Kappa test

sts

2025-04-03

```
library(readxl)
library(dplyr)
```

```
##
## Attaching package: 'dplyr'
```

```
## The following objects are masked from 'package:stats':
##
##     filter, lag
```

```
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
data1 <- read_excel("Latchman_Rubric Scoring Sheet 2025.xlsx", sheet = 1)
data2 <- read_excel("Rubric Scoring Sheet 2025 kva UF.xlsx", sheet = 1)
data3 <-read_excel("Rubric Scoring Sheet 2025 LY UF.xlsx", sheet = 1)
data4 <-read_excel("Wagner_Rubric Scoring Sheet 2025.xlsx", sheet = 1)
df1 <- data1[, c(1, 3:ncol(data1))]
df2 <- data2[, c(1, 3:ncol(data2))]
df3 <- data3[, c(1, 3:ncol(data3))]
df4 <- data4[, c(1, 3:ncol(data4))]
```

```
df1 <- df1 %>%
  mutate(across(-Criteria, ~case_when(
    . == "Y" ~ 1,
    . == "N" ~ 0,
    . == "N/A" ~ NA_real_,
    TRUE ~ NA_real_
  )))
df2 <- df2 %>%
  mutate(across(-Criteria, ~case_when(
    . == "Y" ~ 1,
    . == "N" ~ 0,
    . == "N/A" ~ NA_real_,
    TRUE ~ NA_real_
  )))
df3 <- df3 %>%
  mutate(across(-Criteria, ~case_when(
    . == "Y" ~ 1,
```

```
    . == "N" ~ 0,
    . == "N/A" ~ NA_real_,
    TRUE ~ NA_real_
  )))
df4 <- df4 %>%
  mutate(across(-Criteria, ~case_when(
    . == "Y" ~ 1,
    . == "N" ~ 0,
    . == "N/A" ~ NA_real_,
    TRUE ~ NA_real_
  )))
```

```
library(irr)
```

```
## Loading required package: lpSolve
```

```
dfs <- list(df1, df2, df3, df4)
names(dfs) <- c("Rater1", "Rater2", "Rater3", "Rater4")
```

```
sample_cols <- colnames(df1)[-1]

flaws <- paste0("Flaw", 1:12)
df_list <- lapply(dfs, function(df) {
  df <- df[1:12, ]
  df$Criteria <- flaws
  return(df)
})
```

```
flaws_per_sample <- list()

for (sample in sample_cols) {
  flaws_info <- data.frame(Sample = sample)
  for (rater in names(df_list)) {
    df <- df_list[[rater]]
    ratings <- df[[sample]]
    marked_flaws <- df$Criteria[ratings == 1]
    if (length(marked_flaws) == 0) {
      marked_flaws <- "None"
    }
    flaws_info[[rater]] <- paste(marked_flaws, collapse = ", ")
  }
  flaws_per_sample[[sample]] <- flaws_info
}
```

```
flaws_summary <- do.call(rbind, flaws_per_sample)

print("Flaws marked for each sample by each rater:")
```

```
## [1] "Flaws marked for each sample by each rater:"
```

```
print(flaws_summary)
```

```
##     Sample
## Q1      Q1
## Q2      Q2
## Q3      Q3
## Q4      Q4
## Q5      Q5
## Q6      Q6
## Q7      Q7
## Q8      Q8
## Q9      Q9
## Q10    Q10
## Q11    Q11
## Q12    Q12
## Q13    Q13
## Q14    Q14
## Q15    Q15
## Q16    Q16
## Q17    Q17
## Q18    Q18
## Q19    Q19
## Q20    Q20
## Q21    Q21
## Q22    Q22
## Q23    Q23
## Q24    Q24
## Q25    Q25
## Q26    Q26
## Q27    Q27
## Q28    Q28
## Q29    Q29
## Q30    Q30
##                                                                                 Rater1
## Q1                Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw9, Flaw10, Flaw11, Flaw12
## Q2         Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw9, Flaw10, Flaw11, Flaw12
## Q3             Flaw1, Flaw2, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, NA, Flaw11, Flaw12
## Q4                   Flaw2, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, NA, Flaw11, Flaw12
## Q5                      Flaw3, NA, Flaw6, Flaw7, Flaw8, Flaw9, Flaw10, Flaw11, Flaw12
## Q6  Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, Flaw10, Flaw11, Flaw12
## Q7          Flaw1, Flaw2, Flaw3, Flaw4, Flaw6, Flaw7, Flaw8, Flaw9, NA, Flaw11, Flaw12
## Q8   Flaw1, Flaw2, Flaw3, Flaw4, Flaw5, Flaw6, Flaw7, Flaw8, Flaw9, NA, Flaw11, Flaw12
## Q9  Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, Flaw10, Flaw11, Flaw12
## Q10     Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, NA, Flaw11, Flaw12
## Q11                  Flaw2, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, NA, Flaw11, Flaw12
## Q12         Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, Flaw11, Flaw12
## Q13     Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, NA, Flaw11, Flaw12
## Q14            Flaw1, Flaw2, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, NA, Flaw11, Flaw12
## Q15        Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw9, Flaw10, Flaw11, Flaw12
## Q16                           Flaw2, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, NA, Flaw11
## Q17     Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, NA, Flaw11, Flaw12
## Q18               Flaw1, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, Flaw11, Flaw12
## Q19     Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, NA, Flaw11, Flaw12
```

