## Codes

### Data Cleaning And Manipulation

**#Loading required packages**

library(mosaic)

library(ggplot2)

library(descr)

library(haven)

library(lubridate)

library(dplyr)

library(tidyverse)

library(pROC)

library(ResourceSelection)

**#Cleaning demographic dataset**

**#Importing demographics dataset**



demo<- Demographics\_subsample\_v1\_20230626

**#Creating subset with required variables**

newdemo<- demo %>% select (oGRE\_ID, OBF\_DOB, SEX, SIMD\_2016\_QUINTILE, DATE\_OF\_DEATH)

**#Remove duplicates in ogre ID**

newdemo<- newdemo %>% distinct(oGRE\_ID,.keep\_all=TRUE)

**# Convert date of birth and date of death to date type**

newdemo$OBF\_DOB<- as.Date(newdemo$OBF\_DOB, "%Y-%m-%d")

newdemo$DATE\_OF\_DEATH<- as.Date(newdemo$DATE\_OF\_DEATH, "%Y-%m-%d")

summary(newdemo$DATE\_OF\_DEATH)

**#Removing missing values in deprivation quintile**

sum (is.na (newdemo$SIMD\_2016\_QUINTILE))

newdemoclean <- newdemo [complete.cases(newdemo$SIMD\_2016\_QUINTILE),]

summary(newdemoclean$SIMD\_2016\_QUINTILE)

head(newdemoclean)

**#Check for unique values other than 1-5 deprivation quintile**

newdemoclean2<- newdemoclean%>% filter(SIMD\_2016\_QUINTILE %in% 1:5)

**#Check for values other than M and F**

newdemoclean3<- newdemoclean%>% filter(SEX %in% c("M", "F"))

**#Cleaning TRAK A and E dataset**

**# Renaming second trak A and E dataset**

TRAKAANDE <- TRAK\_AandE\_subsample\_v1\_20230719

**#Creating a subsample with required columns**

NEWTRAK <- TRAKAANDE %>% select(oGRE\_ID, DISCHARGE\_TYPE\_DESCRIPTION, CAUSEOFINJURY\_DESCRIPTION, ADMISSION\_DATE, DISCHARGE\_DATE, ETHNICITY\_DESCRIPTION)

**#Check for missing values**

sum (is.na (NEWTRAK$DISCHARGE\_TYPE\_DESCRIPTION))

sum (is.na (NEWTRAK$CAUSEOFINJURY\_DESCRIPTION))

sum (is.na (NEWTRAK$ADMISSION\_DATE))

sum (is.na (NEWTRAK$DISCHARGE\_DATE))

sum (is.na (NEWTRAK$ETHNICITY\_DESCRIPTION))

**#Remove missing values from discharge date**

NEWTRAK2 <- NEWTRAK [complete.cases(NEWTRAK$DISCHARGE\_DATE),]

**#Check if all the date of birth and date of death are in date format**

NEWTRAK2$ADMISSION\_DATE<- as.Date(NEWTRAK2$ADMISSION\_DATE, "%Y-%m-%d")

NEWTRAK2$DISCHARGE\_DATE<- as.Date(NEWTRAK2$DISCHARGE\_DATE, "%Y-%m-%d")

**#Cleaning SMR 01 dataset**

**#Importing and renaming SMR dataset**

SMR<- SMR01\_subsample\_v1\_20230626

**#Creating a subsample with required columns**

NEWSMR <- SMR %>% select(oGRE\_ID, ADMDATE)

**# Check if admission date are in date format**

NEWSMR$ADMDATE<- as.Date(NEWSMR$ADMDATE, "%Y-%m-%d")

sum (is.na (NEWSMR$ADMDATE))

summary(NEWSMR$ADMDATE)

**#Cleaning urban or rural dataset**

**#importing and renaming the dataset**

Urbanandrural<- Urban\_Rural\_subsample\_v1\_20230721

**#Check for missing values**

sum (is.na (Urbanandrural$Current\_UC))

**#Merging all the datasets with required variables**

MERGEDDATA <- merge(newdemoclean3, NEWTRAK2, by= "oGRE\_ID", all = TRUE)

