Data Recoding & Reliability Diagnostics

June 03, 2025

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### 0.0.1 Importing and Cleaning Raw Data

# ---- Set Paths ----  
base <- normalizePath(file.path("..", ".."), mustWork = FALSE)  
analyses <- file.path(base, "analyses")  
inp <- file.path(analyses, "inputs")  
oup <- file.path(analyses, "outputs")  
  
# ---- Load Raw Dataset ----  
rawdf <- read.csv(file.path(inp, "rawdata.csv")) # 219 responses -------  
nrow(rawdf)

## [1] 219

df <- rawdf %>%  
 filter(PROG > 70) # 150 responses ----  
nrow(df)

## [1] 150

df <- df %>%  
 filter(DURATION > 300) # 140 responses ---------  
nrow(df)

## [1] 140

# 1 Functions

#### 1.0.0.1 Realiability Diagnostics

reliFUN <- function(data, vars, title = "") {  
 cat("\n\n====================", title, "====================\n")  
  
 # Select and clean item set  
 items <- data %>%  
 dplyr::select(all\_of(vars)) %>%  
 dplyr::select(where(~ length(unique(na.omit(.))) > 1))  
 items\_clean <- items[rowSums(is.na(items)) <= 1, ]  
  
 # Cronbach’s Alpha  
 cat("\n=== Cronbach's Alpha ===\n")  
 alpha\_res <- psych::alpha(items\_clean, check.keys = TRUE)  
 print(alpha\_res)  
 cat("Raw Alpha:", round(alpha\_res$total$raw\_alpha, 3), "\n")  
 print(alpha\_res$alpha.drop)  
  
 # McDonald's Omega  
 cat("\n=== McDonald's Omega ===\n")  
 print(psych::omega(items\_clean))  
  
 # Factor Analysis (3-factor, ML) — only if there are ≥3 items  
 if (ncol(items\_clean) >= 3) {  
 cat("\n=== Factor Analysis (3-factor, ML) ===\n")  
 print(psych::fa(items\_clean, nfactors = 3, fm = "ml"))  
 } else {  
 cat("\nFactor analysis skipped: fewer than 3 items.\n")  
 }  
  
 # Greatest Lower Bound (GLB)  
 cat("\n=== Greatest Lower Bound ===\n")  
 print(psych::glb(items\_clean))  
  
 # Split-Half Reliability  
 cat("\n=== Split-Half Reliability ===\n")  
 print(psych::splitHalf(items\_clean))  
  
 # Average Inter-Item Correlation  
 cat("\n=== Average Inter-Item Correlation ===\n")  
 corr\_matrix <- cor(items\_clean, use = "pairwise.complete.obs")  
 mean\_corr <- mean(corr\_matrix[lower.tri(corr\_matrix)])  
 print(mean\_corr)  
  
 # Principal Component Analysis (1-factor) — only if there are ≥1 item  
 cat("\n=== Principal Component Analysis (1-factor) ===\n")  
 if (ncol(items\_clean) >= 1) {  
 print(psych::principal(items\_clean, nfactors = 1, rotate = "none"))  
 } else {  
 cat("Not enough items to run PCA.\n")  
 }  
}

# 2 DEMOGRAPHIC

#### 2.0.0.1 Recoding

df <- df %>%  
 mutate(  
 # RACE: White = 1, Non-White = 0 --------------  
 RACE\_BIN = case\_when(  
 RACE == "White" ~ 1,  
 !is.na(RACE) ~ 0,  
 TRUE ~ NA\_real\_),  
 # INCOME: Above Median = 1, Below = 0 -------  
 INCOME\_BIN = case\_when(  
 INCOME %in% c("$0-20,000", "$20,001-30,000", "$30,001-40,000", "$40,001-50,000", "$50,001-60,000") ~ 0,  
 INCOME %in% c("$60,001-70,000", "$70,001-80,000", "$80,001-90,000", "$90,001-100,000", "$100,001+") ~ 1,  
 TRUE ~ NA\_real\_),  
 # GENDER: Male = 1, Female = 0, Other/Prefer not = NA ----  
 GENDER\_BIN = case\_when(  
 GENDER == "Male" ~ 1,  
 GENDER == "Female" ~ 0,  
 TRUE ~ NA\_real\_),  
 RACE = as.factor(RACE),  
 GENDER = as.factor(GENDER),  
 ETHNICITY = as.factor(ETHNICITY),  
 INCOME = factor(INCOME, ordered = TRUE),  
 DOB = as.numeric(DOB),  
 RESIDENT\_BIN = ifelse(RESIDENT == "Yes", 1, 0))  
df <- df %>%  
 mutate(AGE = 2024 - DOB)  
median\_age <- median(df$AGE, na.rm = TRUE)  
median\_age

## [1] 36.5

## [1] 36.5  
 # AGE: Above median of respondents = 1, below = 0, ---------  
df <- df %>%  
 mutate(  
 AGE\_BIN = case\_when(  
 is.na(AGE) ~ NA\_real\_,  
 AGE >= median\_age ~ 1,  
 AGE < median\_age ~ 0))  
  
  
# Experience / Professional Identity ---------  
df <- df %>%  
 mutate(  
 SELFTITLE\_BIN = ifelse(SELFTITLE == "Yes", 1, 0),  
 AFFILIATE = as.factor(AFFILIATEfill),  
 ACTIVITY = as.factor(ACTIVITYfill),  
 LICENSE\_BIN = ifelse(LICENSE == "Yes", 1, ifelse(LICENSE == "No", 0, NA)),  
 BIOTIME = factor(BIOTIME,  
 levels = c("<1 year", "1-5 years", "5-10 years", "10-20 years", ">20 years"),  
 ordered = TRUE),  
 BIOTIME\_BIN = case\_when(  
 BIOTIME %in% c("10-20 years", ">20 years") ~ 1,  
 BIOTIME %in% c("<1 year", "1-5 years", "5-10 years") ~ 0,  
 TRUE ~ NA\_real\_))  
  
df <- df %>%  
 mutate(AFFILIATE\_GROUP = case\_when(  
 AFFILIATEfill %in% c("Federal Government", "State/Provincial Government") ~ "Government",  
 AFFILIATEfill == "Academic/Research Institution" ~ "Academic",  
 AFFILIATEfill %in% c("Nonprofit/Conservation Organization", "Professional Societies or Associations") ~ "Nonprofit",  
 AFFILIATEfill == "Private Industry" ~ "Private",  
 TRUE ~ "Other")) %>%  
 mutate(AFFILIATE\_GROUP = factor(AFFILIATE\_GROUP,  
 levels = c("Government", "Academic", "Nonprofit", "Private", "Other")))  
  
df <- df %>%  
 mutate(ACTIVITY\_GROUP = case\_when(  
 ACTIVITYfill %in% c("Research") ~ "Science/Technical",  
 ACTIVITYfill %in% c("Land/Wildlife Management", "Consulting") ~ "Fieldwork",  
 ACTIVITYfill %in% c("Education", "Administration") ~ "Education/Admin",  
 TRUE ~ "Other")) %>%  
 mutate(ACTIVITY\_GROUP = factor(ACTIVITY\_GROUP,  
 levels = c("Fieldwork", "Science/Technical", "Education/Admin", "Other")))  
  
  
# Education ---------------  
df <- df %>%  
 mutate(  
 EDUCATION = factor(EDUCATION,  
 levels = c(  
 "Did not graduate high school/no GED",  
 "High school graduate/GED",  
 "Technical/Vocational School",  
 "Some College/AA or AS (2-year degree)",  
 "College Graduate/BA or BS (4-year degree)",  
 "Graduate or Professional School"),  
 ordered = TRUE),  
 EDUCATION\_BIN = case\_when(  
 EDUCATION %in% c("College Graduate/BA or BS (4-year degree)",   
 "Graduate or Professional School") ~ 1,  
 EDUCATION %in% c("Did not graduate high school/no GED", "High school graduate/GED",  
 "Technical/Vocational School", "Some College/AA or AS (2-year degree)") ~ 0, TRUE ~ NA\_real\_),  
 DEGREE = as.factor(DEGREE),  
 DEGREE\_BIN = ifelse(DEGREE == "Yes", 1, 0),  
 TWS = as.factor(TWS),  
 TWS\_BIN = ifelse(TWS == "Yes", 1, 0),  
 COURSE = as.factor(COURSE),  
 COURSE\_BIN = ifelse(COURSE == "Yes", 1, 0),  
 COURSETIME = factor(COURSETIME, levels = c("<5 years", "5-10 years", ">10 years"),  
 ordered = TRUE),  
 # Binary: Took course in last 10 years = 1 ------------  
 COURSETIME\_BIN = case\_when(  
 COURSETIME %in% c("<5 years", "5-10 years") ~ 1,  
 COURSETIME == ">10 years" ~ 0,  
 TRUE ~ NA\_real\_))  
  
df <- df %>%  
 mutate(COURSE\_GROUP = case\_when(  
 COURSE\_BIN == 0 ~ "None",  
 COURSE\_BIN == 1 & COURSETIME\_BIN == 1 ~ "Recent", # Last 10 years  
 COURSE\_BIN == 1 & COURSETIME\_BIN == 0 ~ "Older" # >10 years  
 )) %>%  
 mutate(COURSE\_GROUP = factor(COURSE\_GROUP, levels = c("None", "Older", "Recent")))  
  
# Education Level ----------------  
df <- df %>%  
 mutate(  
 DEMO\_EDU\_SCORE = rowSums(dplyr::select(., EDUCATION\_BIN, DEGREE\_BIN), na.rm = TRUE),  
 DEMO\_EDU\_NORM = DEMO\_EDU\_SCORE / 2)  
  
demoedu\_avg <- mean(df$DEMO\_EDU\_SCORE, na.rm = TRUE)  
demoedu\_med <- median(df$DEMO\_EDU\_SCORE, na.rm = TRUE)  
demoedu\_avg

## [1] 1.592857

demoedu\_med

## [1] 2

demoedu\_norm\_avg <- mean(df$DEMO\_EDU\_NORM, na.rm = TRUE)  
demoedu\_norm\_med <- median(df$DEMO\_EDU\_NORM, na.rm = TRUE)  
  
df <- df %>%  
 mutate(  
 DEMO\_EDU\_AVG = case\_when(DEMO\_EDU\_NORM > demoedu\_norm\_avg ~ 1,  
 DEMO\_EDU\_NORM <= demoedu\_norm\_avg ~ 0,  
 TRUE ~ NA\_real\_),  
 DEMO\_EDU\_MED = case\_when(DEMO\_EDU\_NORM > demoedu\_norm\_med ~ 1,  
 DEMO\_EDU\_NORM <= demoedu\_norm\_med ~ 0,  
 TRUE ~ NA\_real\_))  
  
  
# Experience Level -------------  
df <- df %>% mutate(DEMO\_EXP\_SCORE = rowSums(dplyr::select(., BIOTIME\_BIN, SELFTITLE\_BIN, TWS\_BIN),   
 na.rm = TRUE),  
 DEMO\_EXP\_NORM = DEMO\_EXP\_SCORE / 4)  
  
demoexp\_avg <- mean(df$DEMO\_EXP\_SCORE, na.rm = TRUE)  
demoexp\_med <- median(df$DEMO\_EXP\_SCORE, na.rm = TRUE)  
demoexp\_avg

## [1] 1.292857

demoexp\_med

## [1] 1

demoexp\_norm\_avg <- mean(df$DEMO\_EXP\_NORM, na.rm = TRUE)  
demoexp\_norm\_med <- median(df$DEMO\_EXP\_NORM, na.rm = TRUE)  
  
df <- df %>%  
 mutate(  
 DEMO\_EXP\_AVG = case\_when(DEMO\_EXP\_NORM > demoexp\_norm\_avg ~ 1,  
 DEMO\_EXP\_NORM <= demoexp\_norm\_avg ~ 0,  
 TRUE ~ NA\_real\_),  
 DEMO\_EXP\_MED = case\_when(DEMO\_EXP\_NORM > demoexp\_norm\_med ~ 1,  
 DEMO\_EXP\_NORM <= demoexp\_norm\_med ~ 0,  
 TRUE ~ NA\_real\_))

#### 2.0.0.2 Reliability

# Reliability: Demographic Education  
edu\_items <- df %>% select(EDUCATION\_BIN, DEGREE\_BIN)  
 # removed COURSE\_BIN  
edu\_items <- edu\_items[rowSums(is.na(edu\_items)) <= 1, ]  
edu\_alpha <- psych::alpha(edu\_items, check.keys = TRUE)  
cat("=== Cronbach's Alpha: DEMOGRAPHIC EDUCATION ===\n")

## === Cronbach's Alpha: DEMOGRAPHIC EDUCATION ===

print(edu\_alpha)

##   
## Reliability analysis   
## Call: psych::alpha(x = edu\_items, check.keys = TRUE)  
##   
## raw\_alpha std.alpha G6(smc) average\_r S/N ase mean sd median\_r  
## 0.96 0.97 0.93 0.93 28 0.0066 0.8 0.4 0.93  
##   
## 95% confidence boundaries   
## lower alpha upper  
## Feldt 0.94 0.96 0.97  
## Duhachek 0.95 0.96 0.97  
##   
## Reliability if an item is dropped:  
## raw\_alpha std.alpha G6(smc) average\_r S/N alpha se var.r med.r  
## EDUCATION\_BIN 0.88 0.93 0.87 0.93 14 NA 0 0.93  
## DEGREE\_BIN 0.97 0.93 0.87 0.93 14 NA 0 0.93  
##   
## Item statistics   
## n raw.r std.r r.cor r.drop mean sd  
## EDUCATION\_BIN 139 0.98 0.98 0.95 0.93 0.81 0.39  
## DEGREE\_BIN 140 0.98 0.98 0.95 0.93 0.79 0.41  
##   
## Non missing response frequency for each item  
## 0 1 miss  
## EDUCATION\_BIN 0.19 0.81 0.01  
## DEGREE\_BIN 0.21 0.79 0.00

edu\_alpha$total$raw\_alpha

## [1] 0.9604682

edu\_alpha$alpha.drop

## raw\_alpha std.alpha G6(smc) average\_r S/N alpha se var.r  
## EDUCATION\_BIN 0.8792271 0.9342106 0.8727495 0.9342106 14.20002 NA 0  
## DEGREE\_BIN 0.9734513 0.9342106 0.8727495 0.9342106 14.20002 NA 0  
## med.r  
## EDUCATION\_BIN 0.9342106  
## DEGREE\_BIN 0.9342106

# Reliability: Demographic Experience  
exp\_items <- df %>% select(BIOTIME\_BIN, SELFTITLE\_BIN, TWS\_BIN)   
# removed LICENSE  
exp\_items <- exp\_items[rowSums(is.na(exp\_items)) <= 1, ]  
exp\_alpha <- psych::alpha(exp\_items, check.keys = TRUE)  
cat("=== Cronbach's Alpha: DEMOGRAPHIC EXPERIENCE ===\n")

## === Cronbach's Alpha: DEMOGRAPHIC EXPERIENCE ===

print(exp\_alpha)

##   
## Reliability analysis   
## Call: psych::alpha(x = exp\_items, check.keys = TRUE)  
##   
## raw\_alpha std.alpha G6(smc) average\_r S/N ase mean sd median\_r  
## 0.55 0.56 0.46 0.3 1.3 0.065 0.43 0.31 0.26  
##   
## 95% confidence boundaries   
## lower alpha upper  
## Feldt 0.41 0.55 0.67  
## Duhachek 0.43 0.55 0.68  
##   
## Reliability if an item is dropped:  
## raw\_alpha std.alpha G6(smc) average\_r S/N alpha se var.r med.r  
## BIOTIME\_BIN 0.40 0.40 0.25 0.25 0.66 0.102 NA 0.25  
## SELFTITLE\_BIN 0.54 0.55 0.38 0.38 1.23 0.075 NA 0.38  
## TWS\_BIN 0.41 0.41 0.26 0.26 0.69 0.100 NA 0.26  
##   
## Item statistics   
## n raw.r std.r r.cor r.drop mean sd  
## BIOTIME\_BIN 140 0.78 0.75 0.55 0.4 0.35 0.48  
## SELFTITLE\_BIN 140 0.68 0.69 0.40 0.3 0.77 0.42  
## TWS\_BIN 140 0.71 0.75 0.54 0.4 0.17 0.38  
##   
## Non missing response frequency for each item  
## 0 1 miss  
## BIOTIME\_BIN 0.65 0.35 0  
## SELFTITLE\_BIN 0.23 0.77 0  
## TWS\_BIN 0.83 0.17 0

exp\_alpha$total$raw\_alpha

## [1] 0.552571

exp\_alpha$alpha.drop

## raw\_alpha std.alpha G6(smc) average\_r S/N alpha se  
## BIOTIME\_BIN 0.3950617 0.3969141 0.2475938 0.2475938 0.6581386 0.10162008  
## SELFTITLE\_BIN 0.5413352 0.5522535 0.3814573 0.3814573 1.2334065 0.07508577  
## TWS\_BIN 0.4060014 0.4086269 0.2567763 0.2567763 0.6909798 0.09953827  
## var.r med.r  
## BIOTIME\_BIN NA 0.2475938  
## SELFTITLE\_BIN NA 0.3814573  
## TWS\_BIN NA 0.2567763

#reliFUN(df, vars = c("EDUCATION\_BIN", "DEGREE\_BIN"),  
# title = "DEMOGRAPHIC: Education")  
  
#reliFUN(df, vars = c("BIOTIME\_BIN", "SELFTITLE\_BIN", "TWS\_BIN"),  
# title = "DEMOGRAPHIC: Experience")

# 3 KNOWLEDGE

#### 3.0.0.1 Recoding

# Knowledge: Correct = 1, Incorrect = 0, I don't know = NA -----------  
df <- df %>%  
 mutate(  
 PIGS = as.factor(PIGS),  
 BRUCE = as.factor(BRUCE),  
 CWD = as.factor(CWD),  
 FLUAL = as.factor(FLUAL),  
 FLU = as.factor(FLU),  
 COVID = as.factor(COVID),  
 COVIDSPILL = as.factor(COVIDSPILL),  
 RABIESAL = as.factor(RABIESAL),  
 RABIES = as.factor(RABIES),  
 TURKEY = as.factor(TURKEY),  
 PIGS\_BINK = case\_when(  
 PIGS == "TRUE" ~ 1,  
 PIGS %in% c("FALSE", "I don't know") ~ 0,  
 TRUE ~ NA\_real\_),  
 BRUCE\_BINK = case\_when(  
 BRUCE == "FALSE" ~ 1,  
 BRUCE %in% c("TRUE", "I don't know") ~ 0,  
 TRUE ~ NA\_real\_),  
 CWD\_BINK = case\_when(  
 CWD == "FALSE" ~ 1,  
 CWD %in% c("TRUE", "I don't know") ~ 0,  
 TRUE ~ NA\_real\_),  
 FLUAL\_BINK = case\_when(  
 FLUAL == "TRUE" ~ 1,  
 FLUAL %in% c("FALSE", "I don't know") ~ 0,  
 TRUE ~ NA\_real\_),  
 FLU\_BINK = case\_when(  
 FLU == "FALSE" ~ 1,  
 FLU %in% c("TRUE", "I don't know") ~ 0,  
 TRUE ~ NA\_real\_),  
 COVID\_BINK = case\_when(  
 COVID == "TRUE" ~ 1,  
 COVID %in% c("FALSE", "I don't know") ~ 0,  
 TRUE ~ NA\_real\_),  
 COVIDSPILL\_BINK = case\_when(  
 COVIDSPILL == "TRUE" ~ 1,  
 COVIDSPILL %in% c("FALSE", "I don't know") ~ 0,  
 TRUE ~ NA\_real\_),  
 RABIESAL\_BINK = case\_when(  
 RABIESAL == "TRUE" ~ 1,  
 RABIESAL %in% c("FALSE", "I don't know") ~ 0,  
 TRUE ~ NA\_real\_),  
 RABIES\_BINK = case\_when(  
 RABIES == "Bites" ~ 1,  
 RABIES %in% c("Blood", "Feces", "I don't know") ~ 0,  
 TRUE ~ NA\_real\_),  
 TURKEY\_BINK = case\_when(  
 TURKEY %in% c("Bury", "Incinerate") ~ 1,  
 TURKEY %in% c("Place in a dumpster","Ignore","Field dress and consumption",  
 "I don't know") ~ 0,  
 TRUE ~ NA\_real\_))  
  
df <- df %>%  
 mutate(KNOWLEDGE\_SCORE = rowSums(dplyr::select(., PIGS\_BINK, BRUCE\_BINK, CWD\_BINK, FLUAL\_BINK, FLU\_BINK,  
 COVID\_BINK, COVIDSPILL\_BINK, RABIESAL\_BINK,  
 RABIES\_BINK, TURKEY\_BINK), na.rm = TRUE),  
 KNOWLEDGE\_SCORE\_NORM = KNOWLEDGE\_SCORE / 10)  
  
knowbin\_avg = mean(df$KNOWLEDGE\_SCORE)  
knowbin\_avg

## [1] 7.271429

knowbin\_med = median(df$KNOWLEDGE\_SCORE)  
knowbin\_med

## [1] 7.5

knowbin\_norm\_avg <- mean(df$KNOWLEDGE\_SCORE\_NORM, na.rm = TRUE)  
knowbin\_norm\_avg

## [1] 0.7271429

df <- df %>%  
 mutate(KNOWLEDGE\_AVG = case\_when(  
 KNOWLEDGE\_SCORE\_NORM > knowbin\_norm\_avg ~ 1,  
 KNOWLEDGE\_SCORE\_NORM <= knowbin\_norm\_avg ~ 0,  
 TRUE ~ NA\_real\_))  
  
knowbin\_norm\_med <- median(df$KNOWLEDGE\_SCORE\_NORM, na.rm = TRUE)  
knowbin\_norm\_med

## [1] 0.75

df <- df %>%  
 mutate(KNOWLEDGE\_MED = case\_when(  
 KNOWLEDGE\_SCORE\_NORM > knowbin\_norm\_med ~ 1,  
 KNOWLEDGE\_SCORE\_NORM <= knowbin\_norm\_med ~ 0,  
 TRUE ~ NA\_real\_))  
  
  
# Confidence: I don't know = 1, Answer (Correct/not) = 0 -------------  
df <- df %>%  
 mutate(  
 # Flag 'I don't know' for each knowledge question  
 PIGS\_BINC = ifelse(PIGS == "I don't know", 1, 0),  
 BRUCE\_BINC = ifelse(BRUCE == "I don't know", 1, 0),  
 CWD\_BINC = ifelse(CWD == "I don't know", 1, 0),  
 FLUAL\_BINC = ifelse(FLUAL == "I don't know", 1, 0),  
 FLU\_BINC = ifelse(FLU == "I don't know", 1, 0),  
 COVID\_BINC = ifelse(COVID == "I don't know", 1, 0),  
 COVIDSPILL\_BINC = ifelse(COVIDSPILL == "I don't know", 1, 0),  
 RABIESAL\_BINC = ifelse(RABIESAL == "I don't know", 1, 0),  
 RABIES\_BINC = ifelse(RABIES == "I don't know", 1, 0),  
 TURKEY\_BINC = ifelse(TURKEY == "I don't know", 1, 0))  
  
df <- df %>%  
 mutate(CONFIDENCE\_SCORE = rowSums(dplyr::select(., ends\_with("\_BINC")), na.rm = TRUE),  
 CONFIDENCE\_SCORE\_NORM = CONFIDENCE\_SCORE / 10)  
  
confbin\_avg = mean(df$CONFIDENCE\_SCORE)  
confbin\_avg

## [1] 1.8

confbin\_med = median(df$CONFIDENCE\_SCORE)  
confbin\_med

## [1] 1

confbin\_norm\_avg <- mean(df$CONFIDENCE\_SCORE\_NORM, na.rm = TRUE)  
confbin\_norm\_avg

## [1] 0.18

df <- df %>%  
 mutate(CONFIDENCE\_AVG = case\_when(  
 CONFIDENCE\_SCORE\_NORM > confbin\_norm\_avg ~ 1,  
 CONFIDENCE\_SCORE\_NORM <= confbin\_norm\_avg ~ 0,  
 TRUE ~ NA\_real\_))  
  
confbin\_norm\_med <- median(df$CONFIDENCE\_SCORE\_NORM, na.rm = TRUE)  
confbin\_norm\_med

## [1] 0.1

df <- df %>%  
 mutate(CONFIDENCE\_MED = case\_when(  
 CONFIDENCE\_SCORE\_NORM> confbin\_norm\_med ~ 1,  
 CONFIDENCE\_SCORE\_NORM <= confbin\_norm\_med ~ 0,  
 TRUE ~ NA\_real\_))

#### 3.0.0.2 Reliability

# Correct / Incorrect (+ I Don't Know) -------------  
knowledge\_items <- df %>% select(  
 PIGS\_BINK, BRUCE\_BINK, CWD\_BINK, FLUAL\_BINK, FLU\_BINK,  
 COVID\_BINK, COVIDSPILL\_BINK, RABIESAL\_BINK, RABIES\_BINK, TURKEY\_BINK)  
knowledge\_items <- knowledge\_items %>%  
 select(where(~ length(unique(na.omit(.))) > 1))  
knowledge\_clean <- knowledge\_items[rowSums(is.na(knowledge\_items)) <= 3, ]  
knowledge\_alpha <- alpha(knowledge\_clean, check.keys = TRUE)  
knowledge\_alpha$keys

## [[1]]  
## [1] "PIGS\_BINK" "BRUCE\_BINK" "CWD\_BINK" "FLUAL\_BINK"   
## [5] "FLU\_BINK" "COVID\_BINK" "COVIDSPILL\_BINK" "RABIESAL\_BINK"   
## [9] "RABIES\_BINK" "TURKEY\_BINK"

# Cronbach’s Alpha results   
cat("=== Cronbach's Alpha ===\n")

## === Cronbach's Alpha ===

print(knowledge\_alpha)

