

# EDA\_Visualizations

June 22, 2020

```
[1]: # set data directory
data_dir = "../data"

# import python libraries
import os
import pandas as pd
import numpy as np
from functools import reduce
```

```
[4]: %matplotlib inline
import matplotlib.pyplot as plt
plt.style.use('ggplot')
```

```
[2]: # set up pyspark
from pyspark.sql import *
from pyspark.sql import SparkSession
from pyspark.sql.functions import *

spark = SparkSession.builder.getOrCreate()
```

```
[3]: %%time
NHAMCS = spark.read.parquet(data_dir + "/NHAMCS.2007-2017")
```

CPU times: user 2.54 ms, sys: 740 µs, total: 3.28 ms

Wall time: 5.25 s

```
[6]: NHAMCS.take(2)
```

```
[6]: [Row(VMONTH='July', VYEAR=2009, VDAYR='Saturday', AGE='36', ARRTIME=2125,
WAITTIME='5', LOV='296', RESIDNCE='Private residence', SEX='Female', ETHUN='Not
Hispanic or Latino', RACEUN='Black/African American Only', ARRIVE=None,
PAYPRIV='No', PAYMCARE='No', PAYMCAID='No', PAYWKCMP='No', PAYSELF='No',
PAYNOCHG='No', PAYOTH='Yes', PAYDK='No', PAYTYPE=None, TEMPF='97.9', PULSE='84',
RESPR='18', BPSYS='132', BPDIAS='93', POPCT='99', ORIENTED=None, IMMED=None,
PAIN=None, SEEN72='No', DISCH7DA='No', PASTVIS='Unknown', RFV1='Side pain, flank
pain', RFV2='Blank', RFV3='Blank', RFV13D='Pain, site not referable to a
specifi...', RFV23D='Blank', RFV33D='Blank', EPISODE='Initial visit',
INJURY='No', INTENT='Not applicable/Not an injury visit', CAUSE1='-9',
```

