained with our dimensionality reduction 90.96% of the variance in CholCheck is retained with our dimensionality reduction 65.13% of the variance in BMI is retained with our dimensionality reduction 67.61% of the variance in Smoker is retained with our dimensionality reduction 54.31% of the variance in Stroke is retained with our dimensionality reduction 49.63% of the variance in HeartDiseaseorAttack is retained with our dimensionality reduction 42.06% of the variance in PhysActivity is retained with our dimensionality reduction 59.91% of the variance in Fruits is retained with our dimensionality reduction 61.48% of the variance in Veggies is retained with our dimensionality reduction 73.94% of the variance in HvyAlcoholConsump is retained with our dimensionality reduction 59.23% of the variance in AnyHealthCare is retained with our dimensionality reduction
58.27% of the variance in NoDocbsCost is retained with our dimensionality reduction
58.58% of the variance in GenHlth is retained with our dimensionality reduction
53.29% of the variance in MentHlth is retained with our dimensionality reduction
64.68% of the variance in PhysHlth is retained with our dimensionality reduction
55.89% of the variance in DiffWalk is retained with our dimensionality reduction 73.43% of the variance in Sex is retained with our dimensionality reduction 64.39% of the variance in Age is retained with our dimensionality reduction
65.17% of the variance in Education is retained with our dimensionality reduction
64.88% of the variance of Income is retained with our dimensionality reduction

```
#EQN1 <- '
#          HEALTH =~ GenHlth + PhysHlth + MentHlth + DiffWalk
#          HEALTHCARE =~ NoDocbcCost + AnyHealthcare
#          DIET =~ Fruits + Veggies
#          CLASS =~ Education + Income
#          SUBSTANCE =~ HvyAlcoholConsump
#          BODY =~ Sex
#          HISTORY =~ Stroke + HeartDiseaseorAttack
#          BLOOD =~ HighBP + HighChol
#          diabetesTF ~ HEALTH + HEALTHCARE + DIET + CLASS + SUBSTANCE + BODY + HISTORY + BLOOD +
#  '

EQN1 <- '
          HEALTH =~ GenHlth + PhysHlth + MentHlth + DiffWalk
          HEALTHCARE =~ NoDocbcCost + AnyHealthcare
          DIET =~ Fruits + Veggies
          CLASS =~ Education + Income
          HISTORY =~ Stroke + HeartDiseaseorAttack
          BLOOD =~ HighBP + HighChol
          diabetesTF ~ HEALTH + HEALTHCARE + DIET + CLASS + HISTORY + BLOOD + CholCheck + BMI + Smoker +
        '
```

```
library(lavaan)
```

```
## Warning: package 'lavaan' was built under R version 4.1.2
```

```
## This is lavaan 0.6-11
## lavaan is FREE software! Please report any bugs.
```

```
##
## Attaching package: 'lavaan'
```

```
## The following object is masked from 'package:psych':
##
##     cor2cov
```

```
M1 <- sem(model = EQN1, data = scale(dataT))
parameterEstimates(M1)
```

```
##                    lhs op                 rhs    est    se        z pvalue
## 1               HEALTH =~             GenHlth  1.000 0.000       NA     NA
## 2               HEALTH =~            PhysHlth  0.930 0.003  269.966  0.000
## 3               HEALTH =~            MentHlth  0.564 0.003  176.758  0.000
## 4               HEALTH =~            DiffWalk  0.876 0.003  259.482  0.000
## 5           HEALTHCARE =~         NoDocbcCost  1.000 0.000       NA     NA
## 6           HEALTHCARE =~       AnyHealthcare -0.636 0.009  -70.302  0.000
## 7                 DIET =~              Fruits  1.000 0.000       NA     NA
## 8                 DIET =~             Veggies  1.551 0.028   55.202  0.000
## 9               CLASS =~           Education  1.000 0.000       NA     NA
## 10              CLASS =~              Income  1.369 0.008  163.722  0.000
## 11            HISTORY =~              Stroke  1.000 0.000       NA     NA
## 12            HISTORY =~ HeartDiseaseorAttack  1.443 0.014  102.057  0.000
## 13              BLOOD =~              HighBP  1.000 0.000       NA     NA
## 14              BLOOD =~            HighChol  0.737 0.006  126.242  0.000
## 15          diabetesTF  ~              HEALTH  0.157 0.006   27.628  0.000
## 16          diabetesTF  ~           HEALTHCARE -0.007 0.006   -1.254  0.210
## 17          diabetesTF  ~                DIET  0.004 0.007    0.533  0.594
## 18          diabetesTF  ~               CLASS -0.033 0.006   -5.314  0.000
## 19          diabetesTF  ~             HISTORY  0.160 0.015   10.606  0.000
## 20          diabetesTF  ~               BLOOD  0.355 0.008   44.149  0.000
## 21          diabetesTF  ~           CholCheck  0.025 0.002   13.434  0.000
## 22          diabetesTF  ~                 BMI -0.138 0.002  -74.181  0.000
## 23          diabetesTF  ~              Smoker -0.008 0.002   -4.354  0.000
## 24          diabetesTF  ~        PhysActivity -0.010 0.002   -5.643  0.000
## 25          diabetesTF  ~                 Age  0.067 0.002   36.207  0.000
## 26          diabetesTF  ~                 Sex  0.021 0.002   11.367  0.000
## 27          diabetesTF  ~   HvyAlcoholConsump -0.035 0.002  -19.173  0.000
## 28             GenHlth ~~             GenHlth  0.470 0.002  233.308  0.000
## 29            PhysHlth ~~            PhysHlth  0.541 0.002  263.556  0.000
## 30            MentHlth ~~            MentHlth  0.831 0.002  334.824  0.000
## 31            DiffWalk ~~            DiffWalk  0.593 0.002  281.853  0.000
## 32         NoDocbcCost ~~         NoDocbcCost  0.634 0.006  112.938  0.000
## 33       AnyHealthcare ~~       AnyHealthcare  0.852 0.003  264.693  0.000
```

```
## 34              Fruits ~~              Fruits  0.836 0.004  219.880  0.000
## 35             Veggies ~~             Veggies  0.605 0.007   81.851  0.000
## 36           Education ~~           Education  0.675 0.003  255.946  0.000
## 37              Income ~~              Income  0.391 0.004  108.478  0.000
## 38              Stroke ~~              Stroke  0.859 0.003  299.947  0.000
## 39 HeartDiseaseorAttack ~~ HeartDiseaseorAttack  0.707 0.004  187.092  0.000
## 40              HighBP ~~              HighBP  0.595 0.004  163.829  0.000
## 41            HighChol ~~            HighChol  0.780 0.003  278.192  0.000
## 42          diabetesTF ~~          diabetesTF  0.809 0.002  328.640  0.000
## 43              HEALTH ~~              HEALTH  0.530 0.003  182.300  0.000
## 44          HEALTHCARE ~~          HEALTHCARE  0.366 0.006   63.574  0.000
## 45                DIET ~~                DIET  0.164 0.003   48.729  0.000
## 46               CLASS ~~               CLASS  0.325 0.003  117.457  0.000
## 47             HISTORY ~~             HISTORY  0.141 0.002   66.707  0.000
## 48               BLOOD ~~               BLOOD  0.405 0.004  102.807  0.000
## 49              HEALTH ~~          HEALTHCARE  0.136 0.002   82.103  0.000
## 50              HEALTH ~~                DIET -0.066 0.001  -48.194  0.000
## 51              HEALTH ~~               CLASS -0.224 0.002 -132.921  0.000
## 52              HEALTH ~~             HISTORY  0.158 0.002   99.822  0.000
## 53              HEALTH ~~               BLOOD  0.236 0.002  135.070  0.000
## 54          HEALTHCARE ~~                DIET -0.028 0.001  -24.059  0.000
## 55          HEALTHCARE ~~               CLASS -0.139 0.002  -90.866  0.000
## 56          HEALTHCARE ~~             HISTORY  0.015 0.001   13.231  0.000
## 57          HEALTHCARE ~~               BLOOD -0.002 0.002   -1.495  0.135
## 58                DIET ~~               CLASS  0.073 0.001   53.727  0.000
## 59                DIET ~~             HISTORY -0.019 0.001  -23.458  0.000
## 60                DIET ~~               BLOOD -0.040 0.001  -32.603  0.000
## 61               CLASS ~~             HISTORY -0.073 0.001  -68.442  0.000
## 62               CLASS ~~               BLOOD -0.119 0.001  -83.930  0.000
## 63             HISTORY ~~               BLOOD  0.146 0.002   92.212  0.000
## 64           CholCheck ~~           CholCheck  1.000 0.000       NA     NA
## 65           CholCheck ~~                 BMI -0.040 0.000       NA     NA
## 66           CholCheck ~~              Smoker -0.010 0.000       NA     NA
## 67           CholCheck ~~        PhysActivity  0.004 0.000       NA     NA
## 68           CholCheck ~~                 Age  0.090 0.000       NA     NA
## 69           CholCheck ~~                 Sex -0.022 0.000       NA     NA
## 70           CholCheck ~~   HvyAlcoholConsump -0.024 0.000       NA     NA
## 71                 BMI ~~                 BMI  1.000 0.000       NA     NA
## 72                 BMI ~~              Smoker -0.017 0.000       NA     NA
## 73                 BMI ~~        PhysActivity  0.138 0.000       NA     NA
## 74                 BMI ~~                 Age  0.016 0.000       NA     NA
## 75                 BMI ~~                 Sex -0.091 0.000       NA     NA
## 76                 BMI ~~   HvyAlcoholConsump  0.051 0.000       NA     NA
## 77              Smoker ~~              Smoker  1.000 0.000       NA     NA
## 78              Smoker ~~        PhysActivity -0.087 0.000       NA     NA
## 79              Smoker ~~                 Age  0.121 0.000       NA     NA
## 80              Smoker ~~                 Sex  0.094 0.000       NA     NA
## 81              Smoker ~~   HvyAlcoholConsump  0.102 0.000       NA     NA
## 82        PhysActivity ~~        PhysActivity  1.000 0.000       NA     NA
## 83        PhysActivity ~~                 Age -0.093 0.000       NA     NA
## 84        PhysActivity ~~                 Sex  0.032 0.000       NA     NA
## 85        PhysActivity ~~   HvyAlcoholConsump  0.012 0.000       NA     NA
## 86                 Age ~~                 Age  1.000 0.000       NA     NA
## 87                 Age ~~                 Sex -0.027 0.000       NA     NA
```

```
## 88                 Age ~~    HvyAlcoholConsump -0.035 0.000       NA     NA
## 89                 Sex ~~                  Sex  1.000 0.000       NA     NA
## 90                 Sex ~~    HvyAlcoholConsump  0.006 0.000       NA     NA
## 91    HvyAlcoholConsump ~~    HvyAlcoholConsump  1.000 0.000       NA     NA
##    ci.lower ci.upper
## 1     1.000    1.000
## 2     0.924    0.937
## 3     0.558    0.570
## 4     0.870    0.883
## 5     1.000    1.000
## 6    -0.654   -0.618
## 7     1.000    1.000
## 8     1.496    1.606
## 9     1.000    1.000
## 10    1.352    1.385
## 11    1.000    1.000
## 12    1.415    1.471
## 13    1.000    1.000
## 14    0.725    0.748
## 15    0.146    0.168
## 16   -0.019    0.004
## 17   -0.011    0.019
## 18   -0.045   -0.021
## 19    0.130    0.189
## 20    0.339    0.371
## 21    0.021    0.028
## 22   -0.141   -0.134
## 23   -0.012   -0.004
## 24   -0.014   -0.007
## 25    0.064    0.071
## 26    0.017    0.025
## 27   -0.039   -0.032
## 28    0.466    0.474
## 29    0.537    0.545
## 30    0.827    0.836
## 31    0.589    0.597
## 32    0.623    0.645
## 33    0.846    0.858
## 34    0.829    0.843
## 35    0.591    0.620
## 36    0.670    0.680
## 37    0.384    0.398
## 38    0.854    0.865
## 39    0.700    0.714
## 40    0.588    0.602
## 41    0.775    0.786
## 42    0.804    0.814
## 43    0.524    0.536
## 44    0.354    0.377
## 45    0.157    0.171
## 46    0.320    0.330
## 47    0.137    0.145
## 48    0.397    0.412
## 49    0.133    0.139
```

```
## 50   -0.069   -0.064
## 51   -0.227   -0.220
## 52    0.155    0.161
## 53    0.232    0.239
## 54   -0.030   -0.026
## 55   -0.142   -0.136
## 56    0.013    0.017
## 57   -0.006    0.001
## 58    0.071    0.076
## 59   -0.020   -0.017
## 60   -0.042   -0.037
## 61   -0.075   -0.071
## 62   -0.122   -0.116
## 63    0.143    0.149
## 64    1.000    1.000
## 65   -0.040   -0.040
## 66   -0.010   -0.010
## 67    0.004    0.004
## 68    0.090    0.090
## 69   -0.022   -0.022
## 70   -0.024   -0.024
## 71    1.000    1.000
## 72   -0.017   -0.017
## 73    0.138    0.138
## 74    0.016    0.016
## 75   -0.091   -0.091
## 76    0.051    0.051
## 77    1.000    1.000
## 78   -0.087   -0.087
## 79    0.121    0.121
## 80    0.094    0.094
## 81    0.102    0.102
## 82    1.000    1.000
## 83   -0.093   -0.093
## 84    0.032    0.032
## 85    0.012    0.012
## 86    1.000    1.000
## 87   -0.027   -0.027
## 88   -0.035   -0.035
## 89    1.000    1.000
## 90    0.006    0.006
## 91    1.000    1.000
```

#identify degrees of freedom = data points - parameters

#We have 6 multidimensional factors, HEALTH, HEALTHCARE, DIET, CLASS, HISTORY, and BLOOD GenHlth, PhysHlth, MentHlth, and DiffWalk are all indicators of HEALTH. GenHlth was fixed so it has a standard error of 0. PhysHlth, MentHlth, and DiffWalk are all signifcant indicators of HEALTH and have a pvalue of 0. NoDocbcCost and AnyHealthcare are the indicators of HEALTHCARE. NoDocbcCost was fixed to 1 and AnyHealthcare is shown to be a significant indicator of HEALTHCARE.

INTERPRETATIONS OF INDICATORS- not sure what this means yet.

#Questions #do we calculate # or parameters based on the complete model or the more simple model? #Our EFA analysis worked best with 9 factors but 3 of them only have 1 variable load significantly on it so

we then decide to retain them as response variables right? #The indicators of multidimensional factors all have 1 which is fixed, how do we interpret the significance of this variable on the factor?

#How do we interpret scaled coefficients??