##   
## Reliability analysis   
## Call: alpha(x = knowledge\_clean, check.keys = TRUE)  
##   
## raw\_alpha std.alpha G6(smc) average\_r S/N ase mean sd median\_r  
## 0.67 0.68 0.69 0.17 2.1 0.04 0.73 0.21 0.15  
##   
## 95% confidence boundaries   
## lower alpha upper  
## Feldt 0.59 0.67 0.75  
## Duhachek 0.60 0.67 0.75  
##   
## Reliability if an item is dropped:  
## raw\_alpha std.alpha G6(smc) average\_r S/N alpha se var.r med.r  
## PIGS\_BINK 0.66 0.66 0.67 0.18 2.0 0.042 0.0087 0.15  
## BRUCE\_BINK 0.63 0.64 0.65 0.17 1.8 0.046 0.0089 0.15  
## CWD\_BINK 0.65 0.65 0.65 0.17 1.9 0.043 0.0079 0.15  
## FLUAL\_BINK 0.66 0.66 0.66 0.18 1.9 0.042 0.0098 0.16  
## FLU\_BINK 0.64 0.64 0.64 0.17 1.8 0.044 0.0066 0.15  
## COVID\_BINK 0.61 0.62 0.63 0.16 1.7 0.048 0.0072 0.14  
## COVIDSPILL\_BINK 0.64 0.65 0.65 0.17 1.8 0.044 0.0084 0.15  
## RABIESAL\_BINK 0.67 0.67 0.68 0.19 2.1 0.041 0.0093 0.17  
## RABIES\_BINK 0.66 0.67 0.67 0.18 2.0 0.042 0.0091 0.16  
## TURKEY\_BINK 0.66 0.66 0.67 0.18 2.0 0.042 0.0098 0.15  
##   
## Item statistics   
## n raw.r std.r r.cor r.drop mean sd  
## PIGS\_BINK 140 0.40 0.46 0.35 0.29 0.93 0.26  
## BRUCE\_BINK 140 0.60 0.56 0.49 0.42 0.63 0.48  
## CWD\_BINK 140 0.49 0.52 0.44 0.33 0.82 0.38  
## FLUAL\_BINK 140 0.47 0.49 0.39 0.30 0.81 0.40  
## FLU\_BINK 140 0.51 0.55 0.49 0.40 0.90 0.30  
## COVID\_BINK 140 0.66 0.63 0.60 0.50 0.61 0.49  
## COVIDSPILL\_BINK 140 0.57 0.53 0.46 0.37 0.44 0.50  
## RABIESAL\_BINK 140 0.42 0.41 0.27 0.24 0.77 0.42  
## RABIES\_BINK 140 0.39 0.45 0.34 0.26 0.90 0.30  
## TURKEY\_BINK 140 0.51 0.47 0.35 0.30 0.46 0.50  
##   
## Non missing response frequency for each item  
## 0 1 miss  
## PIGS\_BINK 0.07 0.93 0  
## BRUCE\_BINK 0.37 0.63 0  
## CWD\_BINK 0.18 0.82 0  
## FLUAL\_BINK 0.19 0.81 0  
## FLU\_BINK 0.10 0.90 0  
## COVID\_BINK 0.39 0.61 0  
## COVIDSPILL\_BINK 0.56 0.44 0  
## RABIESAL\_BINK 0.23 0.77 0  
## RABIES\_BINK 0.10 0.90 0  
## TURKEY\_BINK 0.54 0.46 0

knowledge\_alpha$total$raw\_alpha

## [1] 0.6735574

knowledge\_alpha$alpha.drop

## raw\_alpha std.alpha G6(smc) average\_r S/N alpha se  
## PIGS\_BINK 0.6606403 0.6646082 0.6664137 0.1804463 1.981587 0.04208943  
## BRUCE\_BINK 0.6320411 0.6406632 0.6489442 0.1653455 1.782905 0.04552473  
## CWD\_BINK 0.6500989 0.6517592 0.6524267 0.1721531 1.871576 0.04281669  
## FLUAL\_BINK 0.6566685 0.6585298 0.6637371 0.1764662 1.928513 0.04196970  
## FLU\_BINK 0.6439773 0.6443602 0.6415193 0.1675787 1.811834 0.04380156  
## COVID\_BINK 0.6129634 0.6242704 0.6274910 0.1558402 1.661489 0.04813206  
## COVIDSPILL\_BINK 0.6424679 0.6484718 0.6491915 0.1701032 1.844722 0.04408900  
## RABIESAL\_BINK 0.6684239 0.6746531 0.6825219 0.1872593 2.073643 0.04078881  
## RABIES\_BINK 0.6633349 0.6663071 0.6688118 0.1815777 1.996768 0.04154587  
## TURKEY\_BINK 0.6607494 0.6628167 0.6693431 0.1792624 1.965746 0.04154108  
## var.r med.r  
## PIGS\_BINK 0.008745503 0.1528347  
## BRUCE\_BINK 0.008933612 0.1457736  
## CWD\_BINK 0.007869387 0.1539770  
## FLUAL\_BINK 0.009790041 0.1588784  
## FLU\_BINK 0.006563171 0.1480922  
## COVID\_BINK 0.007162231 0.1438461  
## COVIDSPILL\_BINK 0.008417449 0.1480922  
## RABIESAL\_BINK 0.009346828 0.1710102  
## RABIES\_BINK 0.009125426 0.1625900  
## TURKEY\_BINK 0.009793098 0.1480922

# Confidence - I Don't Know vs Answered -------------  
confidence\_items <- df %>% select(  
 PIGS\_BINC, BRUCE\_BINC, CWD\_BINC, FLUAL\_BINC, FLU\_BINC,  
 COVID\_BINC, COVIDSPILL\_BINC, RABIESAL\_BINC, RABIES\_BINC, TURKEY\_BINC)  
confidence\_items <- confidence\_items %>%  
 select(where(~ length(unique(na.omit(.))) > 1))  
confidence\_clean <- confidence\_items[rowSums(is.na(confidence\_items)) <= 3, ]  
confidence\_alpha <- alpha(confidence\_clean, check.keys = TRUE)  
confidence\_alpha$keys

## [[1]]  
## [1] "PIGS\_BINC" "BRUCE\_BINC" "CWD\_BINC" "FLUAL\_BINC"   
## [5] "FLU\_BINC" "COVID\_BINC" "COVIDSPILL\_BINC" "RABIESAL\_BINC"   
## [9] "RABIES\_BINC" "TURKEY\_BINC"

# Cronbach’s Alpha results   
cat("=== Cronbach's Alpha ===\n")

## === Cronbach's Alpha ===

print(confidence\_alpha)

##   
## Reliability analysis   
## Call: alpha(x = confidence\_clean, check.keys = TRUE)  
##   
## raw\_alpha std.alpha G6(smc) average\_r S/N ase mean sd median\_r  
## 0.65 0.64 0.67 0.15 1.7 0.041 0.18 0.18 0.16  
##   
## 95% confidence boundaries   
## lower alpha upper  
## Feldt 0.56 0.65 0.73  
## Duhachek 0.57 0.65 0.73  
##   
## Reliability if an item is dropped:  
## raw\_alpha std.alpha G6(smc) average\_r S/N alpha se var.r med.r  
## PIGS\_BINC 0.65 0.63 0.65 0.16 1.7 0.042 0.016 0.16  
## BRUCE\_BINC 0.58 0.57 0.60 0.13 1.3 0.050 0.015 0.15  
## CWD\_BINC 0.63 0.61 0.64 0.15 1.6 0.043 0.017 0.16  
## FLUAL\_BINC 0.63 0.60 0.64 0.14 1.5 0.043 0.019 0.15  
## FLU\_BINC 0.63 0.61 0.64 0.15 1.5 0.044 0.018 0.15  
## COVID\_BINC 0.57 0.57 0.59 0.13 1.3 0.052 0.014 0.14  
## COVIDSPILL\_BINC 0.64 0.62 0.65 0.15 1.6 0.042 0.017 0.17  
## RABIESAL\_BINC 0.63 0.61 0.65 0.15 1.6 0.043 0.018 0.15  
## RABIES\_BINC 0.66 0.66 0.68 0.18 1.9 0.040 0.013 0.18  
## TURKEY\_BINC 0.62 0.60 0.63 0.14 1.5 0.044 0.017 0.16  
##   
## Item statistics   
## n raw.r std.r r.cor r.drop mean sd  
## PIGS\_BINC 140 0.32 0.39 0.28 0.197 0.057 0.23  
## BRUCE\_BINC 140 0.67 0.62 0.59 0.497 0.257 0.44  
## CWD\_BINC 140 0.42 0.48 0.39 0.319 0.043 0.20  
## FLUAL\_BINC 140 0.48 0.51 0.42 0.308 0.143 0.35  
## FLU\_BINC 140 0.46 0.50 0.41 0.327 0.086 0.28  
## COVID\_BINC 140 0.70 0.63 0.62 0.522 0.329 0.47  
## COVIDSPILL\_BINC 140 0.53 0.44 0.32 0.290 0.414 0.49  
## RABIESAL\_BINC 140 0.47 0.47 0.36 0.278 0.179 0.38  
## RABIES\_BINC 140 0.13 0.26 0.10 0.026 0.036 0.19  
## TURKEY\_BINC 140 0.55 0.52 0.45 0.344 0.257 0.44  
##   
## Non missing response frequency for each item  
## 0 1 miss  
## PIGS\_BINC 0.94 0.06 0  
## BRUCE\_BINC 0.74 0.26 0  
## CWD\_BINC 0.96 0.04 0  
## FLUAL\_BINC 0.86 0.14 0  
## FLU\_BINC 0.91 0.09 0  
## COVID\_BINC 0.67 0.33 0  
## COVIDSPILL\_BINC 0.59 0.41 0  
## RABIESAL\_BINC 0.82 0.18 0  
## RABIES\_BINC 0.96 0.04 0  
## TURKEY\_BINC 0.74 0.26 0

confidence\_alpha$total$raw\_alpha

## [1] 0.6503883

confidence\_alpha$alpha.drop

## raw\_alpha std.alpha G6(smc) average\_r S/N alpha se  
## PIGS\_BINC 0.6456834 0.6324634 0.6505137 0.1605118 1.720818 0.04210661  
## BRUCE\_BINC 0.5797646 0.5737396 0.5997625 0.1300972 1.345984 0.05005986  
## CWD\_BINC 0.6325526 0.6112421 0.6362357 0.1487184 1.572295 0.04348355  
## FLUAL\_BINC 0.6271596 0.6026643 0.6362130 0.1442234 1.516763 0.04321507  
## FLU\_BINC 0.6259962 0.6065737 0.6358404 0.1462536 1.541772 0.04392251  
## COVID\_BINC 0.5705130 0.5689854 0.5940301 0.1279160 1.320107 0.05168707  
## COVIDSPILL\_BINC 0.6380769 0.6202641 0.6533424 0.1536110 1.633409 0.04241686  
## RABIESAL\_BINC 0.6338425 0.6146671 0.6466205 0.1505554 1.595158 0.04260983  
## RABIES\_BINC 0.6632434 0.6608134 0.6782145 0.1779493 1.948230 0.04041174  
## TURKEY\_BINC 0.6199528 0.5998718 0.6251549 0.1427917 1.499199 0.04432026  
## var.r med.r  
## PIGS\_BINC 0.01585550 0.1628015  
## BRUCE\_BINC 0.01490989 0.1451188  
## CWD\_BINC 0.01653318 0.1600960  
## FLUAL\_BINC 0.01889430 0.1545950  
## FLU\_BINC 0.01769840 0.1451188  
## COVID\_BINC 0.01363837 0.1351174  
## COVIDSPILL\_BINC 0.01741928 0.1667274  
## RABIESAL\_BINC 0.01817068 0.1545950  
## RABIES\_BINC 0.01336259 0.1764345  
## TURKEY\_BINC 0.01677034 0.1600960

###### reliFUN -------------------------------  
# Principal Component Analysis   
cat("\n=== Principal Component Analysis (1-factor) ===\n")

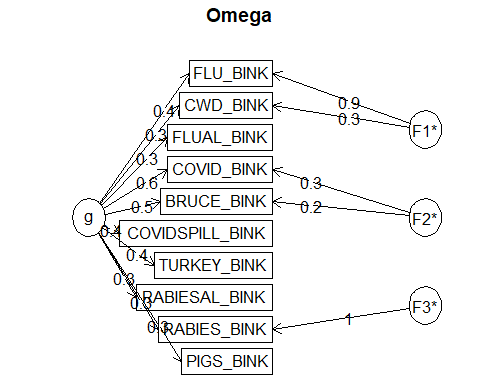
##   
## === Principal Component Analysis (1-factor) ===

pca\_result <- principal(confidence\_clean, nfactors = 1, rotate = "none")  
print(pca\_result)

## Principal Components Analysis  
## Call: principal(r = confidence\_clean, nfactors = 1, rotate = "none")  
## Standardized loadings (pattern matrix) based upon correlation matrix  
## PC1 h2 u2 com  
## PIGS\_BINC 0.27 0.072 0.93 1  
## BRUCE\_BINC 0.67 0.455 0.55 1  
## CWD\_BINC 0.49 0.242 0.76 1  
## FLUAL\_BINC 0.50 0.249 0.75 1  
## FLU\_BINC 0.50 0.253 0.75 1  
## COVID\_BINC 0.71 0.508 0.49 1  
## COVIDSPILL\_BINC 0.47 0.218 0.78 1  
## RABIESAL\_BINC 0.47 0.216 0.78 1  
## RABIES\_BINC 0.04 0.002 1.00 1  
## TURKEY\_BINC 0.55 0.307 0.69 1  
##   
## PC1  
## SS loadings 2.52  
## Proportion Var 0.25  
##   
## Mean item complexity = 1  
## Test of the hypothesis that 1 component is sufficient.  
##   
## The root mean square of the residuals (RMSR) is 0.12   
## with the empirical chi square 176.8 with prob < 7.6e-21   
##   
## Fit based upon off diagonal values = 0.63

reliFUN(df,vars = c("PIGS\_BINK", "BRUCE\_BINK", "CWD\_BINK", "FLUAL\_BINK", "FLU\_BINK",  
 "COVID\_BINK", "COVIDSPILL\_BINK", "RABIESAL\_BINK", "RABIES\_BINK", "TURKEY\_BINK"),  
 title = "KNOWLEDGE: Correct = 1, Incorrect/IDK = 0")

##   
##   
## ==================== KNOWLEDGE: Correct = 1, Incorrect/IDK = 0 ====================  
##   
## === Cronbach's Alpha ===  
##   
## Reliability analysis   
## Call: psych::alpha(x = items\_clean, check.keys = TRUE)  
##   
## raw\_alpha std.alpha G6(smc) average\_r S/N ase mean sd median\_r  
## 0.67 0.68 0.69 0.17 2.1 0.04 0.73 0.21 0.15  
##   
## 95% confidence boundaries   
## lower alpha upper  
## Feldt 0.59 0.67 0.75  
## Duhachek 0.60 0.67 0.75  
##   
## Reliability if an item is dropped:  
## raw\_alpha std.alpha G6(smc) average\_r S/N alpha se var.r med.r  
## PIGS\_BINK 0.66 0.66 0.67 0.18 2.0 0.042 0.0087 0.15  
## BRUCE\_BINK 0.63 0.64 0.65 0.17 1.8 0.046 0.0089 0.15  
## CWD\_BINK 0.65 0.65 0.65 0.17 1.9 0.043 0.0079 0.15  
## FLUAL\_BINK 0.66 0.66 0.66 0.18 1.9 0.042 0.0098 0.16  
## FLU\_BINK 0.64 0.64 0.64 0.17 1.8 0.044 0.0066 0.15  
## COVID\_BINK 0.61 0.62 0.63 0.16 1.7 0.048 0.0072 0.14  
## COVIDSPILL\_BINK 0.64 0.65 0.65 0.17 1.8 0.044 0.0084 0.15  
## RABIESAL\_BINK 0.67 0.67 0.68 0.19 2.1 0.041 0.0093 0.17  
## RABIES\_BINK 0.66 0.67 0.67 0.18 2.0 0.042 0.0091 0.16  
## TURKEY\_BINK 0.66 0.66 0.67 0.18 2.0 0.042 0.0098 0.15  
##   
## Item statistics   
## n raw.r std.r r.cor r.drop mean sd  
## PIGS\_BINK 140 0.40 0.46 0.35 0.29 0.93 0.26  
## BRUCE\_BINK 140 0.60 0.56 0.49 0.42 0.63 0.48  
## CWD\_BINK 140 0.49 0.52 0.44 0.33 0.82 0.38  
## FLUAL\_BINK 140 0.47 0.49 0.39 0.30 0.81 0.40  
## FLU\_BINK 140 0.51 0.55 0.49 0.40 0.90 0.30  
## COVID\_BINK 140 0.66 0.63 0.60 0.50 0.61 0.49  
## COVIDSPILL\_BINK 140 0.57 0.53 0.46 0.37 0.44 0.50  
## RABIESAL\_BINK 140 0.42 0.41 0.27 0.24 0.77 0.42  
## RABIES\_BINK 140 0.39 0.45 0.34 0.26 0.90 0.30  
## TURKEY\_BINK 140 0.51 0.47 0.35 0.30 0.46 0.50  
##   
## Non missing response frequency for each item  
## 0 1 miss  
## PIGS\_BINK 0.07 0.93 0  
## BRUCE\_BINK 0.37 0.63 0  
## CWD\_BINK 0.18 0.82 0  
## FLUAL\_BINK 0.19 0.81 0  
## FLU\_BINK 0.10 0.90 0  
## COVID\_BINK 0.39 0.61 0  
## COVIDSPILL\_BINK 0.56 0.44 0  
## RABIESAL\_BINK 0.23 0.77 0  
## RABIES\_BINK 0.10 0.90 0  
## TURKEY\_BINK 0.54 0.46 0  
## Raw Alpha: 0.674   
## raw\_alpha std.alpha G6(smc) average\_r S/N alpha se  
## PIGS\_BINK 0.6606403 0.6646082 0.6664137 0.1804463 1.981587 0.04208943  
## BRUCE\_BINK 0.6320411 0.6406632 0.6489442 0.1653455 1.782905 0.04552473  
## CWD\_BINK 0.6500989 0.6517592 0.6524267 0.1721531 1.871576 0.04281669  
## FLUAL\_BINK 0.6566685 0.6585298 0.6637371 0.1764662 1.928513 0.04196970  
## FLU\_BINK 0.6439773 0.6443602 0.6415193 0.1675787 1.811834 0.04380156  
## COVID\_BINK 0.6129634 0.6242704 0.6274910 0.1558402 1.661489 0.04813206  
## COVIDSPILL\_BINK 0.6424679 0.6484718 0.6491915 0.1701032 1.844722 0.04408900  
## RABIESAL\_BINK 0.6684239 0.6746531 0.6825219 0.1872593 2.073643 0.04078881  
## RABIES\_BINK 0.6633349 0.6663071 0.6688118 0.1815777 1.996768 0.04154587  
## TURKEY\_BINK 0.6607494 0.6628167 0.6693431 0.1792624 1.965746 0.04154108  
## var.r med.r  
## PIGS\_BINK 0.008745503 0.1528347  
## BRUCE\_BINK 0.008933612 0.1457736  
## CWD\_BINK 0.007869387 0.1539770  
## FLUAL\_BINK 0.009790041 0.1588784  
## FLU\_BINK 0.006563171 0.1480922  
## COVID\_BINK 0.007162231 0.1438461  
## COVIDSPILL\_BINK 0.008417449 0.1480922  
## RABIESAL\_BINK 0.009346828 0.1710102  
## RABIES\_BINK 0.009125426 0.1625900  
## TURKEY\_BINK 0.009793098 0.1480922  
##   
## === McDonald's Omega ===



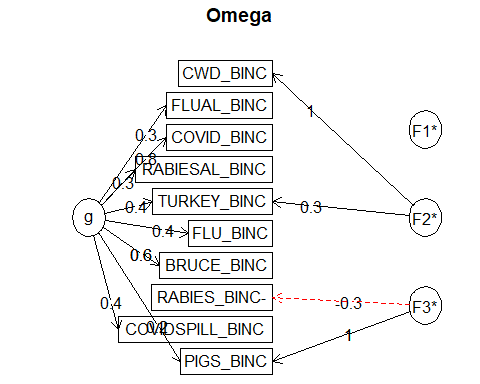
## Omega   
## Call: omegah(m = m, nfactors = nfactors, fm = fm, key = key, flip = flip,   
## digits = digits, title = title, sl = sl, labels = labels,   
## plot = plot, n.obs = n.obs, rotate = rotate, Phi = Phi, option = option,   
## covar = covar)  
## Alpha: 0.68   
## G.6: 0.69   
## Omega Hierarchical: 0.57   
## Omega H asymptotic: 0.75   
## Omega Total 0.76   
##   
## Schmid Leiman Factor loadings greater than 0.2   
## g F1\* F2\* F3\* h2 h2 u2 p2 com  
## PIGS\_BINK 0.33 0.19 0.81 0.56 2.60  
## BRUCE\_BINK 0.50 0.23 0.30 0.30 0.70 0.82 1.43  
## CWD\_BINK 0.34 0.29 0.21 0.21 0.79 0.56 2.12  
## FLUAL\_BINK 0.29 0.13 0.87 0.64 2.04  
## FLU\_BINK 0.43 0.90 1.00 1.00 0.00 0.19 1.43  
## COVID\_BINK 0.60 0.26 0.43 0.43 0.57 0.83 1.40  
## COVIDSPILL\_BINK 0.43 0.23 0.23 0.77 0.80 1.51  
## RABIESAL\_BINK 0.26 0.09 0.91 0.82 1.44  
## RABIES\_BINK 0.28 0.96 1.00 1.00 0.00 0.08 1.17  
## TURKEY\_BINK 0.35 0.16 0.84 0.76 1.61  
##   
## With Sums of squares of:  
## g F1\* F2\* F3\* h2   
## 1.56 0.97 0.23 0.98 2.46   
##   
## general/max 0.63 max/min = 10.48  
## mean percent general = 0.61 with sd = 0.27 and cv of 0.45   
## Explained Common Variance of the general factor = 0.42   
##   
## The degrees of freedom are 18 and the fit is 0.14   
## The number of observations was 140 with Chi Square = 18.73 with prob < 0.41  
## The root mean square of the residuals is 0.04   
## The df corrected root mean square of the residuals is 0.06  
## RMSEA index = 0.015 and the 90 % confidence intervals are 0 0.078  
## BIC = -70.22  
##   
## Compare this with the adequacy of just a general factor and no group factors  
## The degrees of freedom for just the general factor are 35 and the fit is 0.4   
## The number of observations was 140 with Chi Square = 54.31 with prob < 0.02  
## The root mean square of the residuals is 0.08   
## The df corrected root mean square of the residuals is 0.09   
##   
## RMSEA index = 0.062 and the 90 % confidence intervals are 0.026 0.094  
## BIC = -118.65   
##   
## Measures of factor score adequacy   
## g F1\* F2\* F3\*  
## Correlation of scores with factors 0.78 0.96 0.36 0.98  
## Multiple R square of scores with factors 0.61 0.91 0.13 0.97  
## Minimum correlation of factor score estimates 0.21 0.82 -0.74 0.94  
##   
## Total, General and Subset omega for each subset  
## g F1\* F2\* F3\*  
## Omega total for total scores and subscales 0.76 0.64 0.59 0.66  
## Omega general for total scores and subscales 0.57 0.24 0.49 0.14  
## Omega group for total scores and subscales 0.16 0.40 0.10 0.52  
##   
## === Factor Analysis (3-factor, ML) ===  
## Factor Analysis using method = ml  
## Call: psych::fa(r = items\_clean, nfactors = 3, fm = "ml")  
## Standardized loadings (pattern matrix) based upon correlation matrix  
## ML1 ML2 ML3 h2 u2 com  
## PIGS\_BINK -0.09 0.08 0.55 0.339 0.661 1.1  
## BRUCE\_BINK 0.04 0.45 0.08 0.257 0.743 1.1  
## CWD\_BINK 0.32 0.18 0.08 0.207 0.793 1.7  
## FLUAL\_BINK 0.30 -0.02 0.27 0.173 0.827 2.0  
## FLU\_BINK 1.00 0.01 -0.01 0.995 0.005 1.0  
## COVID\_BINK 0.01 0.75 -0.03 0.549 0.451 1.0  
## COVIDSPILL\_BINK 0.01 0.44 0.11 0.253 0.747 1.1  
## RABIESAL\_BINK -0.01 0.28 0.01 0.076 0.924 1.0  
## RABIES\_BINK 0.10 -0.06 0.48 0.226 0.774 1.1  
## TURKEY\_BINK -0.03 0.19 0.25 0.135 0.865 1.9  
##   
## ML1 ML2 ML3  
## SS loadings 1.24 1.20 0.77  
## Proportion Var 0.12 0.12 0.08  
## Cumulative Var 0.12 0.24 0.32  
## Proportion Explained 0.39 0.37 0.24  
## Cumulative Proportion 0.39 0.76 1.00  
##   
## With factor correlations of   
## ML1 ML2 ML3  
## ML1 1.00 0.41 0.12  
## ML2 0.41 1.00 0.47  
## ML3 0.12 0.47 1.00  
##   
## Mean item complexity = 1.3  
## Test of the hypothesis that 3 factors are sufficient.  
##   
## df null model = 45 with the objective function = 1.26 with Chi Square = 170.54  
## df of the model are 18 and the objective function was 0.15   
##   
## The root mean square of the residuals (RMSR) is 0.04   
## The df corrected root mean square of the residuals is 0.07   
##   
## The harmonic n.obs is 140 with the empirical chi square 23.37 with prob < 0.18   
## The total n.obs was 140 with Likelihood Chi Square = 19.84 with prob < 0.34   
##   
## Tucker Lewis Index of factoring reliability = 0.963  
## RMSEA index = 0.026 and the 90 % confidence intervals are 0 0.082  
## BIC = -69.11  
## Fit based upon off diagonal values = 0.95  
## Measures of factor score adequacy   
## ML1 ML2 ML3  
## Correlation of (regression) scores with factors 1.00 0.84 0.73  
## Multiple R square of scores with factors 0.99 0.70 0.54  
## Minimum correlation of possible factor scores 0.99 0.41 0.08  
##   
## === Greatest Lower Bound ===