CAUSE2='-9', CAUSE3='-9', CAUSE13D=-9, CAUSE23D=-9, CAUSE33D=-9, VCAUSE='-9',  
 DIAG1='78652', DIAG2='-9', DIAG3='-9', DIAG13D='786', DIAG23D='-9',  
 DIAG33D='-9', PRDIAG1='No', PRDIAG2='Not applicable', PRDIAG3='Not applicable',  
 DIAGSCRN='Yes', CBC='Yes', BUNCREAT='No', CARDENZ='No', ELECTROL='No',  
 GLUCOSE='No', LFT='No', ABG='No', PTTINR='No', BLOODCX='No', BAC='No',  
 TOXSCREEN='No', OTHERBLD='Yes', CARDMON='No', EKG='No', PREGTEST='No',  
 FLUTEST='No', URINE='No', WOUNDCX='No', OTHRTEST='No', ANYIMAGE='Yes',  
 XRAY='Yes', CATSCAN='No', CTHEAD='No', CTNHEAD='No', CTUNK='No', MRI='No',  
 MRIHEAD=None, MRINHEAD=None, MRIUNK=None, ULTRASND='No', OTHIMAGE='No',  
 TOTDIAG='3', PROC='Yes', IVFLUIDS='Yes', CAST='No', SPLINT='No', LACREP=None,  
 INCDRAIN='No', DEBRIDE=None, FBREM='No', NEBUTHER='No', BLADCATH='No',  
 NGTUBE=None, CPR='No', ENDOINT='No', OTHPROC='No', TOTPROC='1', MED='Yes',  
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 MADE', MED5='NO ENTRY MADE', MED6='NO ENTRY MADE', MED7='NO ENTRY MADE',  
 MED8='NO ENTRY MADE', GPMED1='Given in ED', GPMED2='Given in ED', GPMED3='Not  
 applicable, no medication listed', GPMED4='Not applicable, no medication  
 listed', GPMED5='Not applicable, no medication listed', GPMED6='Not applicable,  
 no medication listed', GPMED7='Not applicable, no medication listed',  
 GPMED8='Not applicable, no medication listed', NUMGIV='2', NUMDIS=None  
 listed/listed drug given at ED only or unknown', NUMMED=2, NOPROVID='No',  
 ATTPHYS='Yes', RESINT='No', ONCALL=None, RNLPN='Yes', NURSEPR='No',  
 PHYSASST='No', EMT='No', OTHPROV='Yes', NODISP='One or more answers to the  
 disposition item', NOFU='No', RETPRN='No', RETREFFU='No', REFSOCS=None,  
 LEFTBMSE='No', LEFTAMSE='No', LEFTAMA='No', DOA='No', DIEDED='No',  
 TRANSFER=None, RFTRANS=None, ADMITOBS=None, ADMITHOS='Yes', OTHDISP='No',  
 ADMIT='Unknown (data not available)', LOS='1', HDDIAG='33829', HDSTAT='Alive',  
 ADISP='Home/Residence', PATWT='10162', REGION='Midwest', MSA='MSA (Metropolitan  
 Statistical Area)', OWNER='Voluntary non-profit', BLANK1='NA', BLANK2='NA',  
 BLANK3='NA', HOSPCODE='1', PATCODE=118, BDATEFL='Not imputed', SEXFL='Not  
 imputed', ETHNICFL='Not imputed', RACEFL=None, IMMEDFL=None, DRUGID1='d00255',  
 PRESCR1='Prescription drug', CONTSUB1='Schedule II', COMSTAT1='Single entity  
 drug', RX1CAT1='60', RX1CAT2=None, RX1CAT3=None, RX1CAT4=None, RX1V1C1=57,  
 RX1V1C2=None, RX1V1C3=None, RX1V1C4=None, RX1V2C1=58, RX1V2C2=None,  
 RX1V2C3=None, RX1V2C4=None, RX1V3C1=60, RX1V3C2=None, RX1V3C3=None,  
 RX1V3C4=None, DRUGID2='d00438', PRESCR2='Prescription or Nonprescription drug',  
 CONTSUB2='No control', COMSTAT2='Single entity drug', RX2CAT1='117',  
 RX2CAT2=129, RX2CAT3=None, RX2CAT4=None, RX2V1C1=115, RX2V1C2=122, RX2V1C3=None,  