```
## Q20     Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, NA, Flaw11, Flaw12
## Q21                  Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw8, NA, Flaw11, Flaw12
## Q22                         Flaw3, NA, Flaw6, Flaw7, Flaw8, Flaw9, NA, Flaw11, Flaw12
## Q23     Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, NA, Flaw11, Flaw12
## Q24           Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, NA, Flaw11, Flaw12
## Q25  Flaw1, Flaw2, Flaw3, Flaw4, Flaw5, Flaw6, Flaw7, Flaw8, Flaw9, NA, Flaw11, Flaw12
## Q26           Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, NA, Flaw11, Flaw12
## Q27               Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw9, Flaw11, Flaw12
## Q28           Flaw1, Flaw2, Flaw3, Flaw4, Flaw6, Flaw7, Flaw9, Flaw10, Flaw11, Flaw12
## Q29                     Flaw2, Flaw3, NA, Flaw6, Flaw7, Flaw8, Flaw10, Flaw11, Flaw12
## Q30           Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw8, Flaw9, NA, Flaw11, Flaw12
##                                                                                 Rater2
## Q1                     NA, NA, Flaw4, NA, Flaw6, Flaw7, NA, Flaw9, NA, Flaw11, Flaw12
## Q2           Flaw1, Flaw2, NA, Flaw4, NA, Flaw6, Flaw7, NA, Flaw9, NA, Flaw11, Flaw12
## Q3      Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, NA, Flaw11, Flaw12
## Q4           Flaw1, Flaw2, NA, Flaw4, NA, Flaw6, Flaw7, NA, Flaw9, NA, Flaw11, Flaw12
## Q5      Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, NA, Flaw11, Flaw12
## Q6              Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, NA, NA, NA
## Q7                       Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw7, NA, Flaw9, NA, NA, NA
## Q8                    Flaw1, Flaw2, Flaw3, NA, Flaw5, NA, Flaw7, NA, Flaw9, NA, NA, NA
## Q9  Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, Flaw10, Flaw11, Flaw12
## Q10       Flaw1, Flaw2, NA, Flaw4, NA, Flaw6, Flaw7, NA, Flaw9, Flaw10, Flaw11, Flaw12
## Q11 Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, Flaw10, Flaw11, Flaw12
## Q12        Flaw1, Flaw2, Flaw3, NA, NA, Flaw6, Flaw7, Flaw8, Flaw9, NA, Flaw11, Flaw12
## Q13     Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, NA, Flaw11, Flaw12
## Q14        Flaw1, Flaw2, Flaw3, NA, NA, Flaw6, Flaw7, Flaw8, Flaw9, NA, Flaw11, Flaw12
## Q15    Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, NA, Flaw9, Flaw10, Flaw11, Flaw12
## Q16                Flaw1, Flaw2, NA, NA, NA, NA, Flaw7, NA, Flaw9, NA, Flaw11, Flaw12
## Q17           Flaw1, Flaw2, Flaw3, NA, NA, NA, Flaw7, Flaw8, Flaw9, NA, Flaw11, Flaw12
## Q18             Flaw1, Flaw2, NA, NA, NA, Flaw6, Flaw7, NA, Flaw9, NA, Flaw11, Flaw12
## Q19     Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, NA, Flaw11, Flaw12
## Q20     Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, NA, Flaw11, Flaw12
## Q21                  Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw8, NA, Flaw11, Flaw12
## Q22     Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, NA, Flaw11, Flaw12
## Q23     Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, NA, Flaw11, Flaw12
## Q24           Flaw1, Flaw2, NA, Flaw4, NA, Flaw6, Flaw7, NA, Flaw9, NA, Flaw11, Flaw12
## Q25        Flaw1, Flaw2, Flaw3, Flaw4, Flaw5, NA, NA, Flaw8, Flaw9, NA, Flaw11, Flaw12
## Q26            Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, NA, Flaw11, Flaw12
## Q27 Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, Flaw10, Flaw11, Flaw12
## Q28       