## Call: psych::glb(r = items\_clean)  
##   
## Estimates of the Greatest Lower Bound for reliability, based on factor and cluster models  
## GLB estimated from factor based communalities = 0.81 with 5 factors.  
## Use glb.fa to see more details   
##   
## Various estimates based upon splitting the scale into two (see keys for the various splits)  
## Beta = 0.57   
## Beta fa 0.54 This is an estimate of the worst split half reliability  
## Kmeans clusters for best split 0.78  
## Cluster based estimates   
## glb.IC = 0.6  
## glb.max 0.78 Is the maximum of these estimates  
## alpha-PC = 0.62 An estimate of alpha based on eignvalues  
## TenBerge bounds   
## mu0 = 0.68 mu1 = 0.69 mu2 = 0.69 mu3 = 0.69   
##   
## estimated greatest lower bound based upon splitHalf = 0.72   
##   
## Use short = FALSE to see the various ways of splitting the scale  
## === Split-Half Reliability ===  
## Split half reliabilities   
## Call: psych::splitHalf(r = items\_clean)  
##   
## Maximum split half reliability (lambda 4) = 0.78  
## Guttman lambda 6 = 0.69  
## Average split half reliability = 0.68  
## Guttman lambda 3 (alpha) = 0.68  
## Guttman lambda 2 = 0.69  
## Minimum split half reliability (beta) = 0.57  
## Average interitem r = 0.17 with median = 0.15  
## === Average Inter-Item Correlation ===  
## [1] 0.1736033  
##   
## === Principal Component Analysis (1-factor) ===  
## Principal Components Analysis  
## Call: psych::principal(r = items\_clean, nfactors = 1, rotate = "none")  
## Standardized loadings (pattern matrix) based upon correlation matrix  
## PC1 h2 u2 com  
## PIGS\_BINK 0.42 0.17 0.83 1  
## BRUCE\_BINK 0.60 0.36 0.64 1  
## CWD\_BINK 0.53 0.28 0.72 1  
## FLUAL\_BINK 0.46 0.21 0.79 1  
## FLU\_BINK 0.59 0.34 0.66 1  
## COVID\_BINK 0.69 0.47 0.53 1  
## COVIDSPILL\_BINK 0.55 0.30 0.70 1  
## RABIESAL\_BINK 0.36 0.13 0.87 1  
## RABIES\_BINK 0.40 0.16 0.84 1  
## TURKEY\_BINK 0.43 0.19 0.81 1  
##   
## PC1  
## SS loadings 2.62  
## Proportion Var 0.26  
##   
## Mean item complexity = 1  
## Test of the hypothesis that 1 component is sufficient.  
##   
## The root mean square of the residuals (RMSR) is 0.11   
## with the empirical chi square 145.48 with prob < 2e-15   
##   
## Fit based upon off diagonal values = 0.7

reliFUN(df,vars = c("PIGS\_BINC", "BRUCE\_BINC", "CWD\_BINC", "FLUAL\_BINC", "FLU\_BINC",  
 "COVID\_BINC", "COVIDSPILL\_BINC", "RABIESAL\_BINC", "RABIES\_BINC", "TURKEY\_BINC"),  
 title = "CONFIDENCE: IDK = 1, Correct/Incorrect = 0")

##   
##   
## ==================== CONFIDENCE: IDK = 1, Correct/Incorrect = 0 ====================  
##   
## === Cronbach's Alpha ===  
##   
## Reliability analysis   
## Call: psych::alpha(x = items\_clean, check.keys = TRUE)  
##   
## raw\_alpha std.alpha G6(smc) average\_r S/N ase mean sd median\_r  
## 0.65 0.64 0.67 0.15 1.7 0.041 0.18 0.18 0.16  
##   
## 95% confidence boundaries   
## lower alpha upper  
## Feldt 0.56 0.65 0.73  
## Duhachek 0.57 0.65 0.73  
##   
## Reliability if an item is dropped:  
## raw\_alpha std.alpha G6(smc) average\_r S/N alpha se var.r med.r  
## PIGS\_BINC 0.65 0.63 0.65 0.16 1.7 0.042 0.016 0.16  
## BRUCE\_BINC 0.58 0.57 0.60 0.13 1.3 0.050 0.015 0.15  
## CWD\_BINC 0.63 0.61 0.64 0.15 1.6 0.043 0.017 0.16  
## FLUAL\_BINC 0.63 0.60 0.64 0.14 1.5 0.043 0.019 0.15  
## FLU\_BINC 0.63 0.61 0.64 0.15 1.5 0.044 0.018 0.15  
## COVID\_BINC 0.57 0.57 0.59 0.13 1.3 0.052 0.014 0.14  
## COVIDSPILL\_BINC 0.64 0.62 0.65 0.15 1.6 0.042 0.017 0.17  
## RABIESAL\_BINC 0.63 0.61 0.65 0.15 1.6 0.043 0.018 0.15  
## RABIES\_BINC 0.66 0.66 0.68 0.18 1.9 0.040 0.013 0.18  
## TURKEY\_BINC 0.62 0.60 0.63 0.14 1.5 0.044 0.017 0.16  
##   
## Item statistics   
## n raw.r std.r r.cor r.drop mean sd  
## PIGS\_BINC 140 0.32 0.39 0.28 0.197 0.057 0.23  
## BRUCE\_BINC 140 0.67 0.62 0.59 0.497 0.257 0.44  
## CWD\_BINC 140 0.42 0.48 0.39 0.319 0.043 0.20  
## FLUAL\_BINC 140 0.48 0.51 0.42 0.308 0.143 0.35  
## FLU\_BINC 140 0.46 0.50 0.41 0.327 0.086 0.28  
## COVID\_BINC 140 0.70 0.63 0.62 0.522 0.329 0.47  
## COVIDSPILL\_BINC 140 0.53 0.44 0.32 0.290 0.414 0.49  
## RABIESAL\_BINC 140 0.47 0.47 0.36 0.278 0.179 0.38  
## RABIES\_BINC 140 0.13 0.26 0.10 0.026 0.036 0.19  
## TURKEY\_BINC 140 0.55 0.52 0.45 0.344 0.257 0.44  
##   
## Non missing response frequency for each item  
## 0 1 miss  
## PIGS\_BINC 0.94 0.06 0  
## BRUCE\_BINC 0.74 0.26 0  
## CWD\_BINC 0.96 0.04 0  
## FLUAL\_BINC 0.86 0.14 0  
## FLU\_BINC 0.91 0.09 0  
## COVID\_BINC 0.67 0.33 0  
## COVIDSPILL\_BINC 0.59 0.41 0  
## RABIESAL\_BINC 0.82 0.18 0  
## RABIES\_BINC 0.96 0.04 0  
## TURKEY\_BINC 0.74 0.26 0  
## Raw Alpha: 0.65   
## raw\_alpha std.alpha G6(smc) average\_r S/N alpha se  
## PIGS\_BINC 0.6456834 0.6324634 0.6505137 0.1605118 1.720818 0.04210661  
## BRUCE\_BINC 0.5797646 0.5737396 0.5997625 0.1300972 1.345984 0.05005986  
## CWD\_BINC 0.6325526 0.6112421 0.6362357 0.1487184 1.572295 0.04348355  
## FLUAL\_BINC 0.6271596 0.6026643 0.6362130 0.1442234 1.516763 0.04321507  
## FLU\_BINC 0.6259962 0.6065737 0.6358404 0.1462536 1.541772 0.04392251  
## COVID\_BINC 0.5705130 0.5689854 0.5940301 0.1279160 1.320107 0.05168707  
## COVIDSPILL\_BINC 0.6380769 0.6202641 0.6533424 0.1536110 1.633409 0.04241686  
## RABIESAL\_BINC 0.6338425 0.6146671 0.6466205 0.1505554 1.595158 0.04260983  
## RABIES\_BINC 0.6632434 0.6608134 0.6782145 0.1779493 1.948230 0.04041174  
## TURKEY\_BINC 0.6199528 0.5998718 0.6251549 0.1427917 1.499199 0.04432026  
## var.r med.r  
## PIGS\_BINC 0.01585550 0.1628015  
## BRUCE\_BINC 0.01490989 0.1451188  
## CWD\_BINC 0.01653318 0.1600960  
## FLUAL\_BINC 0.01889430 0.1545950  
## FLU\_BINC 0.01769840 0.1451188  
## COVID\_BINC 0.01363837 0.1351174  
## COVIDSPILL\_BINC 0.01741928 0.1667274  
## RABIESAL\_BINC 0.01817068 0.1545950  
## RABIES\_BINC 0.01336259 0.1764345  
## TURKEY\_BINC 0.01677034 0.1600960  
##   
## === McDonald's Omega ===



## Omega   
## Call: omegah(m = m, nfactors = nfactors, fm = fm, key = key, flip = flip,   
## digits = digits, title = title, sl = sl, labels = labels,   
## plot = plot, n.obs = n.obs, rotate = rotate, Phi = Phi, option = option,   
## covar = covar)  
## Alpha: 0.61   
## G.6: 0.65   
## Omega Hierarchical: 0.58   
## Omega H asymptotic: 0.8   
## Omega Total 0.73   
##   
## Schmid Leiman Factor loadings greater than 0.2   
## g F1\* F2\* F3\* h2 h2 u2 p2 com  
## PIGS\_BINC 0.24 0.97 1.00 1.00 0.00 0.06 1.12  
## BRUCE\_BINC 0.63 0.40 0.40 0.60 0.99 1.03  
## CWD\_BINC 0.20 0.98 1.00 1.00 0.00 0.04 1.08  
## FLUAL\_BINC 0.32 0.14 0.86 0.73 1.71  
## FLU\_BINC 0.37 0.17 0.83 0.81 1.45  
## COVID\_BINC 0.76 0.58 0.58 0.42 1.00 1.01  
## COVIDSPILL\_BINC 0.40 0.16 0.84 0.97 1.09  
## RABIESAL\_BINC 0.31 0.14 0.86 0.67 1.84  
## RABIES\_BINC- -0.28 0.08 0.92 0.00 1.00  
## TURKEY\_BINC 0.36 0.27 0.21 0.21 0.79 0.61 2.00  
##   
## With Sums of squares of:  
## g F1\* F2\* F3\* h2   
## 1.7 0.0 1.1 1.1 2.6   
##   
## general/max 0.64 max/min = Inf  
## mean percent general = 0.59 with sd = 0.41 and cv of 0.69   
## Explained Common Variance of the general factor = 0.44   
##   
## The degrees of freedom are 18 and the fit is 0.24   
## The number of observations was 140 with Chi Square = 31.53 with prob < 0.025  
## The root mean square of the residuals is 0.05   
## The df corrected root mean square of the residuals is 0.08  
## RMSEA index = 0.073 and the 90 % confidence intervals are 0.026 0.115  
## BIC = -57.42  
##   
## Compare this with the adequacy of just a general factor and no group factors  
## The degrees of freedom for just the general factor are 35 and the fit is 0.58   
## The number of observations was 140 with Chi Square = 77.83 with prob < 4.3e-05  
## The root mean square of the residuals is 0.1   
## The df corrected root mean square of the residuals is 0.11   
##   
## RMSEA index = 0.093 and the 90 % confidence intervals are 0.066 0.122  
## BIC = -95.13   
##   
## Measures of factor score adequacy   
## g F1\* F2\* F3\*  
## Correlation of scores with factors 0.86 0 1.01 1.01  
## Multiple R square of scores with factors 0.74 0 1.01 1.01  
## Minimum correlation of factor score estimates 0.47 -1 1.02 1.03  
##   
## Total, General and Subset omega for each subset  
## g F1\* F2\* F3\*  
## Omega total for total scores and subscales 0.73 NA 0.69 0.52  
## Omega general for total scores and subscales 0.58 NA 0.42 0.47  
## Omega group for total scores and subscales 0.12 NA 0.27 0.05  
##   
## === Factor Analysis (3-factor, ML) ===  
## Factor Analysis using method = ml  
## Call: psych::fa(r = items\_clean, nfactors = 3, fm = "ml")  
## Standardized loadings (pattern matrix) based upon correlation matrix  
## ML3 ML2 ML1 h2 u2 com  
## PIGS\_BINC 0.01 0.00 1.00 0.995 0.005 1.0  
## BRUCE\_BINC 0.64 -0.03 0.04 0.413 0.587 1.0  
## CWD\_BINC -0.01 1.00 0.00 0.995 0.005 1.0  
## FLUAL\_BINC 0.25 0.17 0.11 0.132 0.868 2.1  
## FLU\_BINC 0.38 0.09 -0.17 0.169 0.831 1.5  
## COVID\_BINC 0.76 -0.02 0.02 0.574 0.426 1.0  
## COVIDSPILL\_BINC 0.42 0.01 -0.07 0.168 0.832 1.1  
## RABIESAL\_BINC 0.28 0.20 -0.10 0.144 0.856 2.1  
## RABIES\_BINC -0.08 0.00 0.31 0.088 0.912 1.1  
## TURKEY\_BINC 0.27 0.30 0.08 0.220 0.780 2.1  
##   
## ML3 ML2 ML1  
## SS loadings 1.55 1.21 1.14  
## Proportion Var 0.16 0.12 0.11  
## Cumulative Var 0.16 0.28 0.39  
## Proportion Explained 0.40 0.31 0.29  
## Cumulative Proportion 0.40 0.71 1.00  
##   
## With factor correlations of   
## ML3 ML2 ML1  
## ML3 1.00 0.24 0.26  
## ML2 0.24 1.00 -0.05  
## ML1 0.26 -0.05 1.00  
##   
## Mean item complexity = 1.4  
## Test of the hypothesis that 3 factors are sufficient.  
##   
## df null model = 45 with the objective function = 1.41 with Chi Square = 190.3  
## df of the model are 18 and the objective function was 0.23   
##   
## The root mean square of the residuals (RMSR) is 0.05   
## The df corrected root mean square of the residuals is 0.08   
##   
## The harmonic n.obs is 140 with the empirical chi square 36.15 with prob < 0.0068   
## The total n.obs was 140 with Likelihood Chi Square = 29.99 with prob < 0.038   
##   
## Tucker Lewis Index of factoring reliability = 0.79  
## RMSEA index = 0.069 and the 90 % confidence intervals are 0.017 0.112  
## BIC = -58.96  
## Fit based upon off diagonal values = 0.92  
## Measures of factor score adequacy   
## ML3 ML2 ML1  
## Correlation of (regression) scores with factors 0.86 1.00 1.00  
## Multiple R square of scores with factors 0.74 1.00 0.99  
## Minimum correlation of possible factor scores 0.48 0.99 0.99  
##   
## === Greatest Lower Bound ===



## Call: psych::glb(r = items\_clean)  
##   
## Estimates of the Greatest Lower Bound for reliability, based on factor and cluster models  
## GLB estimated from factor based communalities = 0.79 with 5 factors.  
## Use glb.fa to see more details   
##   
## Various estimates based upon splitting the scale into two (see keys for the various splits)  
## Beta = 0.48   
## Beta fa 0.15 This is an estimate of the worst split half reliability  
## Kmeans clusters for best split 0.79  
## Cluster based estimates   
## glb.IC = 0.52  
## glb.max 0.79 Is the maximum of these estimates  
## alpha-PC = 0.6 An estimate of alpha based on eignvalues  
## TenBerge bounds   
## mu0 = 0.64 mu1 = 0.66 mu2 = 0.66 mu3 = 0.66   
##   
## estimated greatest lower bound based upon splitHalf = 0.63   
##   
## Use short = FALSE to see the various ways of splitting the scale  
## === Split-Half Reliability ===  
## Split half reliabilities   
## Call: psych::splitHalf(r = items\_clean)  
##   
## Maximum split half reliability (lambda 4) = 0.79  
## Guttman lambda 6 = 0.67  
## Average split half reliability = 0.64  
## Guttman lambda 3 (alpha) = 0.64  
## Guttman lambda 2 = 0.66  
## Minimum split half reliability (beta) = 0.49  
## Average interitem r = 0.15 with median = 0.16  
## === Average Inter-Item Correlation ===  
## [1] 0.1482628  
##   
## === Principal Component Analysis (1-factor) ===  
## Principal Components Analysis  
## Call: psych::principal(r = items\_clean, nfactors = 1, rotate = "none")  
## Standardized loadings (pattern matrix) based upon correlation matrix  
## PC1 h2 u2 com  
## PIGS\_BINC 0.27 0.072 0.93 1  
## BRUCE\_BINC 0.67 0.455 0.55 1  
## CWD\_BINC 0.49 0.242 0.76 1  
## FLUAL\_BINC 0.50 0.249 0.75 1  
## FLU\_BINC 0.50 0.253 0.75 1  
## COVID\_BINC 0.71 0.508 0.49 1  
## COVIDSPILL\_BINC 0.47 0.218 0.78 1  
## RABIESAL\_BINC 0.47 0.216 0.78 1  
## RABIES\_BINC 0.04 0.002 1.00 1  
## TURKEY\_BINC 0.55 0.307 0.69 1  
##   
## PC1  
## SS loadings 2.52  
## Proportion Var 0.25  
##   
## Mean item complexity = 1  
## Test of the hypothesis that 1 component is sufficient.  
##   
## The root mean square of the residuals (RMSR) is 0.12   
## with the empirical chi square 176.8 with prob < 7.6e-21   
##   
## Fit based upon off diagonal values = 0.63

# 4 ATTITUDES

#### 4.0.0.1 Recoding

directFUN <- function(x) case\_when(  
 x == "Strongly Disagree" ~ 1,  
 x == "Disagree" ~ 2,  
 x == "Neutral" ~ 3,  
 x == "Agree" ~ 4,  
 x == "Strongly Agree" ~ 5,  
 TRUE ~ NA\_real\_)  
  
reverseFUN <- function(x) case\_when(  
 x == "Strongly Agree" ~ 1,  
 x == "Agree" ~ 2,  
 x == "Neutral" ~ 3,  
 x == "Disagree" ~ 4,  
 x == "Strongly Disagree" ~ 5,  
 TRUE ~ NA\_real\_)  
  
df <- df %>%  
 mutate(  
 POPRED\_A = reverseFUN(POPRED),  
 POPPLAN\_A = reverseFUN(POPPLAN),  
 SURVEY\_A = directFUN(SURVEY),  
 VACCINE\_A = directFUN(VACCINE),  
 PREVAL\_A = directFUN(PREVAL),  
 DIVERSE\_A = directFUN(DIVERSE),  
 CONSEQ\_A = directFUN(CONSEQ),  
 CLIMATE\_A = directFUN(CLIMATE),  
 EDREQ\_A = directFUN(EDREQ),  
 INFO\_A = reverseFUN(INFO),  
 HANDSON\_A = reverseFUN(HANDSON),  
 CWDAL\_A = reverseFUN(CWDAL),  
 BATS\_A = directFUN(BATS),  
 PPEREQ\_A = directFUN(PPEREQ),  
 EHD\_A = reverseFUN(EHD),  
 DARWIN\_A = reverseFUN(DARWIN))  
  
# Define item groupings  
control\_vars <- c("POPRED\_A", "POPPLAN\_A", "SURVEY\_A", "VACCINE\_A", "PPEREQ\_A", "BATS\_A")  
misinfo\_vars <- c("DARWIN\_A", "CWDAL\_A", "EHD\_A")  
concern\_vars <- c("PREVAL\_A", "DIVERSE\_A", "CONSEQ\_A") # CLIMATE\_A excluded  
education\_vars <- c("EDREQ\_A", "INFO\_A", "HANDSON\_A")  
  
rev\_var <- c("DARWIN\_A", "EHD\_A", "CWDAL\_A", "HANDSON\_A", "INFO\_A", "POPPLAN\_A", "POPRED\_A")   
dir\_var <- c("PPEREQ\_A", "BATS\_A", "EDREQ\_A", "CONSEQ\_A", "DIVERSE\_A", "PREVAL\_A", "VACCINE\_A", "SURVEY\_A") # Climate\_A excluded  
  
df <- df %>%  
 rowwise() %>%  
 mutate(  
 ATT\_CONTROL\_SCORE = mean(c\_across(all\_of(control\_vars)), na.rm = TRUE),  
 ATT\_CONTROL\_NORM = ATT\_CONTROL\_SCORE / 5,   
 ATT\_MISINFO\_SCORE = mean(c\_across(all\_of(misinfo\_vars)), na.rm = TRUE),  
 ATT\_MISINFO\_NORM = ATT\_MISINFO\_SCORE / 5,   
 ATT\_CONCERN\_SCORE = mean(c\_across(all\_of(concern\_vars)), na.rm = TRUE),  
 ATT\_CONCERN\_NORM = ATT\_CONCERN\_SCORE / 5,   
 ATT\_EDUCATION\_SCORE = mean(c\_across(all\_of(education\_vars)), na.rm = TRUE),  
 ATT\_EDUCATION\_NORM = ATT\_EDUCATION\_SCORE / 5,   
 ATT\_REVERSE\_SCORE = mean(c\_across(all\_of(rev\_var)), na.rm = TRUE),  
 ATT\_REVERSE\_NORM = ATT\_REVERSE\_SCORE / 5,   
 ATT\_DIRECT\_SCORE = mean(c\_across(all\_of(dir\_var)), na.rm = TRUE),  
 ATT\_DIRECT\_NORM = ATT\_DIRECT\_SCORE / 5) %>%  
 ungroup()  
  
# CONTROL  
control\_avg <- mean(df$ATT\_CONTROL\_SCORE, na.rm = TRUE)  
control\_med <- median(df$ATT\_CONTROL\_SCORE, na.rm = TRUE)  
control\_avg

## [1] 3.554762

control\_med

## [1] 3.5

# MISINFO  
misinfo\_avg <- mean(df$ATT\_MISINFO\_SCORE, na.rm = TRUE)  
misinfo\_med <- median(df$ATT\_MISINFO\_SCORE, na.rm = TRUE)  
misinfo\_avg

## [1] 3.878571

misinfo\_med

## [1] 4

# CONCERN  
concern\_avg <- mean(df$ATT\_CONCERN\_SCORE, na.rm = TRUE)  
concern\_med <- median(df$ATT\_CONCERN\_SCORE, na.rm = TRUE)  
concern\_avg

## [1] 3.330935

concern\_med

## [1] 3.333333

# EDUCATION  
education\_avg <- mean(df$ATT\_EDUCATION\_SCORE, na.rm = TRUE)  
education\_med <- median(df$ATT\_EDUCATION\_SCORE, na.rm = TRUE)  
education\_avg

## [1] 3.093525

education\_med

## [1] 3

# REVERSE  
reverse\_avg <- mean(df$ATT\_REVERSE\_SCORE, na.rm = TRUE)  
reverse\_med <- median(df$ATT\_REVERSE\_SCORE, na.rm = TRUE)  
reverse\_avg

## [1] 3.315714

reverse\_med

## [1] 3.285714

# DIRECT  
direct\_avg <- mean(df$ATT\_DIRECT\_SCORE, na.rm = TRUE)  
direct\_med <- median(df$ATT\_DIRECT\_SCORE, na.rm = TRUE)  
direct\_avg

## [1] 3.633036

direct\_med

## [1] 3.625

# Norm Scores   
control\_norm\_avg <- mean(df$ATT\_CONTROL\_NORM, na.rm = TRUE)  
control\_norm\_med <- median(df$ATT\_CONTROL\_NORM, na.rm = TRUE)  
misinfo\_norm\_avg <- mean(df$ATT\_MISINFO\_NORM, na.rm = TRUE)  
misinfo\_norm\_med <- median(df$ATT\_MISINFO\_NORM, na.rm = TRUE)  
concern\_norm\_avg <- mean(df$ATT\_CONCERN\_NORM, na.rm = TRUE)  
concern\_norm\_med <- median(df$ATT\_CONCERN\_NORM, na.rm = TRUE)  
education\_norm\_avg <- mean(df$ATT\_EDUCATION\_NORM, na.rm = TRUE)  
education\_norm\_med <- median(df$ATT\_EDUCATION\_NORM, na.rm = TRUE)  
reverse\_norm\_avg <- mean(df$ATT\_REVERSE\_NORM, na.rm = TRUE)  
reverse\_norm\_med <- median(df$ATT\_REVERSE\_NORM, na.rm = TRUE)  
direct\_norm\_avg <- mean(df$ATT\_DIRECT\_NORM, na.rm = TRUE)  
direct\_norm\_med <- median(df$ATT\_DIRECT\_NORM, na.rm = TRUE)  
control\_norm\_avg

## [1] 0.7109524

control\_norm\_med

## [1] 0.7

misinfo\_norm\_avg

## [1] 0.7757143

misinfo\_norm\_med

## [1] 0.8

concern\_norm\_avg

## [1] 0.6661871

concern\_norm\_med

## [1] 0.6666667

education\_norm\_avg

## [1] 0.618705

education\_norm\_med

## [1] 0.6

reverse\_norm\_avg

## [1] 0.6631429

reverse\_norm\_med

## [1] 0.6571429

direct\_norm\_avg

## [1] 0.7266071

direct\_norm\_med

## [1] 0.725

df <- df %>%  
 mutate(  
 CONTROL\_AVG = if\_else(ATT\_CONTROL\_NORM > control\_norm\_avg, 1, 0),  
 CONTROL\_MED = if\_else(ATT\_CONTROL\_NORM > control\_norm\_med, 1, 0),  
 MISINFO\_AVG = if\_else(ATT\_MISINFO\_NORM > misinfo\_norm\_avg, 1, 0),  
 MISINFO\_MED = if\_else(ATT\_MISINFO\_NORM > misinfo\_norm\_med, 1, 0),  
 CONCERN\_AVG = if\_else(ATT\_CONCERN\_NORM > concern\_norm\_avg, 1, 0),  
 CONCERN\_MED = if\_else(ATT\_CONCERN\_NORM > concern\_norm\_med, 1, 0),  
 EDUCATION\_AVG = if\_else(ATT\_EDUCATION\_NORM > education\_norm\_avg, 1, 0),  
 EDUCATION\_MED = if\_else(ATT\_EDUCATION\_NORM > education\_norm\_med, 1, 0),  
 REVERSE\_AVG = if\_else(ATT\_REVERSE\_NORM > reverse\_norm\_avg, 1, 0),  
 REVERSE\_MED = if\_else(ATT\_REVERSE\_NORM > reverse\_norm\_med, 1, 0),  
 DIRECT\_AVG = if\_else(ATT\_DIRECT\_NORM > direct\_norm\_avg, 1, 0),  
 DIRECT\_MED = if\_else(ATT\_DIRECT\_NORM > direct\_norm\_med, 1, 0))