 RX2V1C4=None, RX2V2C1=117, RX2V2C2=129, RX2V2C3=None, RX2V2C4=None,  
 RX2V3C1=None, RX2V3C2=None, RX2V3C3=None, RX2V3C4=None, DRUGID3=None,  
 PRESCR3='NA', CONTSUB3='NA', COMSTAT3='NA', RX3CAT1=None, RX3CAT2=None,  
 RX3CAT3=None, RX3CAT4=None, RX3V1C1=None, RX3V1C2=None, RX3V1C3=None,  
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 PRESCR4='NA', CONTSUB4='NA', COMSTAT4='NA', RX4CAT1=None, RX4CAT2=None,  
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PRESCR5='NA', CONTSUB5='NA', COMSTAT5='NA', RX5CAT1=None, RX5CAT2=None,  
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 RX5V3C1=None, RX5V3C2=None, RX5V3C3=None, RX5V3C4=None, DRUGID6=None,  
 PRESCR6='NA', CONTSUB6='NA', COMSTAT6='NA', RX6CAT1=None, RX6CAT2=None,  
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 PRESCR7='NA', CONTSUB7='NA', COMSTAT7='NA', RX7CAT1=None, RX7CAT2=None,  
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 PRESCR8='NA', CONTSUB8='NA', COMSTAT8='NA', RX8CAT1=None, RX8CAT2=None,  
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 applicable', EREMINDE='No', EPUBHTHE='No', ENOTDISE='Not applicable',  
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 BEDCZAR='Yes', BEDDATA='Instantaneously', OBSUNIT='No', OBSED=None, BOARD='Yes',  
 BOARDHOS='No', DIV='Diversion data not available', TOTHRDIVR='Diversion data not  
 available', REGDIV='No', ADMDIV='Yes', BEDREG='Yes', CATRIAGE='No',  
 FASTTRAK='Yes', EDPTOR='No', DASHBORD='No', RFID='No', ZONENURS='No',  
 POOLNURS='No', FULLCAP='No', NOOPTEFF='No', ETHIM='Not Hispanic or Latino',  
 RACEIM=None, RACER='Black', RACEETH=None, AGEDAYS='One year or more',  
 AGER='25-44 years', CAUSE1R='-9', CAUSE2R='-9', CAUSE3R='-9', INTENTR='Not  
 applicable', DIAG1R='178652', DIAG2R='-9', DIAG3R='-9', HDDIAGR=133829,  
 WHOCOMP='Census Field Rep - Abstract after rep period', SETTYPE='NHAMCS - ED',  
 YEAR='2009', CSTRATM=20209201, CPSUM=100001, EDWT='6', PCTPOVR='Quartile 1 (Less  
 than 5.00 percent)', HINCOMER='Quartile 4 (\$52,388 or more)', PBAMORER='Quartile  
 4 (31.69 percent or more)', URBANRUR='Large fringe metro', ID=0, HDDIAGR3=None,  
 RX11V3C1=None, ALGLISTUNKE=None, PRESCR10=None, CONTSUB11=None, RX10CAT3=None,  
 RX10CAT4=None, RX12CAT3=None, RX11V2C3=None, ESETSER=None, RX11V3C2=None,  
 EDDIAL='No', EWHOOTHPE=None, RX10V2C1=None, TRANOTH='No', HIVTEST='No',  
 OSHOSP=None, ESHAREWEBE=None, STAY24=None, INJDETR1=None, ARREMS='No',  
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 COMSTAT12=None, DRUGID11=None, RX12V3C1=None, INJDETR2=None, EWHOOTHLE=None,  
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 RX10V1C1=None, ECQMER=None, GPMD9=None, RX9CAT4=None, ALGLISTREFE=None,  
 MHPROV='No', MEDLISTE3=None, CTAB=None, OBSSTAY='Not Applicable',  
 EHLTHINFOE=None, RX9V3C2=None, HDDIAGR1=None, RX12V1C1=None, RX9CAT2=None,