MERGEDDATA2<- merge(MERGEDDATA, Urbanandrural, by= "oGRE\_ID", all = TRUE)

descriptivedata<-MERGEDDATA2 %>% distinct(oGRE\_ID, .keep\_all = TRUE)

summary(descriptivedata$SEX)

sum (is.na (descriptivedata$SEX))

summary(MERGEDDATA2)

head(MERGEDDATA2)

**#Cleaning the merged dataset**

FINALMERGEDDATA<- MERGEDDATA2 %>% drop\_na(SIMD\_2016\_QUINTILE, OBF\_DOB, ADMISSION\_DATE, DISCHARGE\_DATE)

summary(FINALMERGEDDATA)

summary(FINALMERGEDDATA$DATE\_OF\_DEATH)

**#Calculating age of the patients**

FINALMERGEDDATA$AGE <- as.numeric(difftime(FINALMERGEDDATA$ADMISSION\_DATE, FINALMERGEDDATA$OBF\_DOB, units = "weeks"))/ 52.25

FINALMERGEDDATA$AGE <- round (FINALMERGEDDATA$AGE)

summary(FINALMERGEDDATA$AGE)

**#Removing patients below who are below 18 years of old**

MERGEDSUBSETABOVE18 <- subset(FINALMERGEDDATA, AGE>=18)

summary(MERGEDSUBSETABOVE18$AGE)

**#Categorising age**

MERGEDSUBSETABOVE18$agegroup<- cut(MERGEDSUBSETABOVE18$AGE,

breaks= c(17,24,51,65,Inf),

labels=c('18-24', '25-50', '51-65', 'above65'),

right= TRUE, include.lowest=TRUE)

**#Categorising year of admission**

**#Add year column**

MERGEDSUBSETABOVE18<- MERGEDSUBSETABOVE18 %>% mutate(year= year(as.Date(ADMISSION\_DATE)))

**#Categorise year**

MERGEDSUBSETABOVE18<- MERGEDSUBSETABOVE18%>% mutate(yearcategorised=case\_when(year>=2012& year<=2014~ "2012-2014",

year>=2015& year<=2017~ "2015-2017",

year>=2018& year<=2020~ "2018-2020",

year>=2021& year<=2022~ "2021-2022",

TRUE~ "OTHER"))

**#Recoding cause of admission into three categories**

MERGEDSUBSETABOVE18$CAUSEOFINJURY<- recode(MERGEDSUBSETABOVE18$CAUSEOFINJURY\_DESCRIPTION, "Medical Condition"= 1,

"Injury (Other Mechanism)"= 2,

"Unspecified"= 4, .default = 3)

**#Recoding ethnicity into three categories**

MERGEDSUBSETABOVE18$ETHNICITY<- recode(MERGEDSUBSETABOVE18$ETHNICITY\_DESCRIPTION, "White Scottish"= 1, "Not Known"= 3, .default = 2)

summary(MERGEDSUBSETABOVE18$ETHNICITY)

**#Calculating mortality within 30 days of A and E visit**

**#Creating a subset after removing duplicates in id column**

mortality<-MERGEDSUBSETABOVE18%>% distinct(oGRE\_ID, .keep\_all = TRUE)

**#Creating a subset of population from A and E for whom admission is only after 2018 since the death dates are only from then**

mortality<- mortality %>% mutate(year= year(as.Date(ADMISSION\_DATE)))

mortality<- mortality %>%filter(year>=2018)

**#Creating a new column in the dataset by substracting admission date and date of death**

mortality$mortalitydays<- as.numeric(mortality$DATE\_OF\_DEATH- mortality$ADMISSION\_DATE)

mortality$mortalityin30days<- ifelse(mortality$mortalitydays<=30,1,0)

mortality$mortalityin30days[is.na(mortality$mortalityin30days)]<-0

sum(mortality$mortalityin30days==1)

**#Creating a variable for people Discharged on the same day**

MERGEDSUBSETABOVE18$dischargedays<- as.numeric(MERGEDSUBSETABOVE18$DISCHARGE\_DATE- MERGEDSUBSETABOVE18$ADMISSION\_DATE)

sum(MERGEDSUBSETABOVE18$dischargedays==0)

summary(MERGEDSUBSETABOVE18$dischargedays)

MERGEDSUBSETABOVE18$dischargedsameday<- ifelse(MERGEDSUBSETABOVE18$dischargedays<=0,1,0)

dischargebyID<-MERGEDSUBSETABOVE18%>% distinct(oGRE\_ID, .keep\_all = TRUE)

sum(dischargebyID$dischargedsameday==1)