#### 4.0.0.2 Reliability

### THEMATIC SPLIT ------------------------------------------------------------------------  
control\_vars <- c("POPRED\_A", "POPPLAN\_A", "SURVEY\_A", "VACCINE\_A", "PPEREQ\_A", "BATS\_A")  
alpha\_control <- psych::alpha(df[control\_vars], check.keys = TRUE)  
alpha\_control$key

## [[1]]  
## [1] "-POPRED\_A" "-POPPLAN\_A" "SURVEY\_A" "VACCINE\_A" "PPEREQ\_A"   
## [6] "BATS\_A"

cat("Alpha – Disease Control Beliefs:", round(alpha\_control$total$raw\_alpha, 3), "\n")

## Alpha – Disease Control Beliefs: 0.419

alpha\_control$alpha.drop

## raw\_alpha std.alpha G6(smc) average\_r S/N alpha se  
## POPRED\_A- 0.4003832 0.3967484 0.3561068 0.11624601 0.6576831 0.07832391  
## POPPLAN\_A- 0.3000770 0.3132921 0.2848549 0.08361522 0.4562233 0.09274245  
## SURVEY\_A 0.4101285 0.4123857 0.3805730 0.12308340 0.7017965 0.07896338  
## VACCINE\_A 0.3658483 0.3581225 0.3321570 0.10038446 0.5579297 0.08286054  
## PPEREQ\_A 0.3619791 0.3584104 0.3339473 0.10049759 0.5586288 0.08367053  
## BATS\_A 0.4036612 0.4000414 0.3591456 0.11766496 0.6667816 0.07813621  
## var.r med.r  
## POPRED\_A- 0.004023271 0.13508249  
## POPPLAN\_A- 0.005832523 0.06900152  
## SURVEY\_A 0.007568827 0.14705409  
## VACCINE\_A 0.008009308 0.09407567  
## PPEREQ\_A 0.008550505 0.09027436  
## BATS\_A 0.004087302 0.13508249

misinfo\_vars <- c("DARWIN\_A", "CWDAL\_A", "EHD\_A")   
alpha\_misinfo <- psych::alpha(df[misinfo\_vars], check.keys = TRUE)  
cat("Alpha – Misinformation Orientation:", round(alpha\_misinfo$total$raw\_alpha, 3), "\n")

## Alpha – Misinformation Orientation: 0.578

concern\_vars <- c("PREVAL\_A", "DIVERSE\_A", "CONSEQ\_A")  
alpha\_concern <- psych::alpha(df[concern\_vars], check.keys = TRUE)  
cat("Alpha – Concern & Risk:", round(alpha\_concern$total$raw\_alpha, 3), "\n")

## Alpha – Concern & Risk: 0.661

alpha\_concern$alpha.drop # removed "CLIMATE\_A"

## raw\_alpha std.alpha G6(smc) average\_r S/N alpha se var.r  
## PREVAL\_A 0.4514743 0.4527136 0.2925855 0.2925855 0.8271969 0.09235943 NA  
## DIVERSE\_A 0.5118393 0.5119954 0.3440819 0.3440819 1.0491611 0.08247587 NA  
## CONSEQ\_A 0.7138551 0.7145639 0.5558922 0.5558922 2.5034109 0.04825946 NA  
## med.r  
## PREVAL\_A 0.2925855  
## DIVERSE\_A 0.3440819  
## CONSEQ\_A 0.5558922

education\_vars <- c("EDREQ\_A", "INFO\_A", "HANDSON\_A")  
alpha\_education <- psych::alpha(df[education\_vars], check.keys = TRUE)  
cat("Alpha – Education Orientation:", round(alpha\_education$total$raw\_alpha, 3), "\n")

## Alpha – Education Orientation: 0.4

### Direction of Response = More knowledge, concern, interest in edu ------------------  
rev\_var <- c("DARWIN\_A", "EHD\_A", "CWDAL\_A", "HANDSON\_A", "INFO\_A", "POPPLAN\_A", "POPRED\_A")  
alpha\_rev <- psych::alpha(df[rev\_var], check.keys = TRUE)  
cat("Cronbach's Alpha – Reversed Value Recode:", round(alpha\_rev$total$raw\_alpha, 3), "\n")

## Cronbach's Alpha – Reversed Value Recode: 0.47

alpha\_rev$alpha.drop

## raw\_alpha std.alpha G6(smc) average\_r S/N alpha se  
## DARWIN\_A 0.4518540 0.4491835 0.4913298 0.11965203 0.8154868 0.07219921  
## EHD\_A 0.3884615 0.3812026 0.4079212 0.09311281 0.6160379 0.07986359  
## CWDAL\_A 0.4266994 0.4152462 0.4156571 0.10582840 0.7101214 0.07409976  
## HANDSON\_A 0.3843897 0.3855825 0.4178758 0.09468915 0.6275578 0.08060800  
## INFO\_A 0.4601301 0.4603232 0.4922816 0.12446602 0.8529607 0.07125932  
## POPPLAN\_A 0.4477091 0.4449598 0.4779030 0.11786386 0.8016712 0.07239170  
## POPRED\_A 0.4544453 0.4527715 0.4835395 0.12118689 0.8273902 0.07167859  
## var.r med.r  
## DARWIN\_A 0.02197182 0.10598558  
## EHD\_A 0.01837173 0.08643472  
## CWDAL\_A 0.01359938 0.08643472  
## HANDSON\_A 0.02023897 0.08643472  
## INFO\_A 0.02278614 0.11084932  
## POPPLAN\_A 0.02153697 0.10223093  
## POPRED\_A 0.02327833 0.10598558

dir\_var <- c("PPEREQ\_A", "BATS\_A", "EDREQ\_A", "CONSEQ\_A", "DIVERSE\_A", "PREVAL\_A", "VACCINE\_A", "SURVEY\_A")  
# CLIMATE\_A removed (increased CA estimate)  
alpha\_dir <- psych::alpha(df[dir\_var], check.keys = TRUE)  
cat("Cronbach's Alpha – Direct Value Recode:", round(alpha\_dir$total$raw\_alpha, 3), "\n")

## Cronbach's Alpha – Direct Value Recode: 0.577

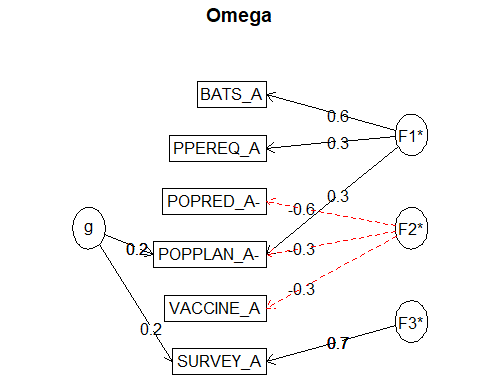
alpha\_dir$alpha.drop

## raw\_alpha std.alpha G6(smc) average\_r S/N alpha se  
## PPEREQ\_A 0.5690493 0.5655901 0.5765909 0.1568270 1.3019733 0.05442039  
## BATS\_A 0.5705274 0.5669756 0.5770060 0.1575744 1.3093388 0.05429079  
## EDREQ\_A 0.5657262 0.5648506 0.5779837 0.1564295 1.2980612 0.05522168  
## CONSEQ\_A 0.5434307 0.5488467 0.5536571 0.1480601 1.2165416 0.05826786  
## DIVERSE\_A 0.4792522 0.4804690 0.4678961 0.1166984 0.9248131 0.06634622  
## PREVAL\_A 0.4764648 0.4774641 0.4649599 0.1154629 0.9137442 0.06677722  
## VACCINE\_A 0.5594276 0.5543062 0.5593713 0.1508660 1.2436931 0.05561696  
## SURVEY\_A 0.5733010 0.5772470 0.5812001 0.1632247 1.3654476 0.05476148  
## var.r med.r  
## PPEREQ\_A 0.017279448 0.1343377  
## BATS\_A 0.016770185 0.1335626  
## EDREQ\_A 0.017636185 0.1335626  
## CONSEQ\_A 0.012335253 0.1335626  
## DIVERSE\_A 0.006575029 0.1335626  
## PREVAL\_A 0.007116497 0.1134102  
## VACCINE\_A 0.016169145 0.1335626  
## SURVEY\_A 0.015229016 0.1315245

###### reliFUN -------------------------------  
# Thematic Scoring   
reliFUN(df, c("POPRED\_A", "POPPLAN\_A", "SURVEY\_A", "VACCINE\_A", "PPEREQ\_A", "BATS\_A"), "CONTROL BELIEFS")

##   
##   
## ==================== CONTROL BELIEFS ====================  
##   
## === Cronbach's Alpha ===

##   
## Reliability analysis   
## Call: psych::alpha(x = items\_clean, check.keys = TRUE)  
##   
## raw\_alpha std.alpha G6(smc) average\_r S/N ase mean sd median\_r  
## 0.42 0.42 0.4 0.11 0.72 0.075 3.4 0.48 0.13  
##   
## 95% confidence boundaries   
## lower alpha upper  
## Feldt 0.26 0.42 0.56  
## Duhachek 0.27 0.42 0.57  
##   
## Reliability if an item is dropped:  
## raw\_alpha std.alpha G6(smc) average\_r S/N alpha se var.r med.r  
## POPRED\_A- 0.40 0.40 0.36 0.116 0.66 0.078 0.0040 0.135  
## POPPLAN\_A- 0.30 0.31 0.28 0.084 0.46 0.093 0.0058 0.069  
## SURVEY\_A 0.41 0.41 0.38 0.123 0.70 0.079 0.0076 0.147  
## VACCINE\_A 0.37 0.36 0.33 0.100 0.56 0.083 0.0080 0.094  
## PPEREQ\_A 0.36 0.36 0.33 0.100 0.56 0.084 0.0086 0.090  
## BATS\_A 0.40 0.40 0.36 0.118 0.67 0.078 0.0041 0.135  
##   
## Item statistics   
## n raw.r std.r r.cor r.drop mean sd  
## POPRED\_A- 140 0.49 0.47 0.27 0.16 2.6 1.01  
## POPPLAN\_A- 140 0.61 0.58 0.46 0.31 2.8 1.00  
## SURVEY\_A 140 0.34 0.45 0.21 0.13 4.5 0.62  
## VACCINE\_A 140 0.52 0.53 0.35 0.22 3.4 0.93  
## PPEREQ\_A 140 0.54 0.53 0.35 0.22 3.7 0.99  
## BATS\_A 140 0.51 0.47 0.27 0.16 3.3 1.08  
##   
## Non missing response frequency for each item  
## 1 2 3 4 5 miss  
## POPRED\_A 0.03 0.18 0.28 0.39 0.12 0  
## POPPLAN\_A 0.03 0.24 0.38 0.25 0.10 0  
## SURVEY\_A 0.00 0.01 0.04 0.43 0.52 0  
## VACCINE\_A 0.04 0.11 0.37 0.39 0.09 0  
## PPEREQ\_A 0.02 0.13 0.19 0.47 0.19 0  
## BATS\_A 0.06 0.22 0.21 0.42 0.09 0  
## Raw Alpha: 0.419   
## raw\_alpha std.alpha G6(smc) average\_r S/N alpha se  
## POPRED\_A- 0.4003832 0.3967484 0.3561068 0.11624601 0.6576831 0.07832391  
## POPPLAN\_A- 0.3000770 0.3132921 0.2848549 0.08361522 0.4562233 0.09274245  
## SURVEY\_A 0.4101285 0.4123857 0.3805730 0.12308340 0.7017965 0.07896338  
## VACCINE\_A 0.3658483 0.3581225 0.3321570 0.10038446 0.5579297 0.08286054  
## PPEREQ\_A 0.3619791 0.3584104 0.3339473 0.10049759 0.5586288 0.08367053  
## BATS\_A 0.4036612 0.4000414 0.3591456 0.11766496 0.6667816 0.07813621  
## var.r med.r  
## POPRED\_A- 0.004023271 0.13508249  
## POPPLAN\_A- 0.005832523 0.06900152  
## SURVEY\_A 0.007568827 0.14705409  
## VACCINE\_A 0.008009308 0.09407567  
## PPEREQ\_A 0.008550505 0.09027436  
## BATS\_A 0.004087302 0.13508249  
##   
## === McDonald's Omega ===



## Omega   
## Call: omegah(m = m, nfactors = nfactors, fm = fm, key = key, flip = flip,   
## digits = digits, title = title, sl = sl, labels = labels,   
## plot = plot, n.obs = n.obs, rotate = rotate, Phi = Phi, option = option,   
## covar = covar)  
## Alpha: 0.42   
## G.6: 0.4   
## Omega Hierarchical: 0.13   
## Omega H asymptotic: 0.24   
## Omega Total 0.54   
##   
## Schmid Leiman Factor loadings greater than 0.2   
## g F1\* F2\* F3\* h2 h2 u2 p2 com  
## POPRED\_A- -0.59 0.38 0.38 0.62 0.06 1.16  
## POPPLAN\_A- 0.21 0.33 -0.34 0.27 0.27 0.73 0.17 2.66  
## SURVEY\_A 0.24 0.66 0.49 0.49 0.51 0.11 1.26  
## VACCINE\_A -0.30 0.14 0.86 0.18 2.13  
## PPEREQ\_A 0.26 0.12 0.88 0.22 2.60  
## BATS\_A 0.61 0.40 0.40 0.60 0.08 1.20  
##   
## With Sums of squares of:  
## g F1\* F2\* F3\* h2   
## 0.21 0.55 0.56 0.48 0.65   
##   
## general/max 0.32 max/min = 1.36  
## mean percent general = 0.14 with sd = 0.06 and cv of 0.46   
## Explained Common Variance of the general factor = 0.12   
##   
## The degrees of freedom are 0 and the fit is 0   
## The number of observations was 140 with Chi Square = 0 with prob < NA  
## The root mean square of the residuals is 0   
## The df corrected root mean square of the residuals is NA  
##   
## Compare this with the adequacy of just a general factor and no group factors  
## The degrees of freedom for just the general factor are 9 and the fit is 0.16   
## The number of observations was 140 with Chi Square = 21.81 with prob < 0.0095  
## The root mean square of the residuals is 0.11   
## The df corrected root mean square of the residuals is 0.14   
##   
## RMSEA index = 0.101 and the 90 % confidence intervals are 0.047 0.156  
## BIC = -22.67   
##   
## Measures of factor score adequacy   
## g F1\* F2\* F3\*  
## Correlation of scores with factors 0.38 0.66 0.66 0.67  
## Multiple R square of scores with factors 0.14 0.43 0.43 0.45  
## Minimum correlation of factor score estimates -0.72 -0.13 -0.13 -0.10  
##   
## Total, General and Subset omega for each subset  
## g F1\* F2\* F3\*  
## Omega total for total scores and subscales 0.54 0.37 0.43 0.49  
## Omega general for total scores and subscales 0.13 0.05 0.07 0.06  
## Omega group for total scores and subscales 0.29 0.32 0.37 0.44  
##   
## === Factor Analysis (3-factor, ML) ===  
## Factor Analysis using method = ml  
## Call: psych::fa(r = items\_clean, nfactors = 3, fm = "ml")  
## Standardized loadings (pattern matrix) based upon correlation matrix  
## ML3 ML1 ML2 h2 u2 com  
## POPRED\_A 0.62 0.07 0.02 0.38 0.62 1.0  
## POPPLAN\_A 0.35 -0.35 0.00 0.27 0.73 2.0  
## SURVEY\_A 0.01 -0.01 0.70 0.50 0.50 1.0  
## VACCINE\_A -0.31 0.04 0.16 0.14 0.86 1.6  
## PPEREQ\_A -0.09 0.27 0.16 0.12 0.88 1.8  
## BATS\_A 0.06 0.64 -0.01 0.40 0.60 1.0  
##   
## ML3 ML1 ML2  
## SS loadings 0.63 0.62 0.56  
## Proportion Var 0.10 0.10 0.09  
## Cumulative Var 0.10 0.21 0.30  
## Proportion Explained 0.35 0.34 0.31  
## Cumulative Proportion 0.35 0.69 1.00  
##   
## With factor correlations of   
## ML3 ML1 ML2  
## ML3 1.00 -0.09 -0.10  
## ML1 -0.09 1.00 0.11  
## ML2 -0.10 0.11 1.00  
##   
## Mean item complexity = 1.4  
## Test of the hypothesis that 3 factors are sufficient.  
##   
## df null model = 15 with the objective function = 0.24 with Chi Square = 32.71  
## df of the model are 0 and the objective function was 0   
##   
## The root mean square of the residuals (RMSR) is 0   
## The df corrected root mean square of the residuals is NA   
##   
## The harmonic n.obs is 140 with the empirical chi square 0 with prob < NA   
## The total n.obs was 140 with Likelihood Chi Square = 0 with prob < NA   
##   
## Tucker Lewis Index of factoring reliability = -Inf  
## Fit based upon off diagonal values = 1  
## Measures of factor score adequacy   
## ML3 ML1 ML2  
## Correlation of (regression) scores with factors 0.69 0.70 0.72  
## Multiple R square of scores with factors 0.48 0.49 0.51  
## Minimum correlation of possible factor scores -0.04 -0.02 0.03  
##   
## === Greatest Lower Bound ===

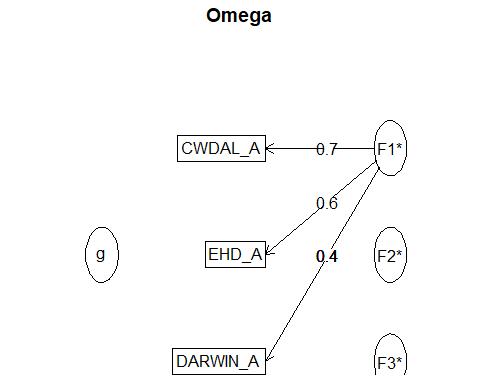


## Call: psych::glb(r = items\_clean)  
##   
## Estimates of the Greatest Lower Bound for reliability, based on factor and cluster models  
## GLB estimated from factor based communalities = 0.31 with 3 factors.  
## Use glb.fa to see more details   
##   
## Various estimates based upon splitting the scale into two (see keys for the various splits)  
## Beta = 0.2   
## Beta fa -0.57 This is an estimate of the worst split half reliability  
## Kmeans clusters for best split 0.28  
## Cluster based estimates   
## glb.IC = -0.06  
## glb.max 0.28 Is the maximum of these estimates  
## alpha-PC = 0.36 An estimate of alpha based on eignvalues  
## TenBerge bounds   
## mu0 = 0.01 mu1 = 0.14 mu2 = 0.15 mu3 = 0.15   
##   
## estimated greatest lower bound based upon splitHalf = 0.14   
##   
## Use short = FALSE to see the various ways of splitting the scale  
## === Split-Half Reliability ===

## Split half reliabilities   
## Call: psych::splitHalf(r = items\_clean)  
##   
## Maximum split half reliability (lambda 4) = 0.53  
## Guttman lambda 6 = 0.4  
## Average split half reliability = 0.42  
## Guttman lambda 3 (alpha) = 0.42  
## Guttman lambda 2 = 0.43  
## Minimum split half reliability (beta) = 0.3  
## Average interitem r = 0.11 with median = 0.13  
## === Average Inter-Item Correlation ===  
## [1] 0.002232837  
##   
## === Principal Component Analysis (1-factor) ===  
## Principal Components Analysis  
## Call: psych::principal(r = items\_clean, nfactors = 1, rotate = "none")  
## Standardized loadings (pattern matrix) based upon correlation matrix  
## PC1 h2 u2 com  
## POPRED\_A -0.47 0.22 0.78 1  
## POPPLAN\_A -0.66 0.44 0.56 1  
## SURVEY\_A 0.36 0.13 0.87 1  
## VACCINE\_A 0.54 0.29 0.71 1  
## PPEREQ\_A 0.53 0.28 0.72 1  
## BATS\_A 0.45 0.20 0.80 1  
##   
## PC1  
## SS loadings 1.56  
## Proportion Var 0.26  
##   
## Mean item complexity = 1  
## Test of the hypothesis that 1 component is sufficient.  
##   
## The root mean square of the residuals (RMSR) is 0.16   
## with the empirical chi square 104.59 with prob < 1.9e-18   
##   
## Fit based upon off diagonal values = -0.44

reliFUN(df, c("DARWIN\_A", "CWDAL\_A", "EHD\_A"), "MISINFORMATION ORIENTATION")

##   
##   
## ==================== MISINFORMATION ORIENTATION ====================  
##   
## === Cronbach's Alpha ===  
##   
## Reliability analysis   
## Call: psych::alpha(x = items\_clean, check.keys = TRUE)  
##   
## raw\_alpha std.alpha G6(smc) average\_r S/N ase mean sd median\_r  
## 0.58 0.57 0.49 0.31 1.3 0.06 3.9 0.68 0.28  
##   
## 95% confidence boundaries   
## lower alpha upper  
## Feldt 0.44 0.58 0.69  
## Duhachek 0.46 0.58 0.70  
##   
## Reliability if an item is dropped:  
## raw\_alpha std.alpha G6(smc) average\_r S/N alpha se var.r med.r  
## DARWIN\_A 0.60 0.60 0.43 0.43 1.49 0.068 NA 0.43  
## CWDAL\_A 0.36 0.37 0.22 0.22 0.58 0.106 NA 0.22  
## EHD\_A 0.43 0.44 0.28 0.28 0.77 0.095 NA 0.28  
##   
## Item statistics   
## n raw.r std.r r.cor r.drop mean sd  
## DARWIN\_A 140 0.64 0.68 0.39 0.30 4.1 0.81  
## CWDAL\_A 140 0.79 0.77 0.60 0.46 3.8 0.96  
## EHD\_A 140 0.78 0.75 0.55 0.42 3.8 0.99  
##   
## Non missing response frequency for each item  
## 1 2 3 4 5 miss  
## DARWIN\_A 0.00 0.04 0.16 0.48 0.31 0  
## CWDAL\_A 0.01 0.09 0.28 0.36 0.26 0  
## EHD\_A 0.01 0.07 0.31 0.31 0.29 0  
## Raw Alpha: 0.578   
## raw\_alpha std.alpha G6(smc) average\_r S/N alpha se var.r  
## DARWIN\_A 0.5984894 0.5986671 0.4272126 0.4272126 1.4916971 0.06783252 NA  
## CWDAL\_A 0.3588723 0.3650919 0.2233103 0.2233103 0.5750310 0.10600625 NA  
## EHD\_A 0.4305850 0.4358407 0.2786422 0.2786422 0.7725491 0.09464821 NA  
## med.r  
## DARWIN\_A 0.4272126  
## CWDAL\_A 0.2233103  
## EHD\_A 0.2786422  
##   
## === McDonald's Omega ===



