

CTPA Interobserver Agreement Analysis

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```
library(tidyverse)
```

```
## -- Attaching core tidyverse packages ----- tidyverse 2.0.0 --
## v dplyr      1.1.4      v readr      2.1.5
## v forcats    1.0.0      v stringr    1.5.1
## v ggplot2    4.0.0      v tibble     3.2.1
## v lubridate  1.9.4      v tidyr      1.3.1
## v purrr      1.0.4
## -- Conflicts ----- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()     masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors
```

```
library(kableExtra)
```

```
##
## Attaching package: 'kableExtra'
##
## The following object is masked from 'package:dplyr':
##
##     group_rows
```

```
ctpa_data <- read.csv("CTPAData.csv", stringsAsFactors = FALSE)
```

```
# Create the base contingency table
contingency_table <- table(ctpa_data$Resident, ctpa_data$Staff)
```

```
# Calculate totals and percentages
total_cases <- sum(contingency_table)
row_totals <- rowSums(contingency_table)
col_totals <- colSums(contingency_table)
```

```
# Create Contingency Table
```

```
simple_table <- matrix(
  c(
    paste0(contingency_table["N", "N"], " (", round(contingency_table["N", "N"]/total_cases*100, 1), "%"),
    paste0(contingency_table["N", "P"], " (", round(contingency_table["N", "P"]/total_cases*100, 1), "%"),
    paste0(row_totals["N"], " (", round(row_totals["N"]/total_cases*100, 1), "%)"),
    paste0(contingency_table["P", "N"], " (", round(contingency_table["P", "N"]/total_cases*100, 1), "%"),
    paste0(contingency_table["P", "P"], " (", round(contingency_table["P", "P"]/total_cases*100, 1), "%")
  )
```

```

paste0(row_totals["P"], " (", round(row_totals["P"]/total_cases*100, 1), "%)"),
paste0(col_totals["N"], " (", round(col_totals["N"]/total_cases*100, 1), "%)"),
paste0(col_totals["P"], " (", round(col_totals["P"]/total_cases*100, 1), "%)"),
paste0(total_cases, " (100%)")
),
nrow = 3,
ncol = 3,
byrow = TRUE
)

colnames(simple_table) <- c("Staff: Negative", "Staff: Positive", "Row Total")
rownames(simple_table) <- c("Resident: Negative", "Resident: Positive", "Column Total")

kable(simple_table, align = 'c') %>%
  kable_styling(bootstrap_options = "striped", full_width = FALSE) %>%
  row_spec(0, bold = TRUE) %>%
  row_spec(3, bold = TRUE) %>%
  column_spec(4, bold = TRUE)

```

	Staff: Negative	Staff: Positive	Row Total
Resident: Negative	463 (77.7%)	9 (1.5%)	472 (79.2%)
Resident: Positive	12 (2%)	112 (18.8%)	124 (20.8%)
Column Total	475 (79.7%)	121 (20.3%)	596 (100%)

```

# Calculate Cohen's Kappa
observed_agreement <- sum(diag(contingency_table)) / total_cases
expected_agreement <- sum((row_totals/total_cases) * (col_totals/total_cases))
kappa_value <- (observed_agreement - expected_agreement) / (1 - expected_agreement)

# Calculate 95% CI
n <- total_cases
p_o <- observed_agreement
p_e <- expected_agreement
var_kappa <- (p_o * (1 - p_o)) / (n * (1 - p_e)^2)
se_kappa <- sqrt(var_kappa)
ci_lower <- kappa_value - 1.96 * se_kappa
ci_upper <- kappa_value + 1.96 * se_kappa

kappa_summary <- data.frame(
  Statistic = c("Cohen's Kappa", "95% CI Lower", "95% CI Upper"),
  Value = c(
    round(kappa_value, 3),
    round(ci_lower, 3),
    round(ci_upper, 3)
  )
)

kable(kappa_summary, align = c('l', 'c')) %>%
  kable_styling(full_width = FALSE)

```

Statistic	Value
Cohen's Kappa	0.892
95% CI Lower	0.847
95% CI Upper	0.937

```
cat("## Interpretation\n\n")
```

```
## ## Interpretation
```

```
cat("**Data Summary:**\n")
```

```
## **Data Summary:**
```

```
cat("- Total CTPA studies:", total_cases, "\n")
```

```
## - Total CTPA studies: 596
```

```
cat("- Overall agreement:", round(observed_agreement * 100, 1), "%\n")
```

```
## - Overall agreement: 96.5 %
```

```
cat("- Discordant cases:", sum(contingency_table["P", "N"] + contingency_table["N", "P"]), "\n\n")
```

```
## - Discordant cases: 21
```

```
cat("**Key Findings:**\n")
```

```
## **Key Findings:**
```

```
cat("- Cohen's Kappa =", round(kappa_value, 3), "\n")
```

```
## - Cohen's Kappa = 0.892
```

```
cat("- 95% CI: [", round(ci_lower, 3), ",", round(ci_upper, 3), "]\n")
```

```
## - 95% CI: [ 0.847 , 0.937 ]
```

Cohen's Kappa	Interpretation
0	No agreement
0.10 - 0.20	Slight agreement
0.21 - 0.40	Fair agreement
0.41 - 0.60	Moderate agreement
0.61 - 0.80	Substantial agreement
0.81 - 0.99	Near perfect agreement
1	Perfect agreement