**#Creating a variable to see repeat presentation to A and E within 30 days of previous visit**

repeatpresentationwithin30days<- MERGEDSUBSETABOVE18 %>%

arrange(oGRE\_ID, ADMISSION\_DATE) %>%

group\_by(oGRE\_ID) %>%

mutate(repeatvisitdays= as.numeric(ADMISSION\_DATE-lag(ADMISSION\_DATE)))

repeatpresentationwithin30days$ repeatvisitin30days <- ifelse(repeatpresentationwithin30days$repeatvisitdays <=30, 1, 0)

repeatpresentationwithin30days$repeatvisitin30days[is.na(repeatpresentationwithin30days$repeatvisitin30days)]<-0

**#Removing multiple enteries of patients to calculate the number of patients**

patientidnoduplicate4<-repeatpresentationwithin30days %>%

arrange(oGRE\_ID, desc(repeatvisitin30days))%>%

group\_by(oGRE\_ID) %>%

mutate(repeatvisitin30days1 = ifelse(any(repeatvisitin30days==1),

1,0)) %>% distinct(oGRE\_ID, .keep\_all = TRUE)

sum(patientidnoduplicate4$repeatvisitin30days==1)

**#To check for immediate hospital admission**

MERGEDSUBSETABOVE18<- MERGEDSUBSETABOVE18 %>% mutate(year= year(as.Date(ADMISSION\_DATE)))

MERGEDDATA8 <- merge(MERGEDSUBSETABOVE18, NEWSMR, by= "oGRE\_ID")

MERGEDDATA8$datematch<- ifelse (MERGEDDATA8$DISCHARGE\_DATE==MERGEDDATA8$ADMDATE,1,0)

HOSPADM<-MERGEDDATA8 %>% group\_by(oGRE\_ID)%>%

summarise(HOSADM= ifelse(any(datematch==1), 1, 0),)

patientidnoduplicateforhospitalisationFINAL<-dischargebyID %>% left\_join(HOSPADM, by="oGRE\_ID")

patientidnoduplicateforhospitalisationFINAL$HOSADM[is.na(patientidnoduplicateforhospitalisationFINAL$HOSADM)]<-0

sum(patientidnoduplicateforhospitalisationFINAL$HOSADM==1, na.rm=TRUE)

**#Loading comorbidity dataset**

comorbDATA<-Comorbidities\_subsample\_v1\_20230728

**#Adding Comorbidity to all merged datasets**

df<- comorbtrial%>% rowwise() %>% mutate (comcount= sum(!is.na(c\_across(-oGRE\_ID))))%>% ungroup()

df<- df%>% mutate( comgroup= case\_when(comcount==0~ 0,

comcount==1~1,

comcount==2~2,

comcount>=3~3))

newcomorb2 <- df%>% select(oGRE\_ID, comgroup)

comorbfinaldis<- dischargebyIDfinal %>% left\_join(newcomorb2, by="oGRE\_ID")

comorbfinalmor<-mortalityfinal%>% left\_join(newcomorb2, by="oGRE\_ID")

comorbfinalhosp<-patientidnoduplicateforhospitalisationFINAL%>% left\_join(newcomorb2, by="oGRE\_ID")

comorbfinalrepeat<-patientidnoduplicate4%>% left\_join(newcomorb2, by="oGRE\_ID")

### Descriptive Statistics

table(descriptivedata$SEX)

table(descriptivedata$ETHNICITY\_DESCRIPTION)

table(descriptivedata$Current\_UC)

table(dischargebyID$agegroup)

table(descriptivedata$SIMD\_2016\_QUINTILE)

table(dischargebyID$CAUSEOFINJURY\_DESCRIPTION)

table(TRAKAANDE$HOSPITAL\_DESCRIPTION)

table(dischargebyIDfinal$yearcategorised)

table(dischargebyIDfinal$CAUSEOFINJURY)

table(comorbfinalhosp$comgroup)

table(comorbfinalhosp$ETHNICITY)

**#Mortalitywithin 30 days**

**#SIMD**

crosstabmortality<- crosstab(mortalityfinal$mortalityin30days, mortalityfinal$SIMD\_2016\_QUINTILE,chisq = FALSE)

print(crosstabmortality)

**#Age**

crosstabage<- crosstab(mortalityfinal$mortalityin30days, mortalityfinal$agegroup)

print(crosstabage)

**#Sex**

crosstabsex<- crosstab(mortalityfinal$mortalityin30days, mortalityfinal$SEX)

print(crosstabsex)

**#Ethnicity**

crosstabmortality<- crosstab(mortalityfinal$mortalityin30days, mortalityfinal$ETHNICITY)

print(crosstabmortality)

**#Cause**

crosstabmortality<- crosstab(mortalityfinal$mortalityin30days, mortalityfinal$CAUSEOFINJURY)

print(crosstabmortality)

**#Year categorised**

crosstabmortality<- crosstab(mortalityfinal$mortalityin30days, mortalityfinal$yearcategorised)

print(crosstabmortality)

**#Comorbidity**

crosstabmortality<- crosstab(comorbfinalmor$mortalityin30days, comorbfinalmor$comgroup)

print(crosstabmortality)

#Discharged on same day of A and E visit

**# SIMD**

crosstabdischarge<- crosstab(dischargebyIDfinal$dischargedsameday, dischargebyIDfinal$SIMD\_2016\_QUINTILE)

print(crosstabdischarge)

**#Age**

crosstabdischargeage<- crosstab(dischargebyID$dischargedsameday, dischargebyID$agegroup)

print(crosstabdischargeage)

**#Sex**

crosstabdischargesex<- crosstab(dischargebyID$dischargedsameday, dischargebyID$SEX)

print(crosstabdischargesex)

**#year**

crosstabyear<- crosstab(dischargebyIDfinal$dischargedsameday, dischargebyIDfinal$yearcategorised)

print(crosstabyear)

**# Ethnicity**

crosstabdischarge<- crosstab(dischargebyID$dischargedsameday, dischargebyID$ETHNICITY)

print(crosstabdischarge)

**# Cause**

crosstabdischargecause<- table(dischargebyID$dischargedsameday, dischargebyID$CAUSEOFINJURY)

print(crosstabdischargecause)

**#Comorbidity**

crosstabdischarge<- crosstab(comorbfinaldis$dischargedsameday, comorbfinaldis$comgroup)

print(crosstabdischarge)

**#Immediate hospital admission**

**#SIMD**

crosstabadmsimd<- crosstab(patientidnoduplicateforhospitalisationFINAL$HOSADM, patientidnoduplicateforhospitalisationFINAL$SIMD\_2016\_QUINTILE)

print(crosstabadmsimd)

**#Age**

crosstabadmage<- crosstab(patientidnoduplicateforhospitalisation4$datematch, patientidnoduplicateforhospitalisation4$agegroup)

print(crosstabadmage)

**#Comorbidity**

crosstabadmcom<- crosstab(comorbfinalhosp$HOSADM, comorbfinalhosp$comgroup)

print(crosstabadmcom)

**#Sex**

crosstabadmsex<- crosstab(patientidnoduplicateforhospitalisationFINAL$HOSADM, patientidnoduplicateforhospitalisationFINAL$SEX)print(crosstabadmsex)

**#Ethinicity**

crosstabadmETHN<- crosstab(patientidnoduplicateforhospitalisationFINAL$HOSADM, patientidnoduplicateforhospitalisationFINAL$ETHNICITY)

print(crosstabadmETHN)

**#Year**

crosstabadmyear<- crosstab(patientidnoduplicateforhospitalisationFINAL$HOSADM, patientidnoduplicateforhospitalisationFINAL$yearcategorised)print(crosstabadmyear)

**#Cause**

crosstabadmcause<- crosstab(patientidnoduplicateforhospitalisation4$datematch, patientidnoduplicateforhospitalisation4$CAUSEOFINJURY)

print(crosstabadmcause)

**#Repeat presentation to A&E**

**#SIMD**

crosstabRPSIMD<- crosstab(patientidnoduplicate4$repeatvisitin30days, patientidnoduplicate4$SIMD\_2016\_QUINTILE)print(crosstabRPSIMD)

**#Age**

crosstabRPage<- crosstab(patientidnoduplicate4$repeatvisitin30days, patientidnoduplicate4$agegroup)print(crosstabRPage)

**#Sex**

crosstabRPsex<- crosstab(patientidnoduplicate4$repeatvisitin30days, patientidnoduplicate4$SEX)print(crosstabRPsex)

**#Ethnicity**

crosstabRPethn<- crosstab(patientidnoduplicate4$repeatvisitin30days, patientidnoduplicate4$ETHNICITY)print(crosstabRPethn)

**#Year**

crosstabRPyear<- crosstab(patientidnoduplicate4$repeatvisitin30days, patientidnoduplicate4$yearcategorised)

print(crosstabRPyear)

**#Cause**

summary(patientidnoduplicate4$CAUSEOFINJURY)crosstabRPcause<- crosstab(patientidnoduplicate4$repeatvisitin30days, patientidnoduplicate4$CAUSEOFINJURY)print(crosstabRPcause)

**#Comorbidity**

crosstabRPcause<- crosstab(comorbfinalrepeat$repeatvisitin30days, comorbfinalrepeat$comgroup)print(crosstabRPcause)

### Regression Models

**#Mortality model building**

**#SIMD**

mortalityfinal$SIMD\_2016\_QUINTILE <-factor(mortalityfinal$SIMD\_2016\_QUINTILE)

MortalitymodelSIMD <- glm(mortalityin30days ~ SIMD\_2016\_QUINTILE , data=mortalityfinal, family="binomial")

summary(MortalitymodelSIMD)

confint.default(MortalitymodelSIMD)

exp(cbind(OR=coef(MortalitymodelSIMD), confint.default(MortalitymodelSIMD)))

**#Age**

Mortalitymodelage <- glm(mortalityin30days ~ AGE , data=mortalityfinal, family="binomial")

summary(Mortalitymodelage)

confint.default(Mortalitymodelage)

exp(cbind(OR=coef(Mortalitymodelage), confint.default(Mortalitymodelage)))

**#Sex**

Mortalitymodelsex <- glm(mortalityin30days ~ SEX, data=mortalityfinal, family="binomial")

summary(Mortalitymodelsex)

confint.default(Mortalitymodelsex)

exp(cbind(OR=coef(Mortalitymodelsex), confint.default(Mortalitymodelsex)))

**#Ethnicity**

mortalityfinal$ETHNICITY <-factor(mortalityfinal$ETHNICITY)

Mortalitymodelethn <- glm(mortalityin30days ~ ETHNICITY , data=mortalityfinal, family="binomial")

summary(Mortalitymodelethn)

confint.default(Mortalitymodelethn)

exp(cbind(OR=coef(Mortalitymodelethn), confint.default(Mortalitymodelethn)))

**# Cause**

mortalityfinal$CAUSEOFINJURY <-factor(mortalityfinal$CAUSEOFINJURY)

Mortalitymodelcause <- glm(mortalityin30days ~ CAUSEOFINJURY , data=mortalityfinal, family="binomial")

summary(Mortalitymodelcause)

confint.default(Mortalitymodelcause)

exp(cbind(OR=coef(Mortalitymodelcause), confint.default(Mortalitymodelcause)))

**#Year**

mortalityfinal$yearcategorised <-factor(mortalityfinal$yearcategorised)

Mortalitymodelyear <- glm(mortalityin30days ~ yearcategorised , data=mortalityfinal, family="binomial")

summary(Mortalitymodelyear)

confint.default(Mortalitymodelyear)

exp(cbind(OR=coef(Mortalitymodelyear), confint.default(Mortalitymodelyear)))

**#Comorb**

comorbfinalmor$comgroup <-factor(comorbfinalmor$comgroup)

Mortalitymodelcomorb <- glm(mortalityin30days ~ comgroup , data=comorbfinalmor, family="binomial")

summary(Mortalitymodelcomorb)

confint.default(Mortalitymodelcomorb)

exp(cbind(OR=coef(Mortalitymodelcomorb), confint.default(Mortalitymodelcomorb)))

**#Adjusted model**

mortalityfinal$SIMD\_2016\_QUINTILE <-factor(mortalityfinal$SIMD\_2016\_QUINTILE)

mortalityfinal$ETHNICITY<-factor(mortalityfinal$ETHNICITY)

mortalityfinal$yearcategorised <-factor(mortalityfinal$yearcategorised)

mortalityfinal$CAUSEOFINJURY <-factor(mortalityfinal$CAUSEOFINJURY)

mortalityfinal$comorbidity <-factor(mortalityfinal$comorbidity)

MortalitymodelADJ <- glm(mortalityin30days ~ SIMD\_2016\_QUINTILE+ SEX+ yearcategorised+ AGE+ CAUSEOFINJURY+ ETHNICITY+ comgroup, data=comorbfinalmor, family="binomial")

summary(MortalitymodelADJ)

confint.default(MortalitymodelADJ)

exp(cbind(OR=coef(MortalitymodelADJ), confint.default(MortalitymodelADJ)))

**#Fit check**

Predict1<- MortalitymodelADJ, newdata= comorbfinalmor, type=”response”)

Roc1<- roc(comorbfinalmor$mortalityin30days, Predict1 , ci= TRUE)

print(Roc1)

plot(Roc1)

**#Discharge model**

**#SIMD**

dischargemodelSIMD <- glm(dischargedsameday ~ SIMD\_2016\_QUINTILE , data=dischargebyID, family="binomial")

summary(dischargemodelSIMD)

confint.default(dischargemodelSIMD)

exp(cbind(OR=coef(dischargemodelSIMD), confint.default(dischargemodelSIMD)))

**#Age**

dischargemodelAGE <- glm(dischargedsameday ~ AGE , data=dischargebyID, family="binomial")

summary(dischargemodelAGE)

confint.default(dischargemodelAGE)

exp(cbind(OR=coef(dischargemodelAGE), confint.default(dischargemodelAGE)))

**#Sex**

dischargemodelsex <- glm(dischargedsameday ~ SEX , data=dischargebyID, family="binomial")

summary(dischargemodelsex)

confint.default(dischargemodelsex)

exp(cbind(OR=coef(dischargemodelsex), confint.default(dischargemodelsex)))

**#Cause**

dischargemodelcause <- glm(dischargedsameday ~ CAUSEOFINJURY , data=dischargebyID, family="binomial")

summary(dischargemodelcause)

confint.default(dischargemodelcause)

exp(cbind(OR=coef(dischargemodelcause), confint.default(dischargemodelcause)))

**#Ethnicity**

dischargemodelethn <- glm(dischargedsameday ~ ETHNICITY , data=dischargebyID, family="binomial")

summary(dischargemodelethn)

confint.default(dischargemodelethn)

exp(cbind(OR=coef(dischargemodelethn), confint.default(dischargemodelethn)))

**#Year**

dischargemodelyear <- glm(dischargedsameday ~ yearcategorised , data=dischargebyID, family="binomial")

summary(dischargemodelyear)

confint.default(dischargemodelyear)

exp(cbind(OR=coef(dischargemodelyear), confint.default(dischargemodelyear)))

**#Comorbidity**

comorbfinaldis$comgroup <-factor(comorbfinaldis$comgroup)

dischargemodelcom <- glm(dischargedsameday ~ comgroup , data=comorbfinaldis, family="binomial")

summary(dischargemodelcom)

confint.default(dischargemodelcom)

exp(cbind(OR=coef(dischargemodelcom), confint.default(dischargemodelcom)))

**#Adjusted Model**

comorbfinaldis$SIMD\_2016\_QUINTILE <-factor(comorbfinaldis$SIMD\_2016\_QUINTILE)

comorbfinaldis$ETHNICITY<-factor(comorbfinaldis$ETHNICITY)

comorbfinaldis$yearcategorised <-factor(comorbfinaldis$yearcategorised)

comorbfinaldis$CAUSEOFINJURY <-factor(comorbfinaldis$CAUSEOFINJURY)

dischargemodel <- glm(dischargedsameday ~ SIMD\_2016\_QUINTILE + AGE+ SEX + yearcategorised+ ETHNICITY+ CAUSEOFINJURY+ comgroup, data=comorbfinaldis, family="binomial")

summary(dischargemodel)

confint.default(dischargemodel)

exp(cbind(OR=coef(dischargemodel), confint.default(dischargemodel)))

**#Fit check**

Predict2<- dischargemodel, newdata= comorbfinaldis, type=”response”)

Roc2<- roc(comorbfinaldis $ dischargedsameday, Predict2 , ci= TRUE)

print(Roc2)

plot(Roc2)