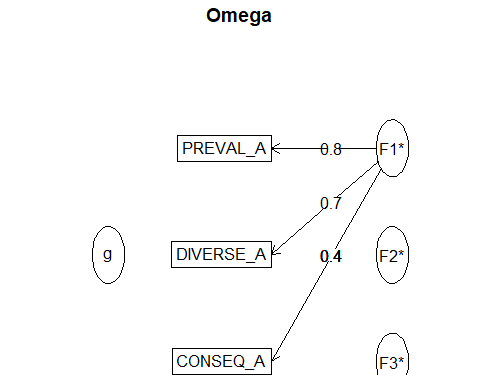
## Omega   
## Call: omegah(m = m, nfactors = nfactors, fm = fm, key = key, flip = flip,   
## digits = digits, title = title, sl = sl, labels = labels,   
## plot = plot, n.obs = n.obs, rotate = rotate, Phi = Phi, option = option,   
## covar = covar)  
## Alpha: 0.57   
## G.6: 0.49   
## Omega Hierarchical: 0.04   
## Omega H asymptotic: 0.07   
## Omega Total 0.6   
##   
## Schmid Leiman Factor loadings greater than 0.2   
## g F1\* F2\* F3\* h2 h2 u2 p2 com  
## DARWIN\_A 0.37 0.17 0.83 0.10 1.58  
## CWDAL\_A 0.67 0.49 0.49 0.51 0.07 1.17  
## EHD\_A 0.61 0.40 0.40 0.60 0.04 1.15  
##   
## With Sums of squares of:  
## g F1\* F2\* F3\* h2   
## 0.07 0.96 0.03 0.00 0.43   
##   
## general/max 0.07 max/min = Inf  
## mean percent general = 0.07 with sd = 0.03 and cv of 0.43   
## Explained Common Variance of the general factor = 0.07   
##   
## The degrees of freedom are -3 and the fit is 0   
## The number of observations was 140 with Chi Square = 0 with prob < NA  
## The root mean square of the residuals is 0   
## The df corrected root mean square of the residuals is NA  
##   
## Compare this with the adequacy of just a general factor and no group factors  
## The degrees of freedom for just the general factor are 0 and the fit is 0.26   
## The number of observations was 140 with Chi Square = 35.09 with prob < NA  
## The root mean square of the residuals is 0.3   
## The df corrected root mean square of the residuals is NA   
##   
## Measures of factor score adequacy   
## g F1\* F2\* F3\*  
## Correlation of scores with factors 0.21 0.77 0.22 0  
## Multiple R square of scores with factors 0.04 0.60 0.05 0  
## Minimum correlation of factor score estimates -0.91 0.20 -0.91 -1  
##   
## Total, General and Subset omega for each subset  
## g F1\* F2\* F3\*  
## Omega total for total scores and subscales 0.60 0.60 NA NA  
## Omega general for total scores and subscales 0.04 0.04 NA NA  
## Omega group for total scores and subscales 0.56 0.56 NA NA  
##   
## === Factor Analysis (3-factor, ML) ===  
## Factor Analysis using method = ml  
## Call: psych::fa(r = items\_clean, nfactors = 3, fm = "ml")  
## Standardized loadings (pattern matrix) based upon correlation matrix  
## ML1 ML2 ML3 h2 u2 com  
## DARWIN\_A 0.40 0 0 0.16 0.84 1  
## CWDAL\_A 0.58 0 0 0.34 0.66 1  
## EHD\_A 0.55 0 0 0.31 0.69 1  
##   
## ML1 ML2 ML3  
## SS loadings 0.81 0.00 0.00  
## Proportion Var 0.27 0.00 0.00  
## Cumulative Var 0.27 0.27 0.27  
## Proportion Explained 1.00 0.00 0.00  
## Cumulative Proportion 1.00 1.00 1.00  
##   
## With factor correlations of   
## ML1 ML2 ML3  
## ML1 1 0 0  
## ML2 0 1 0  
## ML3 0 0 1  
##   
## Mean item complexity = 1  
## Test of the hypothesis that 3 factors are sufficient.  
##   
## df null model = 3 with the objective function = 0.3 with Chi Square = 40.72  
## df of the model are -3 and the objective function was 0.02   
##   
## The root mean square of the residuals (RMSR) is 0.07   
## The df corrected root mean square of the residuals is NA   
##   
## The harmonic n.obs is 140 with the empirical chi square 3.57 with prob < NA   
## The total n.obs was 140 with Likelihood Chi Square = 2.46 with prob < NA   
##   
## Tucker Lewis Index of factoring reliability = 1.147  
## Fit based upon off diagonal values = 0.96  
## Measures of factor score adequacy   
## ML1 ML2 ML3  
## Correlation of (regression) scores with factors 0.71 0 0  
## Multiple R square of scores with factors 0.50 0 0  
## Minimum correlation of possible factor scores 0.00 -1 -1  
##   
## === Greatest Lower Bound ===



## Call: psych::glb(r = items\_clean)  
##   
## Estimates of the Greatest Lower Bound for reliability, based on factor and cluster models  
## GLB estimated from factor based communalities = 0.59 with 1 factors.  
## Use glb.fa to see more details   
##   
## Various estimates based upon splitting the scale into two (see keys for the various splits)  
## Beta = 0.58   
## Beta fa NaN This is an estimate of the worst split half reliability  
## Kmeans clusters for best split 0.62  
## Cluster based estimates   
## glb.IC = 0.58  
## glb.max 0.62 Is the maximum of these estimates  
## alpha-PC = 0.39 An estimate of alpha based on eignvalues  
## TenBerge bounds   
## mu0 = 0.57 mu1 = 0.58 mu2 = 0.59 mu3 = 0.59   
##   
## estimated greatest lower bound based upon splitHalf = 0.58   
##   
## Use short = FALSE to see the various ways of splitting the scale  
## === Split-Half Reliability ===  
## Split half reliabilities   
## Call: psych::splitHalf(r = items\_clean)  
##   
## Maximum split half reliability (lambda 4) = 0.58  
## Guttman lambda 6 = 0.49  
## Average split half reliability = 0.51  
## Guttman lambda 3 (alpha) = 0.57  
## Guttman lambda 2 = 0.58  
## Minimum split half reliability (beta) = 0.41  
## Average interitem r = 0.31 with median = 0.28  
## === Average Inter-Item Correlation ===  
## [1] 0.3097217  
##   
## === Principal Component Analysis (1-factor) ===  
## Principal Components Analysis  
## Call: psych::principal(r = items\_clean, nfactors = 1, rotate = "none")  
## Standardized loadings (pattern matrix) based upon correlation matrix  
## PC1 h2 u2 com  
## DARWIN\_A 0.63 0.40 0.60 1  
## CWDAL\_A 0.80 0.64 0.36 1  
## EHD\_A 0.77 0.59 0.41 1  
##   
## PC1  
## SS loadings 1.63  
## Proportion Var 0.54  
##   
## Mean item complexity = 1  
## Test of the hypothesis that 1 component is sufficient.  
##   
## The root mean square of the residuals (RMSR) is 0.23   
## with the empirical chi square 43.08 with prob < NA   
##   
## Fit based upon off diagonal values = 0.5

reliFUN(df, c("PREVAL\_A", "DIVERSE\_A", "CONSEQ\_A"), "CONCERN & PERCEIVED RISK")

##   
##   
## ==================== CONCERN & PERCEIVED RISK ====================  
##   
## === Cronbach's Alpha ===  
##   
## Reliability analysis   
## Call: psych::alpha(x = items\_clean, check.keys = TRUE)  
##   
## raw\_alpha std.alpha G6(smc) average\_r S/N ase mean sd median\_r  
## 0.66 0.66 0.59 0.4 2 0.05 3.3 0.73 0.34  
##   
## 95% confidence boundaries   
## lower alpha upper  
## Feldt 0.55 0.66 0.75  
## Duhachek 0.56 0.66 0.76  
##   
## Reliability if an item is dropped:  
## raw\_alpha std.alpha G6(smc) average\_r S/N alpha se var.r med.r  
## PREVAL\_A 0.45 0.45 0.29 0.29 0.83 0.093 NA 0.29  
## DIVERSE\_A 0.51 0.51 0.34 0.34 1.05 0.083 NA 0.34  
## CONSEQ\_A 0.71 0.71 0.56 0.56 2.50 0.048 NA 0.56  
##   
## Item statistics   
## n raw.r std.r r.cor r.drop mean sd  
## PREVAL\_A 139 0.82 0.82 0.70 0.55 3.5 0.95  
## DIVERSE\_A 139 0.78 0.80 0.66 0.52 3.7 0.90  
## CONSEQ\_A 139 0.72 0.71 0.43 0.36 2.8 0.98  
##   
## Non missing response frequency for each item  
## 1 2 3 4 5 miss  
## PREVAL\_A 0.01 0.17 0.25 0.45 0.12 0  
## DIVERSE\_A 0.01 0.09 0.25 0.46 0.19 0  
## CONSEQ\_A 0.08 0.35 0.32 0.22 0.03 0  
## Raw Alpha: 0.661   
## raw\_alpha std.alpha G6(smc) average\_r S/N alpha se var.r  
## PREVAL\_A 0.4514743 0.4527136 0.2925855 0.2925855 0.8271969 0.09269107 NA  
## DIVERSE\_A 0.5118393 0.5119954 0.3440819 0.3440819 1.0491611 0.08277201 NA  
## CONSEQ\_A 0.7138551 0.7145639 0.5558922 0.5558922 2.5034109 0.04843274 NA  
## med.r  
## PREVAL\_A 0.2925855  
## DIVERSE\_A 0.3440819  
## CONSEQ\_A 0.5558922  
##   
## === McDonald's Omega ===



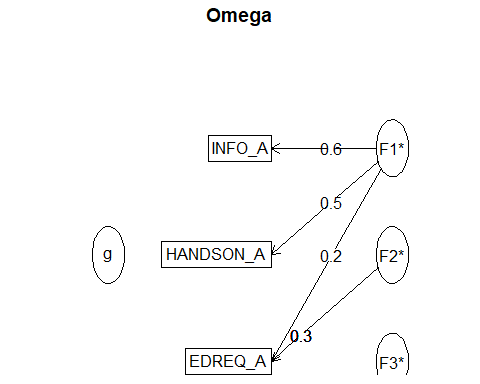
## Omega   
## Call: omegah(m = m, nfactors = nfactors, fm = fm, key = key, flip = flip,   
## digits = digits, title = title, sl = sl, labels = labels,   
## plot = plot, n.obs = n.obs, rotate = rotate, Phi = Phi, option = option,   
## covar = covar)  
## Alpha: 0.66   
## G.6: 0.59   
## Omega Hierarchical: 0.04   
## Omega H asymptotic: 0.05   
## Omega Total 0.69   
##   
## Schmid Leiman Factor loadings greater than 0.2   
## g F1\* F2\* F3\* h2 h2 u2 p2 com  
## PREVAL\_A 0.76 0.62 0.62 0.38 0.05 1.12  
## DIVERSE\_A 0.70 0.52 0.52 0.48 0.03 1.11  
## CONSEQ\_A 0.41 0.20 0.20 0.80 0.07 1.40  
##   
## With Sums of squares of:  
## g F1\* F2\* F3\* h2   
## 0.06 1.25 0.03 0.00 0.70   
##   
## general/max 0.05 max/min = Inf  
## mean percent general = 0.05 with sd = 0.02 and cv of 0.4   
## Explained Common Variance of the general factor = 0.05   
##   
## The degrees of freedom are -3 and the fit is 0   
## The number of observations was 139 with Chi Square = 0 with prob < NA  
## The root mean square of the residuals is 0   
## The df corrected root mean square of the residuals is NA  
##   
## Compare this with the adequacy of just a general factor and no group factors  
## The degrees of freedom for just the general factor are 0 and the fit is 0.46   
## The number of observations was 139 with Chi Square = 62.83 with prob < NA  
## The root mean square of the residuals is 0.39   
## The df corrected root mean square of the residuals is NA   
##   
## Measures of factor score adequacy   
## g F1\* F2\* F3\*  
## Correlation of scores with factors 0.19 0.84 0.22 0  
## Multiple R square of scores with factors 0.04 0.71 0.05 0  
## Minimum correlation of factor score estimates -0.92 0.42 -0.90 -1  
##   
## Total, General and Subset omega for each subset  
## g F1\* F2\* F3\*  
## Omega total for total scores and subscales 0.69 0.69 NA NA  
## Omega general for total scores and subscales 0.04 0.04 NA NA  
## Omega group for total scores and subscales 0.66 0.66 NA NA  
##   
## === Factor Analysis (3-factor, ML) ===  
## Factor Analysis using method = ml  
## Call: psych::fa(r = items\_clean, nfactors = 3, fm = "ml")  
## Standardized loadings (pattern matrix) based upon correlation matrix  
## ML1 ML2 ML3 h2 u2 com  
## PREVAL\_A 0.68 0 0 0.46 0.54 1  
## DIVERSE\_A 0.66 0 0 0.43 0.57 1  
## CONSEQ\_A 0.45 0 0 0.20 0.80 1  
##   
## ML1 ML2 ML3  
## SS loadings 1.10 0.00 0.00  
## Proportion Var 0.37 0.00 0.00  
## Cumulative Var 0.37 0.37 0.37  
## Proportion Explained 1.00 0.00 0.00  
## Cumulative Proportion 1.00 1.00 1.00  
##   
## With factor correlations of   
## ML1 ML2 ML3  
## ML1 1 0 0  
## ML2 0 1 0  
## ML3 0 0 1  
##   
## Mean item complexity = 1  
## Test of the hypothesis that 3 factors are sufficient.  
##   
## df null model = 3 with the objective function = 0.51 with Chi Square = 69.8  
## df of the model are -3 and the objective function was 0.03   
##   
## The root mean square of the residuals (RMSR) is 0.07   
## The df corrected root mean square of the residuals is NA   
##   
## The harmonic n.obs is 139 with the empirical chi square 3.6 with prob < NA   
## The total n.obs was 139 with Likelihood Chi Square = 3.61 with prob < NA   
##   
## Tucker Lewis Index of factoring reliability = 1.101  
## Fit based upon off diagonal values = 0.97  
## Measures of factor score adequacy   
## ML1 ML2 ML3  
## Correlation of (regression) scores with factors 0.78 0 0  
## Multiple R square of scores with factors 0.61 0 0  
## Minimum correlation of possible factor scores 0.22 -1 -1  
##   
## === Greatest Lower Bound ===



## Call: psych::glb(r = items\_clean)  
##   
## Estimates of the Greatest Lower Bound for reliability, based on factor and cluster models  
## GLB estimated from factor based communalities = 0.69 with 1 factors.  
## Use glb.fa to see more details   
##   
## Various estimates based upon splitting the scale into two (see keys for the various splits)  
## Beta = 0.53   
## Beta fa NaN This is an estimate of the worst split half reliability  
## Kmeans clusters for best split 0.72  
## Cluster based estimates   
## glb.IC = 0.53  
## glb.max 0.72 Is the maximum of these estimates  
## alpha-PC = 0.45 An estimate of alpha based on eignvalues  
## TenBerge bounds   
## mu0 = 0.66 mu1 = 0.67 mu2 = 0.68 mu3 = 0.68   
##   
## estimated greatest lower bound based upon splitHalf = 0.68   
##   
## Use short = FALSE to see the various ways of splitting the scale  
## === Split-Half Reliability ===  
## Split half reliabilities   
## Call: psych::splitHalf(r = items\_clean)  
##   
## Maximum split half reliability (lambda 4) = 0.67  
## Guttman lambda 6 = 0.59  
## Average split half reliability = 0.59  
## Guttman lambda 3 (alpha) = 0.66  
## Guttman lambda 2 = 0.67  
## Minimum split half reliability (beta) = 0.47  
## Average interitem r = 0.4 with median = 0.34  
## === Average Inter-Item Correlation ===  
## [1] 0.3975199  
##   
## === Principal Component Analysis (1-factor) ===  
## Principal Components Analysis  
## Call: psych::principal(r = items\_clean, nfactors = 1, rotate = "none")  
## Standardized loadings (pattern matrix) based upon correlation matrix  
## PC1 h2 u2 com  
## PREVAL\_A 0.84 0.71 0.29 1  
## DIVERSE\_A 0.82 0.67 0.33 1  
## CONSEQ\_A 0.66 0.43 0.57 1  
##   
## PC1  
## SS loadings 1.81  
## Proportion Var 0.60  
##   
## Mean item complexity = 1  
## Test of the hypothesis that 1 component is sufficient.  
##   
## The root mean square of the residuals (RMSR) is 0.2   
## with the empirical chi square 33.35 with prob < NA   
##   
## Fit based upon off diagonal values = 0.77

reliFUN(df, c("EDREQ\_A", "INFO\_A", "HANDSON\_A"), "EDUCATION ORIENTATION")

##   
##   
## ==================== EDUCATION ORIENTATION ====================  
##   
## === Cronbach's Alpha ===  
##   
## Reliability analysis   
## Call: psych::alpha(x = items\_clean, check.keys = TRUE)  
##   
## raw\_alpha std.alpha G6(smc) average\_r S/N ase mean sd median\_r  
## 0.4 0.39 0.32 0.18 0.65 0.086 3.1 0.61 0.17  
##   
## 95% confidence boundaries   
## lower alpha upper  
## Feldt 0.20 0.4 0.55  
## Duhachek 0.23 0.4 0.57  
##   
## Reliability if an item is dropped:  
## raw\_alpha std.alpha G6(smc) average\_r S/N alpha se var.r med.r  
## EDREQ\_A 0.46 0.47 0.304 0.304 0.87 0.09 NA 0.304  
## INFO\_A 0.11 0.12 0.062 0.062 0.13 0.15 NA 0.062  
## HANDSON\_A 0.28 0.29 0.168 0.168 0.40 0.12 NA 0.168  
##   
## Item statistics   
## n raw.r std.r r.cor r.drop mean sd  
## EDREQ\_A 139 0.54 0.61 0.23 0.14 4.3 0.78  
## INFO\_A 139 0.73 0.73 0.51 0.33 2.4 0.90  
## HANDSON\_A 139 0.73 0.68 0.40 0.25 2.6 1.01  
##   
## Non missing response frequency for each item  
## 1 2 3 4 5 miss  
## EDREQ\_A 0.00 0.02 0.14 0.38 0.46 0  
## INFO\_A 0.14 0.50 0.23 0.12 0.01 0  
## HANDSON\_A 0.11 0.41 0.22 0.24 0.01 0  
## Raw Alpha: 0.4   
## raw\_alpha std.alpha G6(smc) average\_r S/N alpha se var.r  
## EDREQ\_A 0.4639198 0.4664382 0.3041535 0.3041535 0.8741970 0.09023576 NA  
## INFO\_A 0.1128082 0.1164529 0.0618264 0.0618264 0.1318016 0.14549108 NA  
## HANDSON\_A 0.2847599 0.2872323 0.1677006 0.1677006 0.4029816 0.12007929 NA  
## med.r  
## EDREQ\_A 0.3041535  
## INFO\_A 0.0618264  
## HANDSON\_A 0.1677006  
##   
## === McDonald's Omega ===



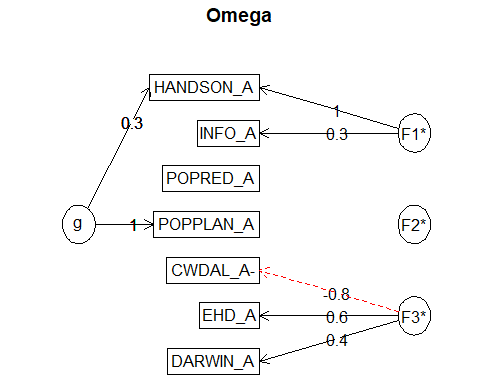
## Omega   
## Call: omegah(m = m, nfactors = nfactors, fm = fm, key = key, flip = flip,   
## digits = digits, title = title, sl = sl, labels = labels,   
## plot = plot, n.obs = n.obs, rotate = rotate, Phi = Phi, option = option,   
## covar = covar)  
## Alpha: 0.39   
## G.6: 0.32   
## Omega Hierarchical: 0   
## Omega H asymptotic: 0.01   
## Omega Total 0.47   
##   
## Schmid Leiman Factor loadings greater than 0.2   
## g F1\* F2\* F3\* h2 h2 u2 p2 com  
## EDREQ\_A 0.23 0.25 0.12 0.88 0.01 2.01  
## INFO\_A 0.65 0.43 0.43 0.57 0.01 1.04  
## HANDSON\_A 0.49 -0.20 0.28 0.28 0.72 0.00 1.32  
##   
## With Sums of squares of:  
## g F1\* F2\* F3\* h2   
## 0.00 0.71 0.11 0.00 0.28   
##   
## general/max 0.01 max/min = Inf  
## mean percent general = 0.01 with sd = 0.01 and cv of 0.87   
## Explained Common Variance of the general factor = 0   
##   
## The degrees of freedom are -3 and the fit is 0   
## The number of observations was 139 with Chi Square = 0 with prob < NA  
## The root mean square of the residuals is 0   
## The df corrected root mean square of the residuals is NA  
##   
## Compare this with the adequacy of just a general factor and no group factors  
## The degrees of freedom for just the general factor are 0 and the fit is 0.12   
## The number of observations was 139 with Chi Square = 16.87 with prob < NA  
## The root mean square of the residuals is 0.2   
## The df corrected root mean square of the residuals is NA   
##   
## Measures of factor score adequacy   
## g F1\* F2\* F3\*  
## Correlation of scores with factors 0.06 0.73 0.35 0  
## Multiple R square of scores with factors 0.00 0.53 0.12 0  
## Minimum correlation of factor score estimates -0.99 0.06 -0.76 -1  
##   
## Total, General and Subset omega for each subset  
## g F1\* F2\* F3\*  
## Omega total for total scores and subscales 0.47 0.5 0.06 NA  
## Omega general for total scores and subscales 0.00 0.0 0.00 NA  
## Omega group for total scores and subscales 0.33 0.5 0.06 NA  
##   
## === Factor Analysis (3-factor, ML) ===  
## Factor Analysis using method = ml  
## Call: psych::fa(r = items\_clean, nfactors = 3, fm = "ml")  
## Standardized loadings (pattern matrix) based upon correlation matrix  
## ML1 ML2 ML3 h2 u2 com  
## EDREQ\_A 0.24 0 0 0.059 0.94 1  
## INFO\_A 0.48 0 0 0.227 0.77 1  
## HANDSON\_A 0.43 0 0 0.184 0.82 1  
##   
## ML1 ML2 ML3  
## SS loadings 0.47 0.00 0.00  
## Proportion Var 0.16 0.00 0.00  
## Cumulative Var 0.16 0.16 0.16  
## Proportion Explained 1.00 0.00 0.00  
## Cumulative Proportion 1.00 1.00 1.00  
##   
## With factor correlations of   
## ML1 ML2 ML3  
## ML1 1 0 0  
## ML2 0 1 0  
## ML3 0 0 1  
##   
## Mean item complexity = 1  
## Test of the hypothesis that 3 factors are sufficient.  
##   
## df null model = 3 with the objective function = 0.13 with Chi Square = 17.12  
## df of the model are -3 and the objective function was 0.02   
##   
## The root mean square of the residuals (RMSR) is 0.07   
## The df corrected root mean square of the residuals is NA   
##   
## The harmonic n.obs is 139 with the empirical chi square 4.03 with prob < NA   
## The total n.obs was 139 with Likelihood Chi Square = 2.51 with prob < NA   
##   
## Tucker Lewis Index of factoring reliability = 1.397  
## Fit based upon off diagonal values = 0.88  
## Measures of factor score adequacy   
## ML1 ML2 ML3  
## Correlation of (regression) scores with factors 0.58 0 0  
## Multiple R square of scores with factors 0.34 0 0  
## Minimum correlation of possible factor scores -0.32 -1 -1  
##   
## === Greatest Lower Bound ===



## Call: psych::glb(r = items\_clean)  
##   
## Estimates of the Greatest Lower Bound for reliability, based on factor and cluster models  
## GLB estimated from factor based communalities = 0.5 with 1 factors.  
## Use glb.fa to see more details   
##   
## Various estimates based upon splitting the scale into two (see keys for the various splits)  
## Beta = 0.39   
## Beta fa 0.25 This is an estimate of the worst split half reliability  
## Kmeans clusters for best split 0.49  
## Cluster based estimates   
## glb.IC = 0.39  
## glb.max 0.49 Is the maximum of these estimates  
## alpha-PC = 0.27 An estimate of alpha based on eignvalues  
## TenBerge bounds   
## mu0 = 0.39 mu1 = 0.41 mu2 = 0.42 mu3 = 0.42   
##   
## estimated greatest lower bound based upon splitHalf = 0.39   
##   
## Use short = FALSE to see the various ways of splitting the scale  
## === Split-Half Reliability ===  
## Split half reliabilities   
## Call: psych::splitHalf(r = items\_clean)  
##   
## Maximum split half reliability (lambda 4) = 0.46  
## Guttman lambda 6 = 0.32  
## Average split half reliability = 0.35  
## Guttman lambda 3 (alpha) = 0.39  
## Guttman lambda 2 = 0.41  
## Minimum split half reliability (beta) = 0.23  
## Average interitem r = 0.18 with median = 0.17  
## === Average Inter-Item Correlation ===  
## [1] 0.1778935  
##   
## === Principal Component Analysis (1-factor) ===  
## Principal Components Analysis  
## Call: psych::principal(r = items\_clean, nfactors = 1, rotate = "none")  
## Standardized loadings (pattern matrix) based upon correlation matrix  
## PC1 h2 u2 com  
## EDREQ\_A 0.47 0.22 0.78 1  
## INFO\_A 0.79 0.63 0.37 1  
## HANDSON\_A 0.72 0.52 0.48 1  
##   
## PC1  
## SS loadings 1.38  
## Proportion Var 0.46  
##   
## Mean item complexity = 1  
## Test of the hypothesis that 1 component is sufficient.  
##   
## The root mean square of the residuals (RMSR) is 0.25   
## with the empirical chi square 53.92 with prob < NA   
##   
## Fit based upon off diagonal values = -0.56

# Directional Scoring  
reliFUN(df, c("DARWIN\_A", "EHD\_A", "CWDAL\_A", "HANDSON\_A", "INFO\_A", "POPPLAN\_A", "POPRED\_A"), "REVERSED-DIRECTION SCALED")

