Confidence Intervals

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#  
# PHONE data-------------------------------------------------------------------  
#  
n\_phone <- 869.9 # person-time years at risk total in study  
n\_cases <- 97  
lambda\_phone <- n\_cases/n\_phone  
lambda\_phone # Point estimate

## [1] 0.1115071

# If lambda \* n is large - then we can use the normal approximation of pois  
  
# Method 1: Normal Approx  
lambda\_phone + 1.96 \* sqrt(lambda\_phone / n\_phone) # Upper bound

## [1] 0.1336979

lambda\_phone - 1.96 \* sqrt(lambda\_phone / n\_phone) # Lower bound

## [1] 0.08931629

# Method 2:Simulation  
x <- 0  
for (i in 1:30000){  
 x[i] <- sum(rpois(n\_phone, lambda\_phone))  
}  
  
summary(x)

## Min. 1st Qu. Median Mean 3rd Qu. Max.   
## 56.00 90.00 97.00 96.87 103.00 139.00

# Take middel 95% of simulations  
x <- x[order(x)]  
l <-.975 \* length(x)  
u <- 0.025 \* length(x)  
x\_2 <- x[l:u]  
upper <- max(x\_2)  
lower <- min(x\_2)  
  
upper/n\_phone # Upper bound

## [1] 0.1344982

lower/n\_phone # Lower bound

## [1] 0.08966548

# Method 3: Exact estimates  
# NOT SURE ABOUTH THIS METHOD. Found at: http://tinyurl.com/hkrncpp  
exactPoiCI <- function (X, conf.level=0.95) {  
 alpha = 1 - conf.level  
 upper <- 0.5 \* qchisq(1-alpha/2, 2\*X+2)  
 lower <- 0.5 \* qchisq(alpha/2, 2\*X)  
 return(c(lower, upper))  
}  
  
  
est\_phone\_upper <- exactPoiCI(n\_cases)[2]  
est\_phone\_lower <- exactPoiCI(n\_cases)[1]  
  
est\_phone\_upper / n\_phone # Upper bound

## [1] 0.1360292

est\_phone\_lower / n\_phone # Lower bound

## [1] 0.09042472

#  
# 48Hr --------------------------------------------------------------------  
#  
  
n\_48hr <- 34.3  
n\_cases\_48h <- 11  
lambda\_48hr <- n\_cases\_48h/n\_48hr  
lambda\_48hr # Point estimate

## [1] 0.3206997

# Check if lambda \* n is large - then we can use the normal approximation of pois  
lambda\_48hr \* n\_48hr

## [1] 11

# Method 1: Normal Approx  
lambda\_48hr + 1.96 \* sqrt(lambda\_48hr / n\_48hr)

## [1] 0.5102211

lambda\_48hr - 1.96 \* sqrt(lambda\_48hr / n\_48hr)

## [1] 0.1311783

# Method 2:Simulation  
x <- 0  
for (i in 1:30000){  
 x[i] <- sum(rpois(n\_48hr, lambda\_48hr))  
}  
summary(x)

## Min. 1st Qu. Median Mean 3rd Qu. Max.   
## 0.00 9.00 11.00 10.93 13.00 27.00

# Take middel 95% of simulations  
x <- x[order(x)]  
l <-.975 \* length(x)  
u <- 0.025 \* length(x)  
x\_2 <- x[l:u]  
upper <- max(x\_2)  
lower <- min(x\_2)  
  
upper/n\_48hr

## [1] 0.5247813

lower/n\_48hr

## [1] 0.1457726

# Method 3: Exact estimates  
# NOT SURE ABOUTH THIS METHOD. Found at: http://tinyurl.com/hkrncpp  
exactPoiCI <- function (X, conf.level=0.95) {  
 alpha = 1 - conf.level  
 upper <- 0.5 \* qchisq(1-alpha/2, 2\*X+2)  
 lower <- 0.5 \* qchisq(alpha/2, 2\*X)  
 return(c(lower, upper))  
}  
  
  
est\_48hr\_upper <- exactPoiCI(n\_cases\_48h)[2]  
est\_48hr\_lower <- exactPoiCI(n\_cases\_48h)[1]  
  
est\_48hr\_upper / n\_48hr

## [1] 0.5738204

est\_48hr\_lower / n\_48hr

## [1] 0.1600921