Flaw1, Flaw2, Flaw3, Flaw4, Flaw5, NA, NA, NA, Flaw9, Flaw10, Flaw11, Flaw12
## Q29                 Flaw1, Flaw2, NA, NA, NA, Flaw6, Flaw7, Flaw8, NA, Flaw11, Flaw12
## Q30           Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw8, Flaw9, NA, Flaw11, Flaw12
##                                                                                 Rater3
## Q1                      Flaw2, Flaw3, NA, Flaw6, Flaw7, Flaw9, Flaw10, Flaw11, Flaw12
## Q2                       Flaw1, Flaw2, Flaw4, NA, Flaw6, Flaw7, Flaw9, Flaw11, Flaw12
## Q3                             Flaw2, NA, Flaw6, Flaw7, Flaw9, Flaw10, Flaw11, Flaw12
## Q4                              Flaw2, NA, Flaw6, Flaw7, Flaw8, Flaw9, Flaw10, Flaw11
## Q5                       Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw9, Flaw10, Flaw11
## Q6                        Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, Flaw11
## Q7            Flaw1, Flaw2, Flaw3, Flaw4, Flaw6, Flaw7, NA, Flaw9, NA, Flaw11, Flaw12
## Q8  Flaw1, Flaw2, Flaw3, Flaw4, Flaw5, Flaw6, Flaw7, NA, Flaw9, Flaw10, Flaw11, Flaw12
## Q9         Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, Flaw11, Flaw12
## Q10 Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, Flaw10, Flaw11, Flaw12
## Q11                                  Flaw2, NA, Flaw6, Flaw7, Flaw9, Flaw10, Flaw11
```

```
## Q12        Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, Flaw10, Flaw11, Flaw12
## Q13 Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, Flaw10, Flaw11, Flaw12
## Q14                  Flaw1, Flaw2, NA, Flaw6, Flaw7, Flaw8, Flaw9, NA, Flaw11, Flaw12
## Q15                               Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9
## Q16                                                  Flaw2, NA, Flaw7, Flaw9, NA, Flaw11
## Q17               Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, Flaw11, Flaw12
## Q18                             Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw11, Flaw12
## Q19 Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, Flaw10, Flaw11, Flaw12
## Q20 Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, Flaw10, Flaw11, Flaw12
## Q21                                Flaw2, Flaw3, Flaw4, NA, Flaw6, NA, Flaw11, Flaw12
## Q22                                 Flaw2, NA, Flaw6, Flaw7, Flaw8, Flaw9, NA, Flaw11
## Q23                  Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw9, NA, Flaw11, Flaw12
## Q24                           Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw9, NA, Flaw12
## Q25  Flaw1, Flaw2, Flaw3, Flaw4, Flaw5, Flaw6, Flaw7, Flaw8, Flaw9, NA, Flaw11, Flaw12
## Q26                       Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw10, Flaw11, Flaw12
## Q27        Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, Flaw10, Flaw11, Flaw12
## Q28     Flaw1, Flaw2, Flaw3, Flaw4, Flaw6, Flaw7, Flaw8, Flaw9, Flaw10, Flaw11, Flaw12
## Q29                             Flaw2, Flaw3, NA, Flaw6, Flaw7, Flaw8, Flaw11, Flaw12
## Q30                                          Flaw2, Flaw4, NA, Flaw6, Flaw7, NA, Flaw11
##                                                                                   Rater4
## Q1                Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw9, Flaw10, Flaw11, Flaw12
## Q2         Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw9, Flaw10, Flaw11, Flaw12
## Q3                                  Flaw1, Flaw2, Flaw4, NA, Flaw6, Flaw7, Flaw9, Flaw10
## Q4         Flaw1, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, Flaw10, Flaw11, Flaw12
## Q5         Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw9, Flaw10, Flaw11, Flaw12
## Q6         Flaw1, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, Flaw10, Flaw11, Flaw12
## Q7                            Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw7, NA, NA, NA, NA, NA
## Q8                   Flaw1, Flaw2, Flaw3, Flaw4, Flaw5, NA, Flaw7, NA, NA, NA, NA, NA
## Q9  Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, Flaw10, Flaw11, Flaw12