##   
##   
## ==================== REVERSED-DIRECTION SCALED ====================  
##   
## === Cronbach's Alpha ===  
##   
## Reliability analysis   
## Call: psych::alpha(x = items\_clean, check.keys = TRUE)  
##   
## raw\_alpha std.alpha G6(smc) average\_r S/N ase mean sd median\_r  
## 0.47 0.47 0.51 0.11 0.87 0.069 3.3 0.47 0.097  
##   
## 95% confidence boundaries   
## lower alpha upper  
## Feldt 0.32 0.47 0.59  
## Duhachek 0.33 0.47 0.60  
##   
## Reliability if an item is dropped:  
## raw\_alpha std.alpha G6(smc) average\_r S/N alpha se var.r med.r  
## DARWIN\_A 0.45 0.45 0.49 0.120 0.82 0.072 0.023 0.106  
## EHD\_A 0.38 0.37 0.40 0.091 0.60 0.081 0.019 0.080  
## CWDAL\_A 0.43 0.42 0.42 0.106 0.71 0.074 0.014 0.080  
## HANDSON\_A 0.38 0.38 0.42 0.094 0.62 0.081 0.021 0.080  
## INFO\_A 0.46 0.46 0.49 0.124 0.85 0.072 0.024 0.116  
## POPPLAN\_A 0.45 0.45 0.48 0.118 0.80 0.073 0.022 0.097  
## POPRED\_A 0.45 0.45 0.49 0.121 0.83 0.072 0.024 0.106  
##   
## Item statistics   
## n raw.r std.r r.cor r.drop mean sd  
## DARWIN\_A 139 0.40 0.45 0.26 0.17 4.1 0.81  
## EHD\_A 139 0.58 0.58 0.51 0.32 3.8 0.99  
## CWDAL\_A 139 0.50 0.51 0.43 0.23 3.8 0.96  
## HANDSON\_A 139 0.58 0.56 0.46 0.31 2.6 1.01  
## INFO\_A 139 0.42 0.43 0.24 0.16 2.4 0.90  
## POPPLAN\_A 139 0.47 0.45 0.29 0.18 3.1 1.00  
## POPRED\_A 139 0.46 0.44 0.26 0.17 3.4 1.01  
##   
## Non missing response frequency for each item  
## 1 2 3 4 5 miss  
## DARWIN\_A 0.00 0.04 0.17 0.48 0.31 0  
## EHD\_A 0.01 0.07 0.30 0.32 0.29 0  
## CWDAL\_A 0.01 0.09 0.28 0.37 0.25 0  
## HANDSON\_A 0.11 0.41 0.22 0.24 0.01 0  
## INFO\_A 0.14 0.50 0.23 0.12 0.01 0  
## POPPLAN\_A 0.03 0.24 0.38 0.24 0.10 0  
## POPRED\_A 0.03 0.18 0.28 0.39 0.12 0  
## Raw Alpha: 0.469   
## raw\_alpha std.alpha G6(smc) average\_r S/N alpha se  
## DARWIN\_A 0.4522389 0.4497051 0.4945049 0.11987423 0.8172075 0.07242014  
## EHD\_A 0.3819583 0.3743873 0.4017688 0.09069322 0.5984331 0.08095462  
## CWDAL\_A 0.4270721 0.4157306 0.4165068 0.10601729 0.7115392 0.07431519  
## HANDSON\_A 0.3830457 0.3841506 0.4191238 0.09417193 0.6237735 0.08106176  
## INFO\_A 0.4590289 0.4591422 0.4933132 0.12394879 0.8489147 0.07163845  
## POPPLAN\_A 0.4484242 0.4457785 0.4795419 0.11820890 0.8043327 0.07254665  
## POPRED\_A 0.4548734 0.4530315 0.4860928 0.12129869 0.8282588 0.07185556  
## var.r med.r  
## DARWIN\_A 0.02269816 0.10598558  
## EHD\_A 0.01850142 0.07985990  
## CWDAL\_A 0.01376477 0.07985990  
## HANDSON\_A 0.02103638 0.07985990  
## INFO\_A 0.02361655 0.11642645  
## POPPLAN\_A 0.02204251 0.09743217  
## POPRED\_A 0.02408990 0.10598558  
##   
## === McDonald's Omega ===



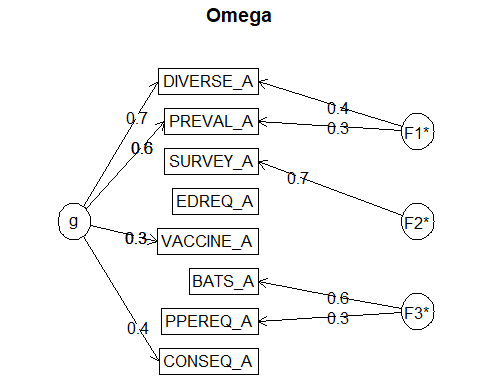
## Omega   
## Call: omegah(m = m, nfactors = nfactors, fm = fm, key = key, flip = flip,   
## digits = digits, title = title, sl = sl, labels = labels,   
## plot = plot, n.obs = n.obs, rotate = rotate, Phi = Phi, option = option,   
## covar = covar)  
## Alpha: 0.23   
## G.6: 0.35   
## Omega Hierarchical: 0.36   
## Omega H asymptotic: 0.63   
## Omega Total 0.58   
##   
## Schmid Leiman Factor loadings greater than 0.2   
## g F1\* F2\* F3\* h2 h2 u2 p2 com  
## DARWIN\_A 0.36 0.14 0.86 0.05 1.18  
## EHD\_A 0.56 0.34 0.34 0.66 0.04 1.13  
## CWDAL\_A- -0.81 0.68 0.68 0.32 0.02 1.04  
## HANDSON\_A 0.27 0.97 1.00 1.00 0.00 0.07 1.15  
## INFO\_A 0.30 0.10 0.90 0.00 1.12  
## POPPLAN\_A 1.00 1.00 1.00 0.00 1.00 1.01  
## POPRED\_A 0.07 0.93 0.53 2.08  
##   
## With Sums of squares of:  
## g F1\* F2\* F3\* h2   
## 1.1 1.1 0.0 1.1 2.6   
##   
## general/max 0.44 max/min = 745.06  
## mean percent general = 0.24 with sd = 0.38 and cv of 1.56   
## Explained Common Variance of the general factor = 0.34   
##   
## The degrees of freedom are 3 and the fit is 0.07   
## The number of observations was 139 with Chi Square = 9.47 with prob < 0.024  
## The root mean square of the residuals is 0.04   
## The df corrected root mean square of the residuals is 0.1  
## RMSEA index = 0.124 and the 90 % confidence intervals are 0.04 0.219  
## BIC = -5.34  
##   
## Compare this with the adequacy of just a general factor and no group factors  
## The degrees of freedom for just the general factor are 14 and the fit is 0.58   
## The number of observations was 139 with Chi Square = 77.45 with prob < 8.4e-11  
## The root mean square of the residuals is 0.16   
## The df corrected root mean square of the residuals is 0.19   
##   
## RMSEA index = 0.18 and the 90 % confidence intervals are 0.143 0.222  
## BIC = 8.36   
##   
## Measures of factor score adequacy   
## g F1\* F2\* F3\*  
## Correlation of scores with factors 1.00 1.00 0.06 0.86  
## Multiple R square of scores with factors 1.00 1.00 0.00 0.73  
## Minimum correlation of factor score estimates 0.99 1.01 -0.99 0.46  
##   
## Total, General and Subset omega for each subset  
## g F1\* F2\* F3\*  
## Omega total for total scores and subscales 0.58 0.55 1.00 0.06  
## Omega general for total scores and subscales 0.36 0.05 0.99 0.05  
## Omega group for total scores and subscales 0.24 0.50 0.00 0.01  
##   
## === Factor Analysis (3-factor, ML) ===  
## Factor Analysis using method = ml  
## Call: psych::fa(r = items\_clean, nfactors = 3, fm = "ml")  
## Standardized loadings (pattern matrix) based upon correlation matrix  
## ML2 ML3 ML1 h2 u2 com  
## DARWIN\_A 0.29 -0.03 0.12 0.088 0.912 1.4  
## EHD\_A 0.46 0.13 0.14 0.243 0.757 1.3  
## CWDAL\_A 0.99 -0.02 -0.02 0.995 0.005 1.0  
## HANDSON\_A -0.01 1.00 0.00 0.995 0.005 1.0  
## INFO\_A 0.11 0.32 -0.05 0.109 0.891 1.3  
## POPPLAN\_A 0.00 0.00 1.00 0.995 0.005 1.0  
## POPRED\_A 0.13 0.19 0.17 0.096 0.904 2.7  
##   
## ML2 ML3 ML1  
## SS loadings 1.30 1.16 1.06  
## Proportion Var 0.19 0.17 0.15  
## Cumulative Var 0.19 0.35 0.50  
## Proportion Explained 0.37 0.33 0.30  
## Cumulative Proportion 0.37 0.70 1.00  
##   
## With factor correlations of   
## ML2 ML3 ML1  
## ML2 1.00 -0.01 -0.11  
## ML3 -0.01 1.00 0.26  
## ML1 -0.11 0.26 1.00  
##   
## Mean item complexity = 1.4  
## Test of the hypothesis that 3 factors are sufficient.  
##   
## df null model = 21 with the objective function = 0.73 with Chi Square = 98.4  
## df of the model are 3 and the objective function was 0.06   
##   
## The root mean square of the residuals (RMSR) is 0.04   
## The df corrected root mean square of the residuals is 0.12   
##   
## The harmonic n.obs is 139 with the empirical chi square 11.65 with prob < 0.0087   
## The total n.obs was 139 with Likelihood Chi Square = 7.67 with prob < 0.053   
##   
## Tucker Lewis Index of factoring reliability = 0.57  
## RMSEA index = 0.106 and the 90 % confidence intervals are 0 0.202  
## BIC = -7.13  
## Fit based upon off diagonal values = 0.94  
## Measures of factor score adequacy   
## ML2 ML3 ML1  
## Correlation of (regression) scores with factors 1.00 1.00 1.00  
## Multiple R square of scores with factors 0.99 1.00 1.00  
## Minimum correlation of possible factor scores 0.99 0.99 0.99  
##   
## === Greatest Lower Bound ===



## Call: psych::glb(r = items\_clean)  
##   
## Estimates of the Greatest Lower Bound for reliability, based on factor and cluster models  
## GLB estimated from factor based communalities = 0.68 with 3 factors.  
## Use glb.fa to see more details   
##   
## Various estimates based upon splitting the scale into two (see keys for the various splits)  
## Beta = 0.12   
## Beta fa 0.12 This is an estimate of the worst split half reliability  
## Kmeans clusters for best split 0.71  
## Cluster based estimates   
## glb.IC = 0.25  
## glb.max 0.71 Is the maximum of these estimates  
## alpha-PC = 0.42 An estimate of alpha based on eignvalues  
## TenBerge bounds   
## mu0 = 0.47 mu1 = 0.51 mu2 = 0.51 mu3 = 0.51   
##   
## estimated greatest lower bound based upon splitHalf = 0.71   
##   
## Use short = FALSE to see the various ways of splitting the scale  
## === Split-Half Reliability ===  
## Split half reliabilities   
## Call: psych::splitHalf(r = items\_clean)  
##   
## Maximum split half reliability (lambda 4) = 0.7  
## Guttman lambda 6 = 0.51  
## Average split half reliability = 0.46  
## Guttman lambda 3 (alpha) = 0.47  
## Guttman lambda 2 = 0.51  
## Minimum split half reliability (beta) = 0.12  
## Average interitem r = 0.11 with median = 0.1  
## === Average Inter-Item Correlation ===  
## [1] 0.1106019  
##   
## === Principal Component Analysis (1-factor) ===  
## Principal Components Analysis  
## Call: psych::principal(r = items\_clean, nfactors = 1, rotate = "none")  
## Standardized loadings (pattern matrix) based upon correlation matrix  
## PC1 h2 u2 com  
## DARWIN\_A 0.48 0.234 0.77 1  
## EHD\_A 0.72 0.516 0.48 1  
## CWDAL\_A 0.63 0.395 0.60 1  
## HANDSON\_A 0.49 0.240 0.76 1  
## INFO\_A 0.35 0.120 0.88 1  
## POPPLAN\_A 0.33 0.109 0.89 1  
## POPRED\_A 0.31 0.096 0.90 1  
##   
## PC1  
## SS loadings 1.71  
## Proportion Var 0.24  
##   
## Mean item complexity = 1  
## Test of the hypothesis that 1 component is sufficient.  
##   
## The root mean square of the residuals (RMSR) is 0.17   
## with the empirical chi square 175.39 with prob < 5.6e-30   
##   
## Fit based upon off diagonal values = 0.06

reliFUN(df, c("PPEREQ\_A", "BATS\_A", "EDREQ\_A", "CONSEQ\_A", "DIVERSE\_A", "PREVAL\_A", "VACCINE\_A", "SURVEY\_A"), "DIRECT-DIRECTION SCALED")

##   
##   
## ==================== DIRECT-DIRECTION SCALED ====================  
##   
## === Cronbach's Alpha ===  
##   
## Reliability analysis   
## Call: psych::alpha(x = items\_clean, check.keys = TRUE)  
##   
## raw\_alpha std.alpha G6(smc) average\_r S/N ase mean sd median\_r  
## 0.58 0.58 0.59 0.15 1.4 0.053 3.6 0.46 0.13  
##   
## 95% confidence boundaries   
## lower alpha upper  
## Feldt 0.47 0.58 0.68  
## Duhachek 0.48 0.58 0.68  
##   
## Reliability if an item is dropped:  
## raw\_alpha std.alpha G6(smc) average\_r S/N alpha se var.r med.r  
## PPEREQ\_A 0.57 0.57 0.58 0.16 1.31 0.054 0.0172 0.13  
## BATS\_A 0.57 0.57 0.58 0.16 1.31 0.054 0.0169 0.13  
## EDREQ\_A 0.57 0.57 0.58 0.16 1.31 0.055 0.0177 0.14  
## CONSEQ\_A 0.55 0.55 0.56 0.15 1.23 0.058 0.0124 0.13  
## DIVERSE\_A 0.48 0.48 0.47 0.12 0.94 0.066 0.0067 0.13  
## PREVAL\_A 0.48 0.48 0.47 0.12 0.93 0.067 0.0073 0.11  
## VACCINE\_A 0.56 0.56 0.56 0.15 1.25 0.056 0.0163 0.14  
## SURVEY\_A 0.58 0.58 0.58 0.16 1.37 0.055 0.0152 0.13  
##   
## Item statistics   
## n raw.r std.r r.cor r.drop mean sd  
## PPEREQ\_A 139 0.46 0.44 0.28 0.21 3.7 0.99  
## BATS\_A 139 0.49 0.45 0.28 0.22 3.3 1.07  
## EDREQ\_A 139 0.41 0.45 0.27 0.21 4.3 0.78  
## CONSEQ\_A 139 0.52 0.49 0.37 0.29 2.8 0.98  
## DIVERSE\_A 139 0.66 0.65 0.65 0.48 3.7 0.90  
## PREVAL\_A 139 0.66 0.66 0.66 0.48 3.5 0.95  
## VACCINE\_A 139 0.47 0.48 0.34 0.24 3.4 0.93  
## SURVEY\_A 139 0.33 0.41 0.24 0.17 4.5 0.62  
##   
## Non missing response frequency for each item  
## 1 2 3 4 5 miss  
## PPEREQ\_A 0.02 0.13 0.19 0.47 0.18 0  
## BATS\_A 0.06 0.22 0.22 0.42 0.09 0  
## EDREQ\_A 0.00 0.02 0.14 0.38 0.46 0  
## CONSEQ\_A 0.08 0.35 0.32 0.22 0.03 0  
## DIVERSE\_A 0.01 0.09 0.25 0.46 0.19 0  
## PREVAL\_A 0.01 0.17 0.25 0.45 0.12 0  
## VACCINE\_A 0.04 0.12 0.37 0.39 0.09 0  
## SURVEY\_A 0.00 0.01 0.04 0.42 0.53 0  
## Raw Alpha: 0.58   
## raw\_alpha std.alpha G6(smc) average\_r S/N alpha se  
## PPEREQ\_A 0.5716304 0.5674111 0.5783269 0.1578100 1.3116638 0.05428263  
## BATS\_A 0.5710039 0.5673517 0.5778687 0.1577779 1.3113464 0.05444338  
## EDREQ\_A 0.5688078 0.5672478 0.5810100 0.1577216 1.3107914 0.05503132  
## CONSEQ\_A 0.5468640 0.5513729 0.5568988 0.1493522 1.2290228 0.05803965  
## DIVERSE\_A 0.4830766 0.4835839 0.4715478 0.1179906 0.9364231 0.06608470  
## PREVAL\_A 0.4803738 0.4806063 0.4687837 0.1167551 0.9253218 0.06651262  
## VACCINE\_A 0.5614020 0.5557643 0.5613677 0.1516239 1.2510574 0.05556792  
## SURVEY\_A 0.5756033 0.5783882 0.5825014 0.1638646 1.3718499 0.05464303  
## var.r med.r  
## PPEREQ\_A 0.017164681 0.1343377  
## BATS\_A 0.016863781 0.1343377  
## EDREQ\_A 0.017674039 0.1420850  
## CONSEQ\_A 0.012395818 0.1343377  
## DIVERSE\_A 0.006720694 0.1343377  
## PREVAL\_A 0.007265515 0.1134102  
## VACCINE\_A 0.016280350 0.1420850  
## SURVEY\_A 0.015214519 0.1315245  
##   
## === McDonald's Omega ===



## Omega   
## Call: omegah(m = m, nfactors = nfactors, fm = fm, key = key, flip = flip,   
## digits = digits, title = title, sl = sl, labels = labels,   
## plot = plot, n.obs = n.obs, rotate = rotate, Phi = Phi, option = option,   
## covar = covar)  
## Alpha: 0.58   
## G.6: 0.59   
## Omega Hierarchical: 0.45   
## Omega H asymptotic: 0.68   
## Omega Total 0.67   
##   
## Schmid Leiman Factor loadings greater than 0.2   
## g F1\* F2\* F3\* h2 h2 u2 p2 com  
## PPEREQ\_A 0.25 0.12 0.88 0.21 2.59  
## BATS\_A 0.57 0.36 0.36 0.64 0.09 1.20  
## EDREQ\_A 0.08 0.92 0.49 2.44  
## CONSEQ\_A 0.38 0.24 0.24 0.76 0.59 2.45  
## DIVERSE\_A 0.75 0.37 0.70 0.70 0.30 0.80 1.48  
## PREVAL\_A 0.61 0.27 0.47 0.47 0.53 0.80 1.50  
## VACCINE\_A 0.27 0.12 0.88 0.66 2.04  
## SURVEY\_A 0.69 0.50 0.50 0.50 0.05 1.10  
##   
## With Sums of squares of:  
## g F1\* F2\* F3\* h2   
## 1.27 0.26 0.60 0.45 1.18   
##   
## general/max 1.08 max/min = 4.6  
## mean percent general = 0.46 with sd = 0.31 and cv of 0.66   
## Explained Common Variance of the general factor = 0.49   
##   
## The degrees of freedom are 7 and the fit is 0.08   
## The number of observations was 139 with Chi Square = 10.33 with prob < 0.17  
## The root mean square of the residuals is 0.03   
## The df corrected root mean square of the residuals is 0.07  
## RMSEA index = 0.058 and the 90 % confidence intervals are 0 0.129  
## BIC = -24.21  
##   
## Compare this with the adequacy of just a general factor and no group factors  
## The degrees of freedom for just the general factor are 20 and the fit is 0.22   
## The number of observations was 139 with Chi Square = 29.35 with prob < 0.081  
## The root mean square of the residuals is 0.08   
## The df corrected root mean square of the residuals is 0.09   
##   
## RMSEA index = 0.058 and the 90 % confidence intervals are 0 0.101  
## BIC = -69.34   
##   
## Measures of factor score adequacy   
## g F1\* F2\* F3\*  
## Correlation of scores with factors 0.80 0.39 0.72 0.63  
## Multiple R square of scores with factors 0.64 0.15 0.52 0.40  
## Minimum correlation of factor score estimates 0.29 -0.70 0.03 -0.21  
##   
## Total, General and Subset omega for each subset  
## g F1\* F2\* F3\*  
## Omega total for total scores and subscales 0.67 0.73 0.37 0.41  
## Omega general for total scores and subscales 0.45 0.59 0.10 0.14  
## Omega group for total scores and subscales 0.15 0.13 0.27 0.27  
##   
## === Factor Analysis (3-factor, ML) ===  
## Factor Analysis using method = ml  
## Call: psych::fa(r = items\_clean, nfactors = 3, fm = "ml")  
## Standardized loadings (pattern matrix) based upon correlation matrix  
## ML1 ML3 ML2 h2 u2 com  
## PPEREQ\_A -0.01 0.19 0.16 0.067 0.933 1.9  
## BATS\_A -0.12 0.38 0.03 0.105 0.895 1.2  
## EDREQ\_A 0.00 0.18 0.17 0.067 0.933 2.0  
## CONSEQ\_A -0.04 0.58 -0.12 0.305 0.695 1.1  
## DIVERSE\_A 0.99 0.01 -0.01 0.995 0.005 1.0  
## PREVAL\_A 0.22 0.52 0.14 0.498 0.502 1.5  
## VACCINE\_A 0.34 -0.07 0.14 0.122 0.878 1.4  
## SURVEY\_A -0.01 0.00 0.84 0.708 0.292 1.0  
##   
## ML1 ML3 ML2  
## SS loadings 1.20 0.84 0.83  
## Proportion Var 0.15 0.11 0.10  
## Cumulative Var 0.15 0.25 0.36  
## Proportion Explained 0.42 0.29 0.29  
## Cumulative Proportion 0.42 0.71 1.00  
##   
## With factor correlations of   
## ML1 ML3 ML2  
## ML1 1.00 0.61 0.14  
## ML3 0.61 1.00 0.09  
## ML2 0.14 0.09 1.00  
##   
## Mean item complexity = 1.4  
## Test of the hypothesis that 3 factors are sufficient.  
##   
## df null model = 28 with the objective function = 0.87 with Chi Square = 117.55  
## df of the model are 7 and the objective function was 0.05   
##   
## The root mean square of the residuals (RMSR) is 0.04   
## The df corrected root mean square of the residuals is 0.07   
##   
## The harmonic n.obs is 139 with the empirical chi square 9.96 with prob < 0.19   
## The total n.obs was 139 with Likelihood Chi Square = 7.1 with prob < 0.42   
##   
## Tucker Lewis Index of factoring reliability = 0.996  
## RMSEA index = 0.007 and the 90 % confidence intervals are 0 0.105  
## BIC = -27.44  
## Fit based upon off diagonal values = 0.96  
## Measures of factor score adequacy   
## ML1 ML3 ML2  
## Correlation of (regression) scores with factors 1.00 0.80 0.85  
## Multiple R square of scores with factors 0.99 0.65 0.72  
## Minimum correlation of possible factor scores 0.99 0.30 0.44  
##   
## === Greatest Lower Bound ===



## Call: psych::glb(r = items\_clean)  
##   
## Estimates of the Greatest Lower Bound for reliability, based on factor and cluster models  
## GLB estimated from factor based communalities = 0.76 with 4 factors.  
## Use glb.fa to see more details   
##   
## Various estimates based upon splitting the scale into two (see keys for the various splits)  
## Beta = 0.52   
## Beta fa 0.37 This is an estimate of the worst split half reliability  
## Kmeans clusters for best split 0.69  
## Cluster based estimates   
## glb.IC = 0.3  
## glb.max 0.69 Is the maximum of these estimates  
## alpha-PC = 0.54 An estimate of alpha based on eignvalues  
## TenBerge bounds   
## mu0 = 0.58 mu1 = 0.6 mu2 = 0.6 mu3 = 0.61   
##   
## estimated greatest lower bound based upon splitHalf = 0.56   
##   
## Use short = FALSE to see the various ways of splitting the scale  
## === Split-Half Reliability ===  
## Split half reliabilities   
## Call: psych::splitHalf(r = items\_clean)  
##   
## Maximum split half reliability (lambda 4) = 0.69  
## Guttman lambda 6 = 0.59  
## Average split half reliability = 0.58  
## Guttman lambda 3 (alpha) = 0.58  
## Guttman lambda 2 = 0.6  
## Minimum split half reliability (beta) = 0.43  
## Average interitem r = 0.15 with median = 0.13  
## === Average Inter-Item Correlation ===  
## [1] 0.146612  
##   
## === Principal Component Analysis (1-factor) ===  
## Principal Components Analysis  
## Call: psych::principal(r = items\_clean, nfactors = 1, rotate = "none")  
## Standardized loadings (pattern matrix) based upon correlation matrix  
## PC1 h2 u2 com  
## PPEREQ\_A 0.35 0.125 0.88 1  
## BATS\_A 0.37 0.138 0.86 1  
## EDREQ\_A 0.37 0.135 0.87 1  
## CONSEQ\_A 0.54 0.291 0.71 1  
## DIVERSE\_A 0.77 0.590 0.41 1  
## PREVAL\_A 0.77 0.587 0.41 1  
## VACCINE\_A 0.44 0.197 0.80 1  
## SURVEY\_A 0.30 0.091 0.91 1  
##   
## PC1  
## SS loadings 2.15  
## Proportion Var 0.27  
##   
## Mean item complexity = 1  
## Test of the hypothesis that 1 component is sufficient.  
##   
## The root mean square of the residuals (RMSR) is 0.12   
## with the empirical chi square 103.03 with prob < 3.6e-13   
##   
## Fit based upon off diagonal values = 0.62

# 5 PRACTICES

#### 5.0.0.1 Recoding

median\_field\_time <- median(df$FIELD, na.rm = TRUE)  
median\_field\_time

## [1] 50

df$TOPIC\_COUNT <- rowSums(dplyr::select(df, starts\_with("TOPIC\_")), na.rm = TRUE)  
median\_topic\_count <- median(df$TOPIC\_COUNT, na.rm = TRUE)  
median\_topic\_count