**#Repeat Presentation Model**

**#SIMD**

repeatpresentationmodelsimd <- glm(repeatvisitin30days ~ SIMD\_2016\_QUINTILE , data=patientidnoduplicate4, family="binomial")

summary(repeatpresentationmodelsimd)

confint.default(repeatpresentationmodelsimd)

exp(cbind(OR=coef(repeatpresentationmodelsimd), confint.default(repeatpresentationmodelsimd)))

**#Sex**

repeatpresentationmodelsex <- glm(repeatvisitin30days ~ SEX , data=patientidnoduplicate4, family="binomial")

summary(repeatpresentationmodelsex)

confint.default(repeatpresentationmodelsex)

exp(cbind(OR=coef(repeatpresentationmodelsex), confint.default(repeatpresentationmodelsex)))

**#Age**

repeatpresentationmodelage <- glm(repeatvisitin30days ~ AGE , data=patientidnoduplicate4, family="binomial")

summary(repeatpresentationmodelage)

confint.default(repeatpresentationmodelage)

exp(cbind(OR=coef(repeatpresentationmodelage), confint.default(repeatpresentationmodelage)))

**#Ethnicity**

patientidnoduplicate4$ETHNICITY<-factor(patientidnoduplicate4$ETHNICITY)

repeatpresentationmodelethn <- glm(repeatvisitin30days ~ ETHNICITY , data=patientidnoduplicate4, family="binomial")

summary(repeatpresentationmodelethn)

confint.default(repeatpresentationmodelethn)

exp(cbind(OR=coef(repeatpresentationmodelethn), confint.default(repeatpresentationmodelethn)))

**#Year**

patientidnoduplicate4$yearcategorised<-factor(patientidnoduplicate4$yearcategorised)

repeatpresentationmodelyear <- glm(repeatvisitin30days ~ yearcategorised , data=patientidnoduplicate4, family="binomial")

summary(repeatpresentationmodelyear)

confint.default(repeatpresentationmodelyear)

exp(cbind(OR=coef(repeatpresentationmodelyear), confint.default(repeatpresentationmodelyear)))

**#Cause**

patientidnoduplicate4$CAUSEOFINJURY<-factor(patientidnoduplicate4$CAUSEOFINJURY)

repeatpresentationmodelcause <- glm(repeatvisitin30days ~ CAUSEOFINJURY , data=patientidnoduplicate4, family="binomial")

summary(repeatpresentationmodelcause)

confint.default(repeatpresentationmodelcause)

exp(cbind(OR=coef(repeatpresentationmodelcause), confint.default(repeatpresentationmodelcause)))

**#Comorbidity**

repeatpresentationmodelcom <- glm(repeatvisitin30days ~ comgroup , data=comorbfinalrepeat, family="binomial")

summary(repeatpresentationmodelcom)

confint.default(repeatpresentationmodelcom)

exp(cbind(OR=coef(repeatpresentationmodelcom), confint.default(repeatpresentationmodelcom)))

**#Adjusted Model**

patientidnoduplicate4$SIMD\_2016\_QUINTILE <-factor(patientidnoduplicate4$SIMD\_2016\_QUINTILE)

patientidnoduplicate4$ETHNICITY<-factor(patientidnoduplicate4$ETHNICITY)

patientidnoduplicate4$yearcategorised <-factor(patientidnoduplicate4$yearcategorised)

patientidnoduplicate4$CAUSEOFINJURY <-factor(patientidnoduplicate4$CAUSEOFINJURY)

comorbfinalrepeat$comgroup <-factor(comorbfinalrepeat$comgroup)

repeatpresentationmodel <- glm(repeatvisitin30days ~ SIMD\_2016\_QUINTILE + AGE+ SEX+ yearcategorised+ CAUSEOFINJURY+ ETHNICITY+ comgroup, data=comorbfinalrepeat, family="binomial")

summary(repeatpresentationmodel)

confint.default(repeatpresentationmodel)

exp(cbind(OR=coef(repeatpresentationmodel), confint.default(repeatpresentationmodel)))

**#Fit check**

Predict3<- repeatpresentationmodel, newdata= comorbfinalrepeat, type=”response”)

Roc3<- roc(comorbfinalrepeat$repeatvisitin30days, Predict3 , ci= TRUE)

print(Roc3)

plot(Roc3)

**#Immediate hospital admission model**

**#Age**

immediatehospitalisationmodelage<- glm( HOSADM ~ AGE , data=patientidnoduplicateforhospitalisationFINAL, family="binomial")

summary(immediatehospitalisationmodelage)

confint.default(immediatehospitalisationmodelage)

exp(cbind(OR=coef(immediatehospitalisationmodelage), confint.default(immediatehospitalisationmodelage)))

**#Sex**

immediatehospitalisationmodelsex<- glm(HOSADM ~ SEX , data=patientidnoduplicateforhospitalisationFINAL, family="binomial")

summary(immediatehospitalisationmodelsex)

confint.default(immediatehospitalisationmodelsex)

exp(cbind(OR=coef(immediatehospitalisationmodelsex), confint.default(immediatehospitalisationmodelsex)))

**#SIMD**

immediatehospitalisationmodelsimd<- glm( HOSADM ~ SIMD\_2016\_QUINTILE , data=patientidnoduplicateforhospitalisationFINAL, family="binomial")

summary(immediatehospitalisationmodelsimd)

confint.default(immediatehospitalisationmodelsimd)

exp(cbind(OR=coef(immediatehospitalisationmodelsimd), confint.default(immediatehospitalisationmodelsimd)))

**#Ethnicity**

immediatehospitalisationmodelethn<- glm( HOSADM ~ ETHNICITY , data=patientidnoduplicateforhospitalisationFINAL, family="binomial")

summary(immediatehospitalisationmodelethn)

confint.default(immediatehospitalisationmodelethn)

exp(cbind(OR=coef(immediatehospitalisationmodelethn), confint.default(immediatehospitalisationmodelethn)))

**#Cause**

immediatehospitalisationmodelcause<- glm( HOSADM~ CAUSEOFINJURY , data=patientidnoduplicateforhospitalisationFINAL, family="binomial")

summary(immediatehospitalisationmodelcause)

confint.default(immediatehospitalisationmodelcause)

exp(cbind(OR=coef(immediatehospitalisationmodelcause), confint.default(immediatehospitalisationmodelcause)))

**#Year**

immediatehospitalisationmodelyear<- glm( HOSADM ~ yearcategorised , data=patientidnoduplicateforhospitalisationFINAL, family="binomial")

summary(immediatehospitalisationmodelyear)

confint.default(immediatehospitalisationmodelyear)

exp(cbind(OR=coef(immediatehospitalisationmodelyear), confint.default(immediatehospitalisationmodelyear)))

**#Comorbidity**

immediatehospitalisationmodelcom<- glm( HOSADM ~ comgroup , data=comorbfinalhosp, family="binomial")

summary(immediatehospitalisationmodelcom)

confint.default(immediatehospitalisationmodelcom)

exp(cbind(OR=coef(immediatehospitalisationmodelcom), confint.default(immediatehospitalisationmodelcom)))

**#Adjusted model**

patientidnoduplicateforhospitalisationFINAL$SIMD\_2016\_QUINTILE <-factor(patientidnoduplicateforhospitalisationFINAL$SIMD\_2016\_QUINTILE)

patientidnoduplicateforhospitalisationFINAL$ETHNICITY <-factor(patientidnoduplicateforhospitalisationFINAL$ETHNICITY)

patientidnoduplicateforhospitalisationFINAL$yearcategorised <-factor(patientidnoduplicateforhospitalisationFINAL$yearcategorised)

patientidnoduplicateforhospitalisationFINAL$CAUSEOFINJURY <-factor(patientidnoduplicateforhospitalisationFINAL$CAUSEOFINJURY)

comorbfinalhosp$comgroup <-factor(comorbfinalhosp$comgroup)

immediatehospitalisationmodel<- glm( HOSADM ~ SIMD\_2016\_QUINTILE + AGE + SEX + yearcategorised+ ETHNICITY+ CAUSEOFINJURY+ comgroup, data=comorbfinalhosp, family="binomial")

summary(immediatehospitalisationmodel)

confint.default(immediatehospitalisationmodel)

exp(cbind(OR=coef(immediatehospitalisationmodel), confint.default(immediatehospitalisationmodel)))

**#Fit check**

Predict4<- immediatehospitalisationmodel, newdata= comorbfinalhosp, type=”response”)

Roc4<- roc(comorbfinalhosp$HOSADM, Predict4 , ci= TRUE)

print(Roc4)

plot(Roc4)