**Question 1) Whether blocks/zip codes with access to Shield testing centers have lower outcome measures (ICU admission, mechanical ventilation, and death due to COVID-19) than block/zip codes without access?**

From the ICU data:

**Access to Shield Testing Center:** Whether the patients live in a zip code with access to a Shield testing center within a 5-mile radius ????? (1 for access, 0 for no access).

**ICU Admission:** Whether the individual was admitted to the ICU *due to COVID-19* (1 for yes, 0 for no).

**Mechanical Ventilation:** Whether the individual required mechanical ventilation *due to COVID-19* (1 for yes, 0 for no).

**Death:** Whether the individual died *due to COVID-19* (1 for yes, 0 for no).

The objective here is to see if there are statistical differences in the rates of ICU admission, mechanical ventilation, and death due to COVID-19 between individuals with and without access to Shield testing centers.

Data = data.frame(access, icu\_admission, mechanical\_ventilation, death)

Chi-square test is necessary (since both dependent and independent variables are categorical) to compare the proportions of each outcome between the two groups.

chi\_icu = chisq.test(table(data$access, data$icu\_admission))

chi\_mv = chisq.test(table(data$access, data$mechanical\_ventilation))

chi\_death = chisq.test(table(data$access, data$death))

**Question 2) Whether underrepresented blocks/zip codes (with low CCVI and ADI indices) have lower outcome measures (ICU admission, mechanical ventilation, and death due to COVID-19) than the other?**

**ICU Admission:** Whether the individual was admitted to the ICU *due to COVID-19* (1 for yes, 0 for no).

**Mechanical Ventilation:** Whether the individual required mechanical ventilation *due to COVID-19* (1 for yes, 0 for no).

**Death:** Whether the individual died *due to COVID-19* (1 for yes, 0 for no).

**Underrepresented blocks/zip codes:** (1 for yes, 0 for no).

The objective is to see if there are statistically significant differences in the rates of ICU admission, mechanical ventilation, and death between underrepresented blocks/zip codes and others.

if (!requireNamespace("dplyr", quietly = TRUE)) install.packages("dplyr")

library(dplyr)

Data = data.frame(underrepresented, icu\_admission, mechanical\_ventilation, death)

Chi-square test is necessary (since both dependent and independent variables are categorical) to compare the proportions of each outcome between the two groups.

chi\_icu = chisq.test(table(data$ underrepresented, data$icu\_admission))

chi\_mv = chisq.test(table(data$ underrepresented, data$mechanical\_ventilation))

chi\_death = chisq.test(table(data$ underrepresented, data$death))

**Question 3) Do the outcome measures (ICU admissions, mechanical ventilation, and death due to COVID-19) change as a function of the test volume?**

**Test volume:** The total number of COVID-19 tests conducted in each block/zip code.

**ICU admission:** The number of ICU admissions due to COVID-19 in each block/zip code.

**Mechanical** **ventilation:** The number of people requiring mechanical ventilation due to COVID-19 in each block/zip code.

**Deaths:** The number of COVID-19-related deaths in each block/zip code.

The objective is to see if there is a statistical relationship between the COVID-19 test volume and the outcome measures.

Install.package(“geepack”)

library(geepack)

gee\_testVol\_icu = geeglm(test\_volume ~ icu\_admission, family = poisson(link = "log"), data = covid\_data, id = block\_zip\_code, corstr = "exchangeable")

summary(gee\_testVol\_icu)

gee\_testVol\_mechVent = geeglm(test\_volume ~ mechanical\_ventilation, family = poisson(link = "log"), data = covid\_data, id = block\_zip\_code, corstr = "exchangeable")

summary(gee\_testVol\_mechVent)

gee\_testVol\_deaths = geeglm(test\_volume ~ deaths, family = poisson(link = "log"), data = covid\_data, id = block\_zip\_code, corstr = "exchangeable")

summary(gee\_testVol\_deaths)

**Question 4: What blocks/zip codes should Shield open a testing center in the future first?**