## [1] 0

df <- df %>%  
 mutate(  
 LICENSE = as.factor(LICENSE),  
 COLLECT = as.factor(COLLECT),  
 HANDLE = as.factor(HANDLE),  
 PPE = as.factor(PPE),  
 ACCESS = as.factor(ACCESS),  
 COLLECT\_BIN = ifelse(COLLECT == "Yes", 1, ifelse(COLLECT == "No", 0, NA)),  
 HANDLE\_BIN = ifelse(HANDLE == "Yes", 1, ifelse(HANDLE == "No", 0, NA)),  
 PPE\_BIN = ifelse(PPE == "Yes", 1, ifelse(PPE == "No", 0, NA)),  
 ACCESS\_BIN = ifelse(ACCESS == "No", 1, ifelse(ACCESS == "Yes", 0, NA)),  
 CONTACT = factor(CONTACT, levels = c("Never", "Rarely", "Monthly", "Weekly", "Daily"),   
 ordered = TRUE),  
 CONTACT\_BIN = case\_when(CONTACT %in% c("Weekly", "Daily") ~ 1,  
 CONTACT %in% c("Monthly", "Rarely", "Never") ~ 0, TRUE ~ NA\_real\_),  
 INTEREST = as.factor(INTEREST),  
 INTEREST\_BIN = case\_when(INTEREST %in% c("No", "Unsure") ~ 0, INTEREST == "Yes" ~ 1,   
 TRUE ~ NA\_real\_),  
 FIELD = as.numeric(FIELD),  
 FIELD\_BIN\_MED = case\_when(is.na(FIELD) ~ NA\_real\_, FIELD >= median\_field\_time ~ 1,   
 FIELD < median\_field\_time ~ 0),  
 FIELD\_BIN\_50 = case\_when(is.na(FIELD) ~ NA\_real\_, FIELD >= 50 ~ 1, FIELD < 50 ~ 0),  
 STATE = as.factor(STATE),  
 STATE\_BIN = case\_when(STATE == "Dead" ~ 0,  
 STATE %in% c("Alive - Sedated", "Alive - Not Sedated") ~ 1,   
 TRUE ~ NA\_real\_),  
 PPETIME = factor(PPETIME, levels = c("Never (0%)", "Rarely (1%-24%)",   
 "Sometimes (25%-75%)", "Usually (76%-99%)", "Always (100%)"), ordered = TRUE),  
 PPETIME\_BIN = case\_when(PPETIME %in% c("Sometimes (25%-75%)", "Usually (76%-99%)", "Always (100%)") ~ 1,   
 PPETIME %in% c("Never (0%)", "Rarely (1%-24%)") ~ 0,  
 TRUE ~ NA\_real\_),  
 FREEINFO\_BIN\_INPERSON = ifelse(grepl("in-person", FREEINFOfill,   
 ignore.case = TRUE), 1, 0),  
 FREEINFO\_BIN\_VIRTUAL = ifelse(grepl("virtual", FREEINFOfill,   
 ignore.case = TRUE), 1, 0),  
 FREEINFO\_BIN\_OTHER = ifelse(grepl("Other", FREEINFOfill,   
 ignore.case = TRUE), 1, 0),  
 TOPIC\_BIN\_RABIES = ifelse(grepl("Rabies", TOPICSfill), 1, 0),  
 TOPIC\_BIN\_FLU = ifelse(grepl("Influenza", TOPICSfill), 1, 0),  
 TOPIC\_BIN\_LEPTO = ifelse(grepl("Leptospirosis", TOPICSfill), 1, 0),  
 TOPIC\_BIN\_RR = ifelse(grepl("Raccoon roundworm", TOPICSfill), 1, 0),  
 TOPIC\_BIN\_VECTOR = ifelse(grepl("Vector borne", TOPICSfill), 1, 0),  
 TOPIC\_BIN\_CWD = ifelse(grepl("CWD", TOPICSfill), 1, 0),  
 TOPIC\_BIN\_COVID = ifelse(grepl("SarsCoV2", TOPICSfill), 1, 0),  
 TOPIC\_BIN\_ONEHEALTH = ifelse(grepl("One Health", TOPICSfill), 1, 0),  
 TOPIC\_BIN\_OTHER = ifelse(grepl("Other", TOPICSfill), 1, 0),  
 TOPIC\_BREADTH\_BIN = case\_when(  
 TOPICSfill == "All" ~ 1,  
 TOPIC\_COUNT >= median\_topic\_count ~ 1,  
 TOPIC\_COUNT < median\_topic\_count ~ 0, TRUE ~ NA\_real\_),  
 SOURCE\_BIN\_FAMILY = ifelse(grepl("Friends/Family", SOURCEfill), 1, 0),  
 SOURCE\_BIN\_AGENCY = ifelse(grepl("State Wildlife Agency", SOURCEfill), 1, 0),  
 SOURCE\_BIN\_ACADEMIC = ifelse(grepl("Academic Publications", SOURCEfill), 1, 0),  
 SOURCE\_BIN\_SOCIAL = ifelse(grepl("Social Media", SOURCEfill), 1, 0),  
 SOURCE\_BIN\_NEWS = ifelse(grepl("News Sources", SOURCEfill), 1, 0),  
 SOURCE\_BIN\_CONFERENCES = ifelse(grepl("Conferences", SOURCEfill), 1, 0),  
 SOURCE\_BIN\_NONE = ifelse(grepl("I have Not looked for health information",   
 SOURCEfill, ignore.case = TRUE), 1, 0),  
 SOURCE\_BIN\_OTHER = ifelse(grepl("Other", SOURCEfill), 1, 0),  
 SOURCE\_TRUST\_COUNT = SOURCE\_BIN\_ACADEMIC + SOURCE\_BIN\_AGENCY + SOURCE\_BIN\_CONFERENCES,  
 SOURCE\_UNTRUST\_COUNT = SOURCE\_BIN\_SOCIAL + SOURCE\_BIN\_NEWS + SOURCE\_BIN\_FAMILY,  
 SOURCE\_TRUST\_BIN = case\_when(  
 SOURCE\_TRUST\_COUNT > SOURCE\_UNTRUST\_COUNT ~ 1,  
 SOURCE\_TRUST\_COUNT < SOURCE\_UNTRUST\_COUNT ~ 0,  
 SOURCE\_TRUST\_COUNT == SOURCE\_UNTRUST\_COUNT ~ 0,  
 TRUE ~ NA\_real\_))  
  
# Exposure = more risky (higher score = more risk) ----------  
df <- df %>%  
 mutate(  
 PRACTICE\_EXPOSURE\_SCORE = rowSums(dplyr::select(.,   
 CONTACT\_BIN,   
 FIELD\_BIN\_50,   
 HANDLE\_BIN, # Removed LICENSE\_BIN to increase CA value   
 COLLECT\_BIN), # Removed STATE\_BIN (too many NA values)   
 na.rm = TRUE),  
 PRACTICE\_EXPOSURE\_NORM = PRACTICE\_EXPOSURE\_SCORE / 4)  
  
pracexp\_avg = mean(df$PRACTICE\_EXPOSURE\_SCORE)  
pracexp\_avg

## [1] 1.857143

pracexp\_med = median(df$PRACTICE\_EXPOSURE\_SCORE)  
pracexp\_med

## [1] 2

pracexp\_norm\_avg <- mean(df$PRACTICE\_EXPOSURE\_NORM, na.rm = TRUE)  
pracexp\_norm\_avg

## [1] 0.4642857

df <- df %>%  
 mutate(PRACTICE\_AVG = case\_when(  
 PRACTICE\_EXPOSURE\_NORM > pracexp\_norm\_avg ~ 1,  
 PRACTICE\_EXPOSURE\_NORM <= pracexp\_norm\_avg ~ 0,  
 TRUE ~ NA\_real\_))  
  
pracexp\_norm\_med <- median(df$PRACTICE\_EXPOSURE\_NORM, na.rm = TRUE)  
pracexp\_norm\_med

## [1] 0.5

df <- df %>%  
 mutate(PRACTICE\_MED = case\_when(  
 PRACTICE\_EXPOSURE\_NORM> pracexp\_norm\_med ~ 1,  
 PRACTICE\_EXPOSURE\_NORM <= pracexp\_norm\_med ~ 0,  
 TRUE ~ NA\_real\_))  
  
# Education interest = more engagement toward wildlife health education ---------  
df <- df %>%  
 mutate(  
 PRACTICE\_EDUCATION\_SCORE = rowSums(dplyr::select(.,   
 TOPIC\_BREADTH\_BIN,  
 FREEINFO\_BIN\_INPERSON,  
 FREEINFO\_BIN\_VIRTUAL), na.rm = TRUE),  
 PRACTICE\_EDUCATION\_NORM = PRACTICE\_EDUCATION\_SCORE / 3)  
  
pracedu\_avg = mean(df$PRACTICE\_EDUCATION\_SCORE)  
pracedu\_avg

## [1] 2.292857

pracedu\_med = median(df$PRACTICE\_EDUCATION\_SCORE)  
pracedu\_med

## [1] 2

pracedu\_norm\_avg <- mean(df$PRACTICE\_EDUCATION\_NORM, na.rm = TRUE)  
pracedu\_norm\_avg

## [1] 0.7642857

df <- df %>%  
 mutate(PRACTICE\_AVG = case\_when(  
 PRACTICE\_EDUCATION\_NORM > pracedu\_norm\_avg ~ 1,  
 PRACTICE\_EDUCATION\_NORM <= pracedu\_norm\_avg ~ 0,  
 TRUE ~ NA\_real\_))  
  
pracedu\_norm\_med <- median(df$PRACTICE\_EDUCATION\_NORM, na.rm = TRUE)  
pracedu\_norm\_med

## [1] 0.6666667

df <- df %>%  
 mutate(PRACTICE\_MED = case\_when(  
 PRACTICE\_EDUCATION\_NORM> pracedu\_norm\_med ~ 1,  
 PRACTICE\_EDUCATION\_NORM <= pracedu\_norm\_med ~ 0,  
 TRUE ~ NA\_real\_))  
  
## Did not have specific 'Precaution' composite score - PPE (IF yes) -> PPETIME -----  
## Use individual variables, composite = issues with NA values (only 55 = yes) ----

#### 5.0.0.2 Reliability

# Exposure-related practice items -----  
practice\_exposure\_vars <- c("CONTACT\_BIN", "FIELD\_BIN\_50", "HANDLE\_BIN","COLLECT\_BIN")   
 # FIELD\_BIN\_50 / FIELD\_BIN\_MED = same CA value   
 # STATE\_BIN removed (NA values)  
 # "LICENSE\_BIN" removed to increase CA value  
practice\_exposure\_items <- df %>% select(all\_of(practice\_exposure\_vars))  
practice\_exposure\_items <- practice\_exposure\_items[rowSums(is.na(practice\_exposure\_items)) <= 2, ]  
alpha\_exposure <- psych::alpha(practice\_exposure\_items, check.keys = TRUE)  
alpha\_exposure$key

## [[1]]  
## [1] "CONTACT\_BIN" "FIELD\_BIN\_50" "HANDLE\_BIN" "COLLECT\_BIN"

cat("Alpha – Practice Exposure (Risky Contact/Handling):",   
 round(alpha\_exposure$total$raw\_alpha, 4), "\n")

## Alpha – Practice Exposure (Risky Contact/Handling): 0.6543

alpha\_exposure$alpha.drop

## raw\_alpha std.alpha G6(smc) average\_r S/N alpha se  
## CONTACT\_BIN 0.6320904 0.6334302 0.6121775 0.3654813 1.727993 0.05531073  
## FIELD\_BIN\_50 0.6480733 0.6501068 0.6191945 0.3824638 1.858015 0.05293569  
## HANDLE\_BIN 0.5392269 0.5391460 0.4439490 0.2805556 1.169885 0.06751565  
## COLLECT\_BIN 0.5138691 0.5125194 0.4230170 0.2595086 1.051364 0.07109892  
## var.r med.r  
## CONTACT\_BIN 0.071954045 0.2536286  
## FIELD\_BIN\_50 0.062770139 0.2475317  
## HANDLE\_BIN 0.004861427 0.2536286  
## COLLECT\_BIN 0.008987031 0.2475317

# Education engagement practice items (Binary vs Attitude = Likert) ----------  
practice\_education\_vars <- c("FREEINFO\_BIN\_INPERSON", "FREEINFO\_BIN\_VIRTUAL", "TOPIC\_BREADTH\_BIN")  
 # Removed ACCESS/INTEREST to improve CA value  
practice\_education\_items <- df %>% select(all\_of(practice\_education\_vars))  
practice\_education\_items <- practice\_education\_items[rowSums(is.na(practice\_education\_items)) <= 2, ]  
alpha\_education <- psych::alpha(practice\_education\_items, check.keys = TRUE)  
alpha\_education$key

## [[1]]  
## [1] "-FREEINFO\_BIN\_INPERSON" "FREEINFO\_BIN\_VIRTUAL"

cat("Alpha – Practice Education (Interest in Training):",   
 round(alpha\_education$total$raw\_alpha, 3), "\n")

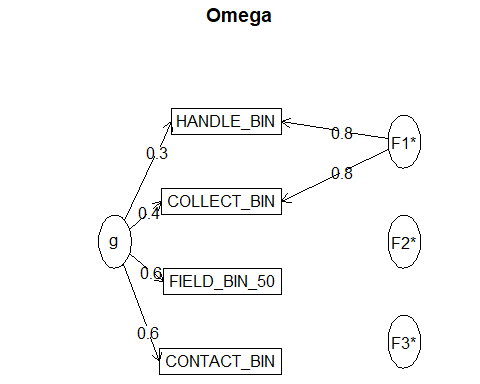
## Alpha – Practice Education (Interest in Training): 0.592

alpha\_education$alpha.drop

## raw\_alpha std.alpha G6(smc) average\_r S/N  
## FREEINFO\_BIN\_INPERSON- 0.4343201 0.4205864 0.1768929 0.4205864 0.7258827  
## FREEINFO\_BIN\_VIRTUAL 0.4072869 0.4205864 0.1768929 0.4205864 0.7258827  
## alpha se var.r med.r  
## FREEINFO\_BIN\_INPERSON- NA 0 0.4205864  
## FREEINFO\_BIN\_VIRTUAL NA 0 0.4205864

###### reliFUN ----------------------------------------------  
reliFUN(df, c("CONTACT\_BIN", "FIELD\_BIN\_50", "HANDLE\_BIN","COLLECT\_BIN"))

##   
##   
## ==================== ====================  
##   
## === Cronbach's Alpha ===  
##   
## Reliability analysis   
## Call: psych::alpha(x = items\_clean, check.keys = TRUE)  
##   
## raw\_alpha std.alpha G6(smc) average\_r S/N ase mean sd median\_r  
## 0.65 0.66 0.65 0.32 1.9 0.049 0.46 0.35 0.25  
##   
## 95% confidence boundaries   
## lower alpha upper  
## Feldt 0.55 0.65 0.74  
## Duhachek 0.56 0.65 0.75  
##   
## Reliability if an item is dropped:  
## raw\_alpha std.alpha G6(smc) average\_r S/N alpha se var.r med.r  
## CONTACT\_BIN 0.63 0.63 0.61 0.37 1.7 0.055 0.0720 0.25  
## FIELD\_BIN\_50 0.65 0.65 0.62 0.38 1.9 0.053 0.0628 0.25  
## HANDLE\_BIN 0.54 0.54 0.44 0.28 1.2 0.068 0.0049 0.25  
## COLLECT\_BIN 0.51 0.51 0.42 0.26 1.1 0.071 0.0090 0.25  
##   
## Item statistics   
## n raw.r std.r r.cor r.drop mean sd  
## CONTACT\_BIN 140 0.66 0.65 0.44 0.37 0.49 0.50  
## FIELD\_BIN\_50 140 0.64 0.64 0.42 0.34 0.54 0.50  
## HANDLE\_BIN 140 0.74 0.75 0.69 0.50 0.37 0.48  
## COLLECT\_BIN 140 0.77 0.77 0.72 0.54 0.45 0.50  
##   
## Non missing response frequency for each item  
## 0 1 miss  
## CONTACT\_BIN 0.51 0.49 0  
## FIELD\_BIN\_50 0.46 0.54 0  
## HANDLE\_BIN 0.63 0.37 0  
## COLLECT\_BIN 0.55 0.45 0  
## Raw Alpha: 0.654   
## raw\_alpha std.alpha G6(smc) average\_r S/N alpha se  
## CONTACT\_BIN 0.6320904 0.6334302 0.6121775 0.3654813 1.727993 0.05531073  
## FIELD\_BIN\_50 0.6480733 0.6501068 0.6191945 0.3824638 1.858015 0.05293569  
## HANDLE\_BIN 0.5392269 0.5391460 0.4439490 0.2805556 1.169885 0.06751565  
## COLLECT\_BIN 0.5138691 0.5125194 0.4230170 0.2595086 1.051364 0.07109892  
## var.r med.r  
## CONTACT\_BIN 0.071954045 0.2536286  
## FIELD\_BIN\_50 0.062770139 0.2475317  
## HANDLE\_BIN 0.004861427 0.2536286  
## COLLECT\_BIN 0.008987031 0.2475317  
##   
## === McDonald's Omega ===



## Omega   
## Call: omegah(m = m, nfactors = nfactors, fm = fm, key = key, flip = flip,   
## digits = digits, title = title, sl = sl, labels = labels,   
## plot = plot, n.obs = n.obs, rotate = rotate, Phi = Phi, option = option,   
## covar = covar)  
## Alpha: 0.66   
## G.6: 0.65   
## Omega Hierarchical: 0.47   
## Omega H asymptotic: 0.61   
## Omega Total 0.78   
##   
## Schmid Leiman Factor loadings greater than 0.2   
## g F1\* F2\* F3\* h2 h2 u2 p2 com  
## CONTACT\_BIN 0.61 0.40 0.40 0.60 0.93 1.16  
## FIELD\_BIN\_50 0.63 0.42 0.42 0.58 0.94 1.12  
## HANDLE\_BIN 0.32 0.76 0.72 0.72 0.28 0.14 1.43  
## COLLECT\_BIN 0.37 0.76 0.73 0.73 0.27 0.19 1.55  
##   
## With Sums of squares of:  
## g F1\* F2\* F3\* h2   
## 1.0 1.2 0.0 0.1 1.4   
##   
## general/max 0.73 max/min = 548.75  
## mean percent general = 0.55 with sd = 0.45 and cv of 0.81   
## Explained Common Variance of the general factor = 0.44   
##   
## The degrees of freedom are -3 and the fit is 0   
## The number of observations was 140 with Chi Square = 0 with prob < NA  
## The root mean square of the residuals is 0   
## The df corrected root mean square of the residuals is NA  
##   
## Compare this with the adequacy of just a general factor and no group factors  
## The degrees of freedom for just the general factor are 2 and the fit is 0.49   
## The number of observations was 140 with Chi Square = 66.15 with prob < 4.3e-15  
## The root mean square of the residuals is 0.23   
## The df corrected root mean square of the residuals is 0.39   
##   
## RMSEA index = 0.479 and the 90 % confidence intervals are 0.385 0.583  
## BIC = 56.27   
##   
## Measures of factor score adequacy   
## g F1\* F2\* F3\*  
## Correlation of scores with factors 0.77 0.87 0.04 0.46  
## Multiple R square of scores with factors 0.59 0.75 0.00 0.21  
## Minimum correlation of factor score estimates 0.18 0.50 -1.00 -0.58  
##   
## Total, General and Subset omega for each subset  
## g F1\* F2\* F3\*  
## Omega total for total scores and subscales 0.78 0.83 NA 0.56  
## Omega general for total scores and subscales 0.47 0.14 NA 0.56  
## Omega group for total scores and subscales 0.29 0.69 NA 0.00  
##   
## === Factor Analysis (3-factor, ML) ===  
## Factor Analysis using method = ml  
## Call: psych::fa(r = items\_clean, nfactors = 3, fm = "ml")  
## Standardized loadings (pattern matrix) based upon correlation matrix  
## ML2 ML1 ML3 h2 u2 com  
## CONTACT\_BIN 0.12 -0.06 0.55 0.33 0.6738 1.1  
## FIELD\_BIN\_50 -0.06 0.05 0.65 0.42 0.5823 1.0  
## HANDLE\_BIN 0.99 0.01 0.00 0.99 0.0094 1.0  
## COLLECT\_BIN 0.01 0.99 0.00 0.99 0.0050 1.0  
##   
## ML2 ML1 ML3  
## SS loadings 1.01 1.00 0.73  
## Proportion Var 0.25 0.25 0.18  
## Cumulative Var 0.25 0.50 0.68  
## Proportion Explained 0.37 0.36 0.27  
## Cumulative Proportion 0.37 0.73 1.00  
##   
## With factor correlations of   
## ML2 ML1 ML3  
## ML2 1.00 0.67 0.31  
## ML1 0.67 1.00 0.38  
## ML3 0.31 0.38 1.00  
##   
## Mean item complexity = 1  
## Test of the hypothesis that 3 factors are sufficient.  
##   
## df null model = 6 with the objective function = 0.85 with Chi Square = 115.91  
## df of the model are -3 and the objective function was 0   
##   
## The root mean square of the residuals (RMSR) is 0   
## The df corrected root mean square of the residuals is NA   
##   
## The harmonic n.obs is 140 with the empirical chi square 0 with prob < NA   
## The total n.obs was 140 with Likelihood Chi Square = 0 with prob < NA   
##   
## Tucker Lewis Index of factoring reliability = 1.055  
## Fit based upon off diagonal values = 1  
## Measures of factor score adequacy   
## ML2 ML1 ML3  
## Correlation of (regression) scores with factors 1.00 1.00 0.76  
## Multiple R square of scores with factors 0.99 0.99 0.57  
## Minimum correlation of possible factor scores 0.98 0.99 0.15  
##   
## === Greatest Lower Bound ===

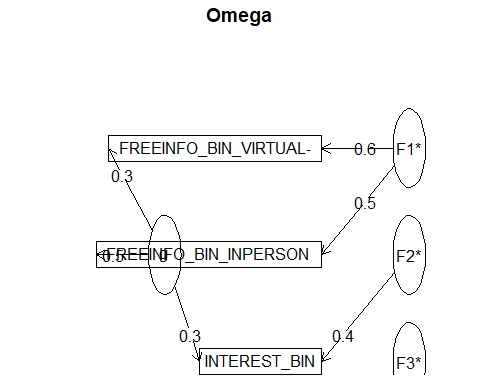


## Call: psych::glb(r = items\_clean)  
##   
## Estimates of the Greatest Lower Bound for reliability, based on factor and cluster models  
## GLB estimated from factor based communalities = 0.68 with 1 factors.  
## Use glb.fa to see more details   
##   
## Various estimates based upon splitting the scale into two (see keys for the various splits)  
## Beta = 0.46   
## Beta fa 0.46 This is an estimate of the worst split half reliability  
## Kmeans clusters for best split 0.78  
## Cluster based estimates   
## glb.IC = 0.46  
## glb.max 0.78 Is the maximum of these estimates  
## alpha-PC = 0.5 An estimate of alpha based on eignvalues  
## TenBerge bounds   
## mu0 = 0.66 mu1 = 0.68 mu2 = 0.69 mu3 = 0.69   
##   
## estimated greatest lower bound based upon splitHalf = 0.78   
##   
## Use short = FALSE to see the various ways of splitting the scale  
## === Split-Half Reliability ===  
## Split half reliabilities   
## Call: psych::splitHalf(r = items\_clean)  
##   
## Maximum split half reliability (lambda 4) = 0.78  
## Guttman lambda 6 = 0.65  
## Average split half reliability = 0.66  
## Guttman lambda 3 (alpha) = 0.66  
## Guttman lambda 2 = 0.68  
## Minimum split half reliability (beta) = 0.46  
## Average interitem r = 0.32 with median = 0.25  
## === Average Inter-Item Correlation ===  
## [1] 0.3220023  
##   
## === Principal Component Analysis (1-factor) ===  
## Principal Components Analysis  
## Call: psych::principal(r = items\_clean, nfactors = 1, rotate = "none")  
## Standardized loadings (pattern matrix) based upon correlation matrix  
## PC1 h2 u2 com  
## CONTACT\_BIN 0.59 0.35 0.65 1  
## FIELD\_BIN\_50 0.56 0.32 0.68 1  
## HANDLE\_BIN 0.80 0.64 0.36 1  
## COLLECT\_BIN 0.82 0.68 0.32 1  
##   
## PC1  
## SS loadings 1.99  
## Proportion Var 0.50  
##   
## Mean item complexity = 1  
## Test of the hypothesis that 1 component is sufficient.  
##   
## The root mean square of the residuals (RMSR) is 0.2   
## with the empirical chi square 68.52 with prob < 1.3e-15   
##   
## Fit based upon off diagonal values = 0.69

reliFUN(df, c("INTEREST\_BIN", "FREEINFO\_BIN\_INPERSON", "FREEINFO\_BIN\_VIRTUAL"))

##   
##   
## ==================== ====================  
##   
## === Cronbach's Alpha ===

##   
## Reliability analysis   
## Call: psych::alpha(x = items\_clean, check.keys = TRUE)  
##   
## raw\_alpha std.alpha G6(smc) average\_r S/N ase mean sd median\_r  
## 0.5 0.48 0.43 0.24 0.93 0.065 0.62 0.3 0.25  
##   
## 95% confidence boundaries   
## lower alpha upper  
## Feldt 0.34 0.5 0.63  
## Duhachek 0.38 0.5 0.63  
##   
## Reliability if an item is dropped:  
## raw\_alpha std.alpha G6(smc) average\_r S/N alpha se  
## INTEREST\_BIN 0.592 0.592 0.421 0.421 1.452 0.069  
## FREEINFO\_BIN\_INPERSON 0.072 0.082 0.043 0.043 0.089 0.139  
## FREEINFO\_BIN\_VIRTUAL- 0.353 0.397 0.248 0.248 0.659 0.094  
## var.r med.r  
## INTEREST\_BIN NA 0.421  
## FREEINFO\_BIN\_INPERSON NA 0.043  
## FREEINFO\_BIN\_VIRTUAL- NA 0.248  
##   
## Item statistics   
## n raw.r std.r r.cor r.drop mean sd  
## INTEREST\_BIN 137 0.47 0.61 0.26 0.17 0.91 0.28  
## FREEINFO\_BIN\_INPERSON 140 0.85 0.79 0.65 0.48 0.62 0.49  
## FREEINFO\_BIN\_VIRTUAL- 140 0.75 0.70 0.47 0.35 0.33 0.47  
##   
## Non missing response frequency for each item  
## 0 1 miss  
## INTEREST\_BIN 0.09 0.91 0.02  
## FREEINFO\_BIN\_INPERSON 0.38 0.62 0.00  
## FREEINFO\_BIN\_VIRTUAL 0.33 0.67 0.00  
## Raw Alpha: 0.503   
## raw\_alpha std.alpha G6(smc) average\_r S/N  
## INTEREST\_BIN 0.59191553 0.59213065 0.42058636 0.42058636 1.45176548  
## FREEINFO\_BIN\_INPERSON 0.07179464 0.08179749 0.04264278 0.04264278 0.08908437  
## FREEINFO\_BIN\_VIRTUAL- 0.35260659 0.39718794 0.24780693 0.24780693 0.65889183  
## alpha se var.r med.r  
## INTEREST\_BIN 0.06893563 NA 0.42058636  
## FREEINFO\_BIN\_INPERSON 0.13861865 NA 0.04264278  
## FREEINFO\_BIN\_VIRTUAL- 0.09448332 NA 0.24780693  
##   
## === McDonald's Omega ===



## Omega   
## Call: omegah(m = m, nfactors = nfactors, fm = fm, key = key, flip = flip,   
## digits = digits, title = title, sl = sl, labels = labels,   
## plot = plot, n.obs = n.obs, rotate = rotate, Phi = Phi, option = option,   
## covar = covar)  
## Alpha: 0.48   
## G.6: 0.43   
## Omega Hierarchical: 0.26   
## Omega H asymptotic: 0.42   
## Omega Total 0.61   
##   
## Schmid Leiman Factor loadings greater than 0.2   
## g F1\* F2\* F3\* h2 h2 u2 p2 com  
## INTEREST\_BIN 0.30 0.44 0.29 0.29 0.71 0.32 1.78  
## FREEINFO\_BIN\_INPERSON 0.48 0.54 0.20 0.56 0.56 0.44 0.41 2.26  
## FREEINFO\_BIN\_VIRTUAL- 0.28 0.58 0.43 0.43 0.57 0.19 1.59  
##   
## With Sums of squares of:  
## g F1\* F2\* F3\* h2   
## 0.40 0.63 0.25 0.00 0.58   
##   
## general/max 0.64 max/min = Inf  
## mean percent general = 0.31 with sd = 0.11 and cv of 0.36   
## Explained Common Variance of the general factor = 0.31   
##   
## The degrees of freedom are -3 and the fit is 0   
## The number of observations was 140 with Chi Square = 0 with prob < NA  
## The root mean square of the residuals is 0   
## The df corrected root mean square of the residuals is NA  
##   
## Compare this with the adequacy of just a general factor and no group factors  
## The degrees of freedom for just the general factor are 0 and the fit is 0.12   
## The number of observations was 140 with Chi Square = 16.74 with prob < NA  
## The root mean square of the residuals is 0.18   
## The df corrected root mean square of the residuals is NA   
##   
## Measures of factor score adequacy   
## g F1\* F2\* F3\*  
## Correlation of scores with factors 0.52 0.67 0.50 0  
## Multiple R square of scores with factors 0.28 0.45 0.25 0  
## Minimum correlation of factor score estimates -0.45 -0.10 -0.50 -1  
##   
## Total, General and Subset omega for each subset  
## g F1\* F2\* F3\*  
## Omega total for total scores and subscales 0.61 0.64 0.29 NA  
## Omega general for total scores and subscales 0.26 0.20 0.09 NA  
## Omega group for total scores and subscales 0.33 0.44 0.19 NA  
##   
## === Factor Analysis (3-factor, ML) ===  
## Factor Analysis using method = ml  
## Call: psych::fa(r = items\_clean, nfactors = 3, fm = "ml")  
## Standardized loadings (pattern matrix) based upon correlation matrix  
## ML1 ML2 ML3 h2 u2 com  
## INTEREST\_BIN 0.10 0.28 0 0.12 0.88 1.3  
## FREEINFO\_BIN\_INPERSON 0.54 0.09 0 0.35 0.65 1.1  
## FREEINFO\_BIN\_VIRTUAL -0.57 0.07 0 0.28 0.72 1.0  
##   
## ML1 ML2 ML3  
## SS loadings 0.64 0.11 0.00  
## Proportion Var 0.21 0.04 0.00  
## Cumulative Var 0.21 0.25 0.25  
## Proportion Explained 0.85 0.15 0.00  
## Cumulative Proportion 0.85 1.00 1.00  
##   
## With factor correlations of   
## ML1 ML2 ML3  
## ML1 1.00 0.52 0  
## ML2 0.52 1.00 0  
## ML3 0.00 0.00 1  
##   
## Mean item complexity = 1.1  
## Test of the hypothesis that 3 factors are sufficient.  
##   
## df null model = 3 with the objective function = 0.26 with Chi Square = 36.07  
## df of the model are -3 and the objective function was 0.04   
##   
## The root mean square of the residuals (RMSR) is 0.09   
## The df corrected root mean square of the residuals is NA   
##   
## The harmonic n.obs is 138 with the empirical chi square 6.95 with prob < NA   
## The total n.obs was 140 with Likelihood Chi Square = 5.87 with prob < NA   
##   
## Tucker Lewis Index of factoring reliability = 1.272  
## Fit based upon off diagonal values = 0.9  
## Measures of factor score adequacy   
## ML1 ML2 ML3  
## Correlation of (regression) scores with factors 0.68 0.46 0  
## Multiple R square of scores with factors 0.46 0.21 0  
## Minimum correlation of possible factor scores -0.08 -0.58 -1  
##   
## === Greatest Lower Bound ===



## Call: psych::glb(r = items\_clean)  
##   
## Estimates of the Greatest Lower Bound for reliability, based on factor and cluster models  
## GLB estimated from factor based communalities = 0.31 with 1 factors.  
## Use glb.fa to see more details   
##   
## Various estimates based upon splitting the scale into two (see keys for the various splits)  
## Beta = 0.29   
## Beta fa -0.83 This is an estimate of the worst split half reliability  
## Kmeans clusters for best split 0.32  
## Cluster based estimates   
## glb.IC = -0.83  
## glb.max 0.32 Is the maximum of these estimates  
## alpha-PC = 0.34 An estimate of alpha based on eignvalues  
## TenBerge bounds   
## mu0 = -0.25 mu1 = 0.16 mu2 = 0.18 mu3 = 0.19   
##   
## estimated greatest lower bound based upon splitHalf = 0.32   
##   
## Use short = FALSE to see the various ways of splitting the scale  
## === Split-Half Reliability ===

## Split half reliabilities   
## Call: psych::splitHalf(r = items\_clean)  
##   
## Maximum split half reliability (lambda 4) = 0.6  
## Guttman lambda 6 = 0.43  
## Average split half reliability = 0.43  
## Guttman lambda 3 (alpha) = 0.48  
## Guttman lambda 2 = 0.51  
## Minimum split half reliability (beta) = 0.26  
## Average interitem r = 0.24 with median = 0.25  
## === Average Inter-Item Correlation ===  
## [1] -0.0718074  
##   
## === Principal Component Analysis (1-factor) ===  
## Principal Components Analysis  
## Call: psych::principal(r = items\_clean, nfactors = 1, rotate = "none")  
## Standardized loadings (pattern matrix) based upon correlation matrix  
## PC1 h2 u2 com  
## INTEREST\_BIN 0.48 0.23 0.77 1  
## FREEINFO\_BIN\_INPERSON 0.85 0.72 0.28 1  
## FREEINFO\_BIN\_VIRTUAL -0.75 0.56 0.44 1  
##   
## PC1  
## SS loadings 1.51  
## Proportion Var 0.50  
##   
## Mean item complexity = 1  
## Test of the hypothesis that 1 component is sufficient.  
##   
## The root mean square of the residuals (RMSR) is 0.24   
## with the empirical chi square 47.34 with prob < NA   
##   
## Fit based upon off diagonal values = 0.3

# 6 Exports

#### 6.0.0.1 Recoded DF

write.csv(df, file.path(oup, "recodeddata.csv"), row.names = FALSE)

#### 6.0.0.2 Data Dictionary

meta <- read.csv(file.path(inp, "surveymeta.csv"))  
  
data\_profile <- tibble(  
 Variable = names(df),  
 Data\_Type = sapply(df, function(x) class(x)[1]),  
 Unique\_Values = sapply(df, function(x) length(unique(na.omit(x)))),  
 Missing\_Values = sapply(df, function(x) sum(is.na(x))))  
  
metasum <- meta %>%  
 select(COLUMNID, QUESTION, ANSWERS) %>%  
 rename(  
 Variable = COLUMNID,  
 Question = QUESTION,  
 Answer\_Options = ANSWERS) %>%  
 left\_join(data\_profile, by = "Variable") %>%  
 arrange(Variable)  
# Derived Vars ------------------------------------------  
derived\_vars <- tribble(  
 ~New\_Variable, ~Description, ~Source\_Variables,  
 "PIGS\_BINK", "Correct = 1 if TRUE; Incorrect/Don't Know = 0", "PIGS",  
 "BRUCE\_BINK", "Correct = 1 if FALSE; Incorrect/Don't Know = 0", "BRUCE",  
 "CWD\_BINK", "Correct = 1 if FALSE; Incorrect/Don't Know = 0", "CWD",  
 "FLUAL\_BINK", "Correct = 1 if TRUE; Incorrect/Don't Know = 0", "FLUAL",  
 "FLU\_BINK", "Correct = 1 if FALSE; Incorrect/Don't Know = 0", "FLU",  
 "COVID\_BINK", "Correct = 1 if TRUE; Incorrect/Don't Know = 0", "COVID",  
 "COVIDSPILL\_BINK", "Correct = 1 if TRUE; Incorrect/Don't Know = 0", "COVIDSPILL",  
 "RABIESAL\_BINK", "Correct = 1 if TRUE; Incorrect/Don't Know = 0", "RABIESAL",  
 "RABIES\_BINK", "Correct = 1 if Bites; Incorrect/Don't Know = 0", "RABIES",  
 "TURKEY\_BINK", "Correct = 1 if Bury or Incinerate; others = 0", "TURKEY",  
 "KNOWLEDGE\_SCORE", "Sum of 10 knowledge binary scores", "All \_BINK variables",  
 "KNOWLEDGE\_SCORE\_NORM", "KNOWLEDGE\_SCORE divided by 10", "KNOWLEDGE\_SCORE",  
 "KNOWLEDGE\_AVG", "Binary: Above avg = 1, below = 0", "KNOWLEDGE\_SCORE\_NORM",  
 "KNOWLEDGE\_MED", "Binary: Above median = 1, below = 0", "KNOWLEDGE\_SCORE\_NORM",  
 "CONFIDENCE\_SCORE", "Count of 'I don't know' answers (10 questions)", "All \_BINC variables",  
 "CONFIDENCE\_SCORE\_NORM", "Normalized confidence score (0-1 scale)", "CONFIDENCE\_SCORE",  
 "CONFIDENCE\_AVG", "Binary: Confidence score > average = 1", "CONFIDENCE\_SCORE\_NORM",  
 "CONFIDENCE\_MED", "Binary: Confidence score > median = 1", "CONFIDENCE\_SCORE\_NORM")  
attitude\_indiv <- names(df)[str\_detect(names(df), "\_A$")]  
attitude\_derived <- names(df)[str\_detect(names(df), "ATT|LIKERT")]  
attitude\_doc <- tibble(  
 New\_Variable = sort(unique(c(attitude\_indiv, attitude\_derived))),  
 Description = case\_when(  
 str\_detect(New\_Variable, "\_A$") ~ "Individual attitude item (recoded Likert)",  
 str\_detect(New\_Variable, "LIKERT\_SUM") ~ "Sum of core Likert-scale attitude items",  
 str\_detect(New\_Variable, "NORM") ~ "Normalized attitude score (0–1 scale)",  
 str\_detect(New\_Variable, "AVG") ~ "Binary: Above or below average score",  
 str\_detect(New\_Variable, "MED") ~ "Binary: Above or below median score",  
 str\_detect(New\_Variable, "BINARY") ~ "Final binary classification of attitude score",  
 TRUE ~ "Composite or derived attitude metric"),  
 Source\_Variables = case\_when(  
 str\_detect(New\_Variable, "\_A$") ~ "POPRED, POPPLAN, SURVEY, VACCINE, PREVAL",  
 str\_detect(New\_Variable, "LIKERT\_SUM") ~ "POPRED, POPPLAN, SURVEY, VACCINE, PREVAL",  
 str\_detect(New\_Variable, "ATT") ~ "LIKERT\_SUM",  
 TRUE ~ "Derived from Likert scale responses"))  
demographic\_vars <- tribble(  
 ~New\_Variable, ~Description, ~Source\_Variables,  
 "RACE\_BIN", "Binary: White = 1, Non-White = 0", "RACE",  
 "INCOME\_BIN", "Binary: ≥$60,001 = 1, <$60,001 = 0", "INCOME",  
 "GENDER\_BIN", "Binary: Male = 1, Female = 0, Other/NA = NA", "GENDER",  
 "RESIDENT\_BIN", "Binary: Resident = Yes = 1, No = 0", "RESIDENT",  
 "AGE", "Calculated age (2024 - DOB)", "DOB",  
 "AGE\_BIN", "Binary: AGE ≥ sample median = 1, else = 0", "AGE",  
 "SELFTITLE\_BIN", "Binary: Identifies as biologist = 1, else = 0", "SELFTITLE",  
 "LICENSE\_BIN", "Binary: Holds sample license = 1, else = 0", "LICENSE",  
 "BIOTIME\_BIN", "Binary: ≥10 years of bio experience = 1, <10 = 0", "BIOTIME",  
 "EDUCATION\_BIN", "Binary: ≥ Bachelor's degree = 1, else = 0", "EDUCATION",  
 "DEGREE\_BIN", "Binary: Completed any degree = 1, else = 0", "DEGREE",  
 "TWS\_BIN", "Binary: TWS member = 1, else = 0", "TWS",  
 "COURSE\_BIN", "Binary: Took course = 1, else = 0", "COURSE",  
 "COURSETIME\_BIN", "Binary: Took course ≤10 years ago = 1, else = 0", "COURSETIME",  
 "DEMO\_EDU\_SCORE", "Sum of education variables (EDUCATION\_BIN, DEGREE\_BIN)", "EDUCATION\_BIN, DEGREE\_BIN",  
 "DEMO\_EDU\_NORM", "Normalized education score (0–1 scale)", "DEMO\_EDU\_SCORE",  
 "DEMO\_EDU\_AVG", "Binary: Above average normalized education score = 1", "DEMO\_EDU\_NORM",  
 "DEMO\_EDU\_MED", "Binary: Above median normalized education score = 1", "DEMO\_EDU\_NORM",  
 "DEMO\_EXP\_SCORE", "Sum of experience variables (BIOTIME\_BIN, SELFTITLE\_BIN, TWS\_BIN)", "BIOTIME\_BIN, SELFTITLE\_BIN, TWS\_BIN",  
 "DEMO\_EXP\_NORM", "Normalized experience score (0–1 scale)", "DEMO\_EXP\_SCORE",  
 "DEMO\_EXP\_AVG", "Binary: Above average normalized experience score = 1", "DEMO\_EXP\_NORM",  
 "DEMO\_EXP\_MED", "Binary: Above median normalized experience score = 1", "DEMO\_EXP\_NORM")  
demographic\_vars <- demographic\_vars %>%  
 add\_row(New\_Variable = "ACTIVITY\_GROUP",  
 Description = "Grouped activity types: Fieldwork, Education/Admin, Science/Technical, Other",  
 Source\_Variables = "ACTIVITY") %>%  
 add\_row(New\_Variable = "AFFILIATE\_GROUP",  
 Description = "Grouped affiliations: Government, Academic, Nonprofit, Private, Other",  
 Source\_Variables = "AFFILIATE") %>%  
 add\_row(New\_Variable = "COURSE\_GROUP",  
 Description = "Grouped course recency: None, Older (>10 years), Recent (≤10 years)",  
 Source\_Variables = "COURSE\_BIN, COURSETIME\_BIN")  
practice\_vars <- tribble(  
 ~New\_Variable, ~Description, ~Source\_Variables,  
 "LICENSE\_BIN", "Binary: Licensed = 1, Not licensed = 0", "LICENSE",  
 "COLLECT\_BIN", "Binary: Collect samples = 1, else = 0", "COLLECT",  
 "HANDLE\_BIN", "Binary: Handle samples = 1, else = 0", "HANDLE",  
 "PPE\_BIN", "Binary: Uses PPE = 1, else = 0", "PPE",  
 "ACCESS\_BIN", "Binary: No = 1, Yes = 0", "ACCESS",  
 "CONTACT\_BIN", "Binary: Frequent contact (Weekly/Daily) = 1, else = 0", "CONTACT",  
 "INTEREST\_BIN", "Binary: Interested = 1, Not/Unsure = 0", "INTEREST",  
 "FIELD\_BIN\_MED", "Binary: FIELD ≥ median = 1, else = 0", "FIELD",  
 "FIELD\_BIN\_50", "Binary: FIELD ≥ 50% = 1, else = 0", "FIELD",  
 "STATE\_BIN", "Binary: Works with live animals = 1, else = 0", "STATE",  
 "PPETIME\_BIN", "Binary: PPE use Sometimes+ = 1, Rarely/Never = 0", "PPETIME",  
 "FREEINFO\_BIN\_INPERSON", "Interested in in-person courses = 1", "FREEINFOfill",  
 "FREEINFO\_BIN\_VIRTUAL", "Interested in virtual courses = 1", "FREEINFOfill",  
 "FREEINFO\_BIN\_OTHER", "Selected 'Other' for course format = 1", "FREEINFOfill",  
 "TOPIC\_BIN\_RABIES", "Selected Rabies as topic = 1", "TOPICSfill",  
 "TOPIC\_BIN\_FLU", "Selected Influenza = 1", "TOPICSfill",  
 "TOPIC\_BIN\_LEPTO", "Selected Leptospirosis = 1", "TOPICSfill",  
 "TOPIC\_BIN\_RR", "Selected Raccoon roundworm = 1", "TOPICSfill",  
 "TOPIC\_BIN\_VECTOR", "Selected Vector borne diseases = 1", "TOPICSfill",  
 "TOPIC\_BIN\_CWD", "Selected CWD = 1", "TOPICSfill",  
 "TOPIC\_BIN\_COVID", "Selected SarsCoV2 = 1", "TOPICSfill",  
 "TOPIC\_BIN\_ONEHEALTH", "Selected One Health = 1", "TOPICSfill",  
 "TOPIC\_BIN\_OTHER", "Selected 'Other' for topic = 1", "TOPICSfill",  
 "TOPIC\_COUNT", "Count of selected topics (checkbox)", "TOPICSfill",  
 "TOPIC\_BREADTH\_BIN", "Binary: Full breadth or above median topic count = 1", "TOPIC\_COUNT, TOPICSfill",  
 "SOURCE\_BIN\_FAMILY", "Selected Friends/Family = 1", "SOURCEfill",  
 "SOURCE\_BIN\_AGENCY", "Selected State Wildlife Agency = 1", "SOURCEfill",  
 "SOURCE\_BIN\_ACADEMIC", "Selected Academic Publications = 1", "SOURCEfill",  
 "SOURCE\_BIN\_SOCIAL", "Selected Social Media = 1", "SOURCEfill",  
 "SOURCE\_BIN\_NEWS", "Selected News Sources = 1", "SOURCEfill",  
 "SOURCE\_BIN\_CONFERENCES", "Selected Conferences = 1", "SOURCEfill",  
 "SOURCE\_BIN\_NONE", "Indicated no source sought = 1", "SOURCEfill",  
 "SOURCE\_BIN\_OTHER", "Selected 'Other' source = 1", "SOURCEfill",  
 "SOURCE\_TRUST\_BIN", "Trusted sources = 1 (academic, agency, conferences); others = 0", "SOURCE\_BIN\_\*",  
 "PRACTICE\_EXPOSURE\_SCORE", "Sum of binary risky exposure variables", "CONTACT\_BIN, FIELD\_BIN\_50, HANDLE\_BIN, COLLECT\_BIN",  
 "PRACTICE\_EXPOSURE\_NORM", "Normalized exposure score (0–1)", "PRACTICE\_EXPOSURE\_SCORE",  
 "PRACTICE\_AVG", "Binary: Above average exposure = 1", "PRACTICE\_EXPOSURE\_NORM",  
 "PRACTICE\_MED", "Binary: Above median exposure = 1", "PRACTICE\_EXPOSURE\_NORM",  
 "PRACTICE\_EDUCATION\_SCORE", "Sum of education interest variables", "INTEREST\_BIN, FREEINFO\_BIN\_\*",  
 "PRACTICE\_EDUCATION\_NORM", "Normalized education score (0–1)", "PRACTICE\_EDUCATION\_SCORE")  
new\_derived\_vars <- tribble(  
 ~New\_Variable, ~Description, ~Source\_Variables,  
 "QSNCS", "Question sequence number or status code", "Qualtrics metadata",  
 "SOURCE\_TRUST\_COUNT", "Count of trusted sources (e.g., academic, agency)", "SOURCE\_BIN\_\*",  
 "SOURCE\_UNTRUST\_COUNT", "Count of untrusted sources", "SOURCE\_BIN\_\*",  
 "SOURCE\_TRUST\_BIN", "Binary: Any trusted source selected = 1", "SOURCE\_TRUST\_COUNT",  
 "PRACTICE\_EXPOSURE\_SCORE", "Sum of binary risky exposure variables", "CONTACT\_BIN, FIELD\_BIN\_50, HANDLE\_BIN, COLLECT\_BIN",  
 "PRACTICE\_EXPOSURE\_NORM", "Normalized exposure score (0–1)", "PRACTICE\_EXPOSURE\_SCORE",  
 "PRACTICE\_AVG", "Binary: Above average exposure = 1", "PRACTICE\_EXPOSURE\_NORM",  
 "PRACTICE\_MED", "Binary: Above median exposure = 1", "PRACTICE\_EXPOSURE\_NORM",  
 "PRACTICE\_EDUCATION\_SCORE", "Sum of education interest variables", "INTEREST\_BIN, FREEINFO\_BIN\_\*",  
 "PRACTICE\_EDUCATION\_NORM", "Normalized education score (0–1)", "PRACTICE\_EDUCATION\_SCORE")  
  
  
derived\_data\_info <- tibble(  
 New\_Variable = names(df),  
 Data\_Type = sapply(df, function(x) class(x)[1]),  
 Missing\_Values = sapply(df, function(x) sum(is.na(x))))  
  
all\_derived\_vars <- bind\_rows(  
 derived\_vars,  
 attitude\_doc,  
 practice\_vars,  
 demographic\_vars,  
 new\_derived\_vars) %>%  
 left\_join(derived\_data\_info, by = "New\_Variable") %>%  
 arrange(New\_Variable)  
  
env\_summary <- ls(envir = .GlobalEnv) %>%  
 purrr::map\_df(function(obj\_name) {  
 obj <- get(obj\_name, envir = .GlobalEnv)  
 tibble(  
 Object = obj\_name,  
 Class = class(obj)[1],  
 Type = typeof(obj),  
 Size = format(object.size(obj), units = "auto"),  
 Length = if (is.atomic(obj)) length(obj) else NA\_integer\_,  
 Dimensions = if (is.data.frame(obj) || is.matrix(obj)) paste(dim(obj), collapse = " x ") else  
 NA\_character\_,  
 Is\_Numeric = is.numeric(obj),  
 Is\_Scalar = is.atomic(obj) && length(obj) == 1,  
 Is\_Vector = is.atomic(obj) && length(obj) > 1,  
 Preview = if (is.numeric(obj) || is.character(obj) || is.logical(obj)) {  
 paste0(utils::capture.output(print(utils::head(obj, 3))), collapse = " | ")  
 } else {  
 NA\_character\_  
 }  
 )  
 })  
  
write\_xlsx(list(Original\_vars = metasum, Derived\_vars = all\_derived\_vars, GlobalEnv\_Objects = env\_summary),  
 file.path(oup, "datadictionary.xlsx"))

#### 6.0.0.3 References

# ----to display the packages within the .qmd without creating another .bib -----  
knitr::write\_bib(sub("^package:", "", grep("package", search(), value=TRUE)), file='')

## @Manual{R-base,  
## title = {R: A Language and Environment for Statistical Computing},  
## author = {{R Core Team}},  
## organization = {R Foundation for Statistical Computing},  
## address = {Vienna, Austria},  
## year = {2024},  
## url = {https://www.R-project.org/},  
## }  
##   
## @Manual{R-dplyr,  
## title = {dplyr: A Grammar of Data Manipulation},  
## author = {Hadley Wickham and Romain François and Lionel Henry and Kirill Müller and Davis Vaughan},  
## year = {2023},  
## note = {R package version 1.1.4},  
## url = {https://dplyr.tidyverse.org},  
## }  
##   
## @Manual{R-forcats,  
## title = {forcats: Tools for Working with Categorical Variables (Factors)},  
## author = {Hadley Wickham},  
## year = {2023},  
## note = {R package version 1.0.0},  
## url = {https://forcats.tidyverse.org/},  
## }  
##   
## @Manual{R-janitor,  
## title = {janitor: Simple Tools for Examining and Cleaning Dirty Data},  
## author = {Sam Firke},  
## year = {2023},  
## note = {R package version 2.2.0},  
## url = {https://github.com/sfirke/janitor},  
## }  
##   
## @Manual{R-psych,  
## title = {psych: Procedures for Psychological, Psychometric, and Personality  
## Research},  
## author = {William Revelle},  
## year = {2025},  
## note = {R package version 2.5.3},  
## url = {https://personality-project.org/r/psych/},  
## }  
##   
## @Manual{R-purrr,  
## title = {purrr: Functional Programming Tools},  
## author = {Hadley Wickham and Lionel Henry},  
## year = {2023},  
## note = {R package version 1.0.2},  
## url = {https://purrr.tidyverse.org/},  
## }  
##   
## @Manual{R-readr,  
## title = {readr: Read Rectangular Text Data},  
## author = {Hadley Wickham and Jim Hester and Jennifer Bryan},  
## year = {2024},  
## note = {R package version 2.1.5},  
## url = {https://readr.tidyverse.org},  
## }  
##   
## @Manual{R-stringr,  
## title = {stringr: Simple, Consistent Wrappers for Common String Operations},  
## author = {Hadley Wickham},  
## year = {2023},  
## note = {R package version 1.5.1},  
## url = {https://stringr.tidyverse.org},  
## }  
##   
## @Manual{R-tibble,  
## title = {tibble: Simple Data Frames},  
## author = {Kirill Müller and Hadley Wickham},  
## year = {2023},  
## note = {R package version 3.2.1},  
## url = {https://tibble.tidyverse.org/},  
## }  
##   
## @Manual{R-writexl,  
## title = {writexl: Export Data Frames to Excel xlsx Format},  
## author = {Jeroen Ooms},  
## year = {2024},  
## note = {R package version 1.5.0},  
## url = {https://docs.ropensci.org/writexl/},  
## }