## Q10 Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, Flaw10, Flaw11, Flaw12
## Q11        Flaw1, Flaw2, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, Flaw10, Flaw11, Flaw12
## Q12        Flaw1, Flaw2, Flaw3, NA, Flaw6, Flaw7, Flaw8, Flaw9, Flaw10, Flaw11, Flaw12
## Q13 Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, Flaw10, Flaw11, Flaw12
## Q14        Flaw1, Flaw2, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, Flaw10, Flaw11, Flaw12
## Q15 Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, Flaw10, Flaw11, Flaw12
## Q16               Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw9, Flaw10, Flaw11, Flaw12
## Q17                                Flaw1, Flaw2, Flaw3, NA, Flaw6, Flaw7, Flaw11, Flaw12
## Q18 Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, Flaw10, Flaw11, Flaw12
## Q19 Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, Flaw10, Flaw11, Flaw12
## Q20 Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, Flaw10, Flaw11, Flaw12
## Q21                              Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw10, Flaw11, Flaw12
## Q22 Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, Flaw10, Flaw11, Flaw12
## Q23 Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, Flaw10, Flaw11, Flaw12
## Q24               Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, Flaw10, Flaw11, Flaw12
## Q25                Flaw1, Flaw2, Flaw3, Flaw4, Flaw5, Flaw6, Flaw7, NA, NA, NA, NA, NA
## Q26 Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, Flaw10, Flaw11, Flaw12
## Q27 Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw9, Flaw10, Flaw11, Flaw12
## Q28                    Flaw1, Flaw2, Flaw3, Flaw4, Flaw5, Flaw6, Flaw7, NA, NA, NA, NA
## Q29        Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw7, Flaw8, Flaw10, Flaw11, Flaw12
## Q30        Flaw1, Flaw2, Flaw3, Flaw4, NA, Flaw6, Flaw8, Flaw9, Flaw10, Flaw11, Flaw12
```

```r
kappa_results <- data.frame(Sample = sample_cols, Kappa = NA, P_value = NA)

for (sample in sample_cols) {
```

```
  ratings <- sapply(df_list, function(df) df[[sample]])

  ratings_matrix <- matrix(ratings, nrow = 12, ncol = 4, byrow = FALSE)

  ratings_matrix <- ratings_matrix[complete.cases(ratings_matrix), ]

  if (nrow(ratings_matrix) > 1) {
    kappa_result <- kappam.fleiss(ratings_matrix)

    kappa_results$Kappa[kappa_results$Sample == sample] <- kappa_result$value
    kappa_results$P_value[kappa_results$Sample == sample] <- kappa_result$p.value
  } else {

    kappa_results$Kappa[kappa_results$Sample == sample] <- NA
    kappa_results$P_value[kappa_results$Sample == sample] <- NA
  }
}

print("Kappa results for each sample:")
```

```
## [1] "Kappa results for each sample:"
```

```
print(kappa_results)
```

```
##    Sample       Kappa      P_value
## 1      Q1 -0.07692308 6.181186e-01
## 2      Q2         NaN          NaN
## 3      Q3  0.09199522 4.760983e-01
## 4      Q4 -0.02716049 8.507407e-01
## 5      Q5  0.01875902 8.844687e-01
## 6      Q6 -0.06666667 6.441672e-01
## 7      Q7  1.00000000 1.973175e-09
## 8      Q8         NaN          NaN
## 9      Q9 -0.02325581 8.501468e-01
## 10    Q10         NaN          NaN
## 11    Q11  0.16666667 1.967056e-01
## 12    Q12 -0.02857143 8.337018e-01
## 13    Q13        -Inf          NaN
## 14    Q14  0.63636364 2.920992e-06
## 15    Q15 -0.11111111 3.894237e-01
## 16    Q16  0.41052632 1.377193e-02
## 17    Q17 -0.10344828 4.735526e-01
## 18    Q18 -0.12000000 4.367524e-01
## 19    Q19        -Inf          NaN
## 20    Q20        -Inf          NaN
## 21    Q21  0.68253968 1.243865e-07
## 22    Q22  0.01875902 8.844687e-01
## 23    Q23 -0.05263158 6.835068e-01
## 24    Q24  0.28888889 4.534059e-02
## 25    Q25         NaN          NaN
## 26    Q26  0.31428571 1.491458e-02
## 27    Q27 -0.07317073 5.522166e-01
```

```
## 28    Q28  0.11111111 5.049851e-01
## 29    Q29  0.72649573 4.820825e-07
## 30    Q30  0.06250000 6.282986e-01
```

```r
write.csv(flaws_summary, "flaws_per_sample.csv", row.names = FALSE)
```