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Hispanic or Latino', RACEIM=None, RACER='White', RACEETH=None, AGEDAYS='One year or more', AGER='25-44 years', CAUSE1R='8121', CAUSE2R='8495', CAUSE3R='-9', INTENTR='Unintentional', DIAG1R='-9', DIAG2R='-9', DIAG3R='-9', HDDIAGR=-7, WHOCOMP='Census Field Rep - Abstract after rep period', SETTYPE='NHAMCS - ED', YEAR='2009', CSTRATM=20209201, CPSUM=100001, EDWT='0', PCTPOVR='Quartile 2 (5.00-9.99 percent)', HINCOMER='Quartile 3 (\$40,627-\$52,387)', PBAMORER='Quartile 2 (12.84-19.66 percent)', URBANRUR='Large fringe metro', ID=1, HDDIAG3R=None, RX11V3C1=None, ALGLISTUNKE=None, PRESCR10=None, CONTSUB11=None, RX10CAT3=None, RX10CAT4=None, RX12CAT3=None, RX11V2C3=None, ESETSER=None, RX11V3C2=None, EDDIAL='No', EWHOOTHEPE=None, RX10V2C1=None, TRANOTH='No', HIVTEST='No', OBSHOSP=None, ESHAREWEBE=None, STAY24=None, INJDETR1=None, ARREMS='Yes', LEFTBTBI=None, HDDIAG2R=None, WIRELESS=None, COMSTAT10=None, EMSGE=None, HDDIAG3=None, IMAGREPE4=None, PTPROBE4=None, RX11V1C3=None, LABRESE1=None, RX11CAT4=None, LABRESE2=None, AGEFL=None, SUTURE='No', INJPOISAD=None, COMSTAT12=None, DRUGID11=None, RX12V3C1=None, INJDETR2=None, EWHOOHLE=None, EWHOUNKPE=None, GPMED10=None, LABRESE3=None, ADMTPHYS='Not applicable', RX10V3C3=None, IMAGREPUNKE=None, COPD=None, COMSTAT11=None, RX9V1C3=None, ESMOKEER=None, BNP=None, ECPOEER=None, IMAGREPE2=None, FIPSSTHOSP=None, RX12V2C1=None, RX10V1C1=None, ECQMER=None, GPMED9=None, RX9CAT4=None, ALGLISTREFE=None, MHPROV='No', MEDLISTE3=None, CTAB=None, OBSSTAY='Not Applicable', EHLTHINFOE=None, RX9V3C2=None, HDDIAG1=None, RX12V1C1=None, RX9CAT2=None, RX9V1C2=None, EQOCE=None, MED9=None, ESUME=None, KIOSELCHK=None, RX11V3C4=None, EHRINSE=None, RX9V2C2=None, HLISTED=None, AMBDIV=None, INJR1=None, RX12V3C3=None, BPAP=None, IMBED=None, EORDERER=None, GPMED11=None, PTPROBREFE=None, RX12V2C3=None, CENTLINE='No', RX9V2C4=None, DIABETES='No', ECQME=None, ESHAREEHRE=None, PTPROBUNKE=None, PRESCR12=None, RX10V1C3=None, EGRAPHER=None, RX12V2C2=None, INJPOISADR2=None, CANCER=None, CONSULT='No', ADVTRIAG=None, INTENDYR=None, RX12CAT1=None, EWHOUNKLE=None, EINSHOWE=None, ESHAREUNKE=None, ESHAREREFEE=None, RX10V1C2=None, DDIMER=None, OBSPHYSED=None, INJDETR=None, EHLTHINFOER=None, RX10CAT1=None, ESMOKEE=None, EWHOREFLE=None, EGENLISTE=None, PRESCR11=None, RACERETH='Non-Hispanic White', ALGLISTE3=None, ESETSE=None, RX11V2C1=None, CEBVD='No', MEDLISTE2=None, DRUGID12=None, RX10V2C2=None, MEDLISTE4=None, ESHAREE=None, PRESCR9=None, HDDIAG23D=None, PAINSCALE='6', TRANNH=None, DEMENTIA=None, PTPROBE1=None, PTPROBE3=None, CONTSUB12=None, NOPAY=None, HDDIAG2=None, IMMEDR='Immediate', RX12CAT2=None, EMUREPE=None, HDDIAG1R=None, EREMINDER=None, ONO2='No', LABRESUNKE=None, IMAGREPE3=None, EDEMOGER=None, EGENLISTER=None, RX10V3C1=None, EMUREPER=None, NOCHRON='Yes', ESCRIPER=None, RX10V3C2=None, RX9V3C3=None, EVITALE=None, OBSPHYSSUN=None, OBSHOS='No', RX9V1C4=None, URINECX=None, MEDLISTREFE=None, EBILLANYE=None, RX11V3C3=None, RX12V1C3=None, TOTCHRON=None, EMEDALGER=None, EWHOPRACLE=None, ERESULTE=None, EINSFASTE=None, MEDLISTUNKE=None, DRUGID9=None, DVT=None, ALGLISTE4=None, RX9V2C1=None, RX11CAT3=None, EIMGRESER=None, RX12V3C4=None, LACTATE=None, TRANPSYC='No', MED11=None, MEDLISTE1=None, EGRAPHE=None, CASTSPLINT=None, OBSDIS='No', PAYTYPER='Private insurance', CTCHEST=None, LUMBAR=None, RX10V1C4=None, RX11CAT2=None, EMSGER=None, MED10=None, MIHX=None, RX12V1C2=None, RX12V2C4=None, EMEDALGE=None, EQOCER=None, EWHOPRACPE=None, LABRESREFE=None, OBSUNITS=None,

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[ ]: