Assignment-6.R

Zachary

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library(dplyr)

##   
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':  
##   
## filter, lag

## The following objects are masked from 'package:base':  
##   
## intersect, setdiff, setequal, union

library(tidyr)

## Warning: package 'tidyr' was built under R version 4.0.3

library(ggplot2)  
  
#import files to read  
mortality <- read.csv("mortality.csv")  
poverty <- read.csv("poverty.csv")  
  
#quick explorations  
  
#see the head  
head(mortality)

## country X1960 X1961 X1962 X1963 X1964 X1965 X1966 X1967 X1968  
## 1 Afghanistan 356.5 350.5 344.8 339.3 334.1 328.5 323 317.5 312.1  
## 2 Albania NA NA NA NA NA NA NA NA NA  
## 3 Algeria 241.7 242.2 242.8 243.7 245.0 246.2 247 247.1 246.3  
## 4 Andorra NA NA NA NA NA NA NA NA NA  
## 5 Angola NA NA NA NA NA NA NA NA NA  
## 6 Antigua and Barbuda NA NA NA NA NA NA NA NA NA  
## X1969 X1970 X1971 X1972 X1973 X1974 X1975 X1976 X1977 X1978 X1979 X1980 X1981  
## 1 306.6 300.9 295.3 290.0 283.9 278.2 272.2 266.2 260.2 254.1 247.7 241.3 234.6  
## 2 NA NA NA NA NA NA NA NA NA 95.0 87.2 80.1 73.6  
## 3 244.0 240.0 234.9 228.5 221.0 212.4 203.1 193.4 183.4 172.9 161.7 149.1 134.5  
## 4 NA NA NA NA NA NA NA NA NA NA NA NA NA  
## 5 NA NA NA NA NA NA NA NA NA NA NA 235.6 233.0  
## 6 NA NA NA NA NA NA NA NA NA NA NA NA NA  
## X1982 X1983 X1984 X1985 X1986 X1987 X1988 X1989 X1990 X1991 X1992 X1993 X1994  
## 1 228.1 221.4 214.7 208.0 201.3 194.6 188.0 181.4 175.1 168.9 162.9 157.4 152.4  
## 2 67.9 62.7 58.2 54.0 50.4 47.2 44.5 42.2 40.1 38.4 36.8 35.4 33.9  
## 3 118.3 102.0 86.9 74.3 64.8 58.4 54.0 51.3 49.6 48.3 47.2 46.1 44.9  
## 4 NA NA NA 11.7 11.0 10.3 9.7 9.1 8.5 8.0 7.5 7.1 6.7  
## 5 230.8 228.6 226.9 225.5 224.7 224.1 223.8 223.5 223.5 223.6 223.7 223.8 223.5  
## 6 NA NA NA 35.5 33.4 31.5 29.6 27.9 26.3 24.7 23.3 22.0 20.7  
## X1995 X1996 X1997 X1998 X1999 X2000 X2001 X2002 X2003 X2004 X2005 X2006 X2007  
## 1 147.8 143.5 139.6 135.8 132.3 128.8 125.3 121.7 117.9 114.1 110.1 106.1 102.0  
## 2 32.4 30.9 29.3 27.7 26.1 24.5 22.9 21.4 19.9 18.5 17.2 16.0 14.8  
## 3 43.7 42.5 41.6 40.8 40.2 39.7 38.9 37.8 36.5 35.0 33.5 32.1 30.7  
## 4 6.3 6.0 5.7 5.4 5.2 5.0 4.8 4.7 4.5 4.4 4.3 4.2 4.2  
## 5 222.7 221.3 218.9 215.6 211.4 206.3 200.3 193.4 185.7 177.0 167.8 158.2 148.7  
## 6 19.5 18.4 17.4 16.5 15.6 14.9 14.2 13.6 13.0 12.5 12.0 11.5 11.1  
## X2008 X2009 X2010 X2011 X2012 X2013 X2014 X2015 X2016 X2017  
## 1 97.9 93.9 90.0 86.2 82.6 79.2 76.0 73.1 70.4 67.9  
## 2 13.8 12.8 12.0 11.3 10.7 10.1 9.7 9.4 9.1 8.8  
## 3 29.4 28.3 27.4 26.7 26.1 25.7 25.3 24.9 24.5 24.0  
## 4 4.1 4.0 3.9 3.9 3.8 3.7 3.6 3.5 3.4 3.3  
## 5 139.3 130.0 121.3 113.2 105.8 99.2 93.6 88.9 84.6 81.1  
## 6 10.7 10.3 9.8 9.5 9.1 8.7 8.3 8.0 7.7 7.4

head(poverty)

## country X1996 X2002 X2005 X2008 X2012 X2000 X1986 X1987 X1991 X1992 X1993  
## 1 Albania 12.36 16.61 9.79 6.11 6.79 NA NA NA NA NA NA  
## 2 Angola NA NA NA 54.52 NA 54.25 NA NA NA NA NA  
## 3 Argentina 8.98 25.40 11.36 6.79 3.69 12.12 0 2.22 3.91 4.48 5.16  
## 4 Armenia 40.42 49.45 24.70 12.92 17.40 NA NA NA NA NA NA  
## 5 Azerbaijan NA 0.24 0.00 2.51 NA NA NA NA NA NA NA  
## 6 Bangladesh NA NA 62.96 NA NA 70.06 NA NA 82.37 NA NA  
## X1994 X1995 X1997 X1998 X1999 X2001 X2003 X2004 X2006 X2007 X2009 X2010 X2011  
## 1 NA NA NA NA NA NA NA NA NA NA NA NA NA  
## 2 NA NA NA NA NA NA NA NA NA NA NA NA NA  
## 3 5.39 8.23 8.48 9.77 10.15 17.05 19.14 14.59 8.70 7.13 6.41 4.99 3.60  
## 4 NA NA NA NA 50.02 53.09 45.48 33.93 20.04 21.92 16.35 21.65 19.03  
## 5 NA 24.78 NA NA NA 16.32 0.35 0.00 NA NA NA NA NA  
## 6 NA 73.17 NA NA NA NA NA NA NA NA NA 56.80 NA  
## X2013 X2014 X1983 X1985 X1988 X1990 X1981 X1982 X1984 X1989  
## 1 NA NA NA NA NA NA NA NA NA NA  
## 2 NA NA NA NA NA NA NA NA NA NA  
## 3 3.63 4.28 NA NA NA NA NA NA NA NA  
## 4 16.97 14.62 NA NA NA NA NA NA NA NA  
## 5 NA NA NA NA NA NA NA NA NA NA  
## 6 NA NA 81.23 76.79 81.52 NA NA NA NA NA

#get a summary  
summary(mortality)

## country X1960 X1961 X1962   
## Length:239 Min. : 19.60 Min. : 19.20 Min. : 18.60   
## Class :character 1st Qu.: 66.55 1st Qu.: 64.25 1st Qu.: 64.58   
## Mode :character Median :154.40 Median :147.40 Median :144.75   
## Mean :156.99 Mean :152.56 Mean :151.38   
## 3rd Qu.:223.65 3rd Qu.:218.43 3rd Qu.:224.45   
## Max. :393.90 Max. :388.10 Max. :382.10   
## NA's :139 NA's :139 NA's :137   
## X1963 X1964 X1965 X1966   
## Min. : 17.90 Min. : 17.10 Min. : 16.30 Min. : 15.50   
## 1st Qu.: 60.35 1st Qu.: 58.62 1st Qu.: 58.83 1st Qu.: 58.12   
## Median :138.70 Median :137.30 Median :129.65 Median :126.95   
## Mean :146.80 Mean :147.37 Mean :145.52 Mean :144.40   
## 3rd Qu.:214.55 3rd Qu.:223.25 3rd Qu.:218.72 3rd Qu.:215.20   
## Max. :441.90 Max. :434.20 Max. :426.50 Max. :419.40   
## NA's :131 NA's :125 NA's :121 NA's :119   
## X1967 X1968 X1969 X1970   
## Min. : 14.9 Min. : 14.40 Min. : 13.90 Min. : 13.40   
## 1st Qu.: 59.3 1st Qu.: 55.77 1st Qu.: 55.35 1st Qu.: 53.75   
## Median :120.5 Median :116.10 Median :111.30 Median :103.30   
## Mean :140.9 Mean :136.29 Mean :133.88 Mean :129.82   
## 3rd Qu.:211.3 3rd Qu.:201.90 3rd Qu.:199.85 3rd Qu.:197.45   
## Max. :413.4 Max. :408.10 Max. :403.50 Max. :399.30   
## NA's :115 NA's :111 NA's :104 NA's :100   
## X1971 X1972 X1973 X1974   
## Min. : 12.90 Min. : 12.30 Min. : 11.60 Min. : 11.0   
## 1st Qu.: 51.05 1st Qu.: 50.00 1st Qu.: 47.52 1st Qu.: 44.9   
## Median : 97.20 Median : 95.95 Median : 91.60 Median : 89.7   
## Mean :125.63 Mean :123.80 Mean :120.54 Mean :117.4   
## 3rd Qu.:189.80 3rd Qu.:189.20 3rd Qu.:190.28 3rd Qu.:187.6   
## Max. :395.00 Max. :389.90 Max. :384.00 Max. :376.7   
## NA's :96 NA's :93 NA's :93 NA's :90   
## X1975 X1976 X1977 X1978   
## Min. : 10.30 Min. : 9.80 Min. : 9.4 Min. : 9.0   
## 1st Qu.: 44.05 1st Qu.: 40.52 1st Qu.: 38.2 1st Qu.: 36.6   
## Median : 88.35 Median : 86.35 Median : 83.6 Median : 81.1   
## Mean :114.68 Mean :111.37 Mean :108.0 Mean :105.7   
## 3rd Qu.:183.43 3rd Qu.:175.60 3rd Qu.:171.4 3rd Qu.:171.4   
## Max. :368.40 Max. :359.50 Max. :350.3 Max. :341.2   
## NA's :85 NA's :83 NA's :82 NA's :78   
## X1979 X1980 X1981 X1982   
## Min. : 8.7 Min. : 8.40 Min. : 8.20 Min. : 7.90   
## 1st Qu.: 33.1 1st Qu.: 30.20 1st Qu.: 27.25 1st Qu.: 25.40   
## Median : 77.9 Median : 74.10 Median : 68.65 Median : 65.90   
## Mean :102.5 Mean : 99.07 Mean : 93.70 Mean : 91.07   
## 3rd Qu.:166.7 3rd Qu.:162.12 3rd Qu.:154.35 3rd Qu.:146.20   
## Max. :332.7 Max. :324.70 Max. :317.50 Max. :319.20   
## NA's :74 NA's :71 NA's :65 NA's :62   
## X1983 X1984 X1985 X1986   
## Min. : 7.60 Min. : 7.50 Min. : 7.30 Min. : 7.10   
## 1st Qu.: 24.45 1st Qu.: 23.23 1st Qu.: 22.40 1st Qu.: 21.40   
## Median : 63.60 Median : 59.00 Median : 57.00 Median : 54.60   
## Mean : 88.74 Mean : 84.13 Mean : 82.07 Mean : 79.85   
## 3rd Qu.:142.65 3rd Qu.:129.60 3rd Qu.:127.60 3rd Qu.:125.30   
## Max. :322.80 Max. :327.10 Max. :331.20 Max. :334.20   
## NA's :60 NA's :53 NA's :46 NA's :46   
## X1987 X1988 X1989 X1990   
## Min. : 6.80 Min. : 6.60 Min. : 6.5 Min. : 6.30   
## 1st Qu.: 20.20 1st Qu.: 18.70 1st Qu.: 17.9 1st Qu.: 19.39   
## Median : 52.40 Median : 50.10 Median : 48.3 Median : 53.90   
## Mean : 77.77 Mean : 75.96 Mean : 74.0 Mean : 75.40   
## 3rd Qu.:123.10 3rd Qu.:118.00 3rd Qu.:116.0 3rd Qu.:118.25   
## Max. :335.30 Max. :334.30 Max. :331.3 Max. :326.50   
## NA's :46 NA's :46 NA's :46   
## X1991 X1992 X1993 X1994   
## Min. : 6.10 Min. : 5.90 Min. : 5.70 Min. : 5.20   
## 1st Qu.: 19.40 1st Qu.: 19.17 1st Qu.: 18.80 1st Qu.: 18.36   
## Median : 52.90 Median : 51.50 Median : 49.00 Median : 46.90   
## Mean : 73.89 Mean : 72.47 Mean : 71.14 Mean : 70.18   
## 3rd Qu.:116.25 3rd Qu.:114.75 3rd Qu.:113.25 3rd Qu.:111.65   
## Max. :319.90 Max. :311.60 Max. :301.60 Max. :289.90   
##   
## X1995 X1996 X1997 X1998   
## Min. : 4.80 Min. : 4.50 Min. : 4.30 Min. : 4.20   
## 1st Qu.: 17.39 1st Qu.: 16.45 1st Qu.: 15.30 1st Qu.: 14.85   
## Median : 44.60 Median : 42.80 Median : 41.20 Median : 39.50   
## Mean : 68.53 Mean : 66.72 Mean : 65.22 Mean : 63.63   
## 3rd Qu.:108.45 3rd Qu.:106.30 3rd Qu.:103.95 3rd Qu.:101.00   
## Max. :277.40 Max. :264.70 Max. :253.30 Max. :243.10   
##   
## X1999 X2000 X2001 X2002   
## Min. : 4.10 Min. : 3.90 Min. : 3.60 Min. : 3.40   
## 1st Qu.: 14.75 1st Qu.: 14.20 1st Qu.: 13.65 1st Qu.: 13.25   
## Median : 37.50 Median : 35.50 Median : 33.30 Median : 31.98   
## Mean : 61.49 Mean : 59.43 Mean : 57.27 Mean : 55.06   
## 3rd Qu.: 97.39 3rd Qu.: 93.79 3rd Qu.: 90.42 3rd Qu.: 86.81   
## Max. :238.10 Max. :233.10 Max. :227.70 Max. :222.00   
##   
## X2003 X2004 X2005 X2006   
## Min. : 3.20 Min. : 3.00 Min. : 2.90 Min. : 2.90   
## 1st Qu.: 12.60 1st Qu.: 12.25 1st Qu.: 11.90 1st Qu.: 11.55   
## Median : 29.90 Median : 28.70 Median : 27.50 Median : 26.20   
## Mean : 52.89 Mean : 50.89 Mean : 48.69 Mean : 46.68   
## 3rd Qu.: 83.51 3rd Qu.: 80.42 3rd Qu.: 77.35 3rd Qu.: 74.20   
## Max. :216.00 Max. :209.80 Max. :203.20 Max. :196.10   
##   
## X2007 X2008 X2009 X2010   
## Min. : 2.90 Min. : 2.80 Min. : 2.80 Min. : 2.70   
## 1st Qu.: 11.30 1st Qu.: 11.05 1st Qu.: 10.70 1st Qu.: 10.35   
## Median : 25.90 Median : 24.80 Median : 23.90 Median : 23.50   
## Mean : 44.76 Mean : 43.03 Mean : 41.16 Mean : 40.02   
## 3rd Qu.: 71.42 3rd Qu.: 68.40 3rd Qu.: 65.41 3rd Qu.: 62.48   
## Max. :188.60 Max. :180.50 Max. :171.90 Max. :210.90   
##   
## X2011 X2012 X2013 X2014   
## Min. : 2.60 Min. : 2.50 Min. : 2.40 Min. : 2.30   
## 1st Qu.: 10.00 1st Qu.: 9.80 1st Qu.: 9.30 1st Qu.: 8.75   
## Median : 22.50 Median : 21.90 Median : 21.00 Median : 19.80   
## Mean : 37.81 Mean : 36.30 Mean : 34.93 Mean : 33.68   
## 3rd Qu.: 59.64 3rd Qu.: 57.01 3rd Qu.: 54.72 3rd Qu.: 52.40   
## Max. :154.30 Max. :148.90 Max. :144.10 Max. :139.80   
##   
## X2015 X2016 X2017   
## Min. : 2.30 Min. : 2.20 Min. : 2.10   
## 1st Qu.: 8.40 1st Qu.: 7.95 1st Qu.: 7.70   
## Median : 19.60 Median : 18.90 Median : 18.20   
## Mean : 32.49 Mean : 31.38 Mean : 30.35   
## 3rd Qu.: 50.15 3rd Qu.: 48.15 3rd Qu.: 46.45   
## Max. :135.60 Max. :131.50 Max. :127.20   
##

summary(poverty)

## country X1996 X2002 X2005   
## Length:148 Min. : 0.26 Min. : 0.07 Min. : 0.000   
## Class :character 1st Qu.:16.59 1st Qu.:13.81 1st Qu.: 9.175   
## Mode :character Median :40.94 Median :35.19 Median :24.430   
## Mean :42.74 Mean :38.85 Mean :31.948   
## 3rd Qu.:69.14 3rd Qu.:61.16 3rd Qu.:53.405   
## Max. :94.04 Max. :92.04 Max. :90.040   
## NA's :97 NA's :78 NA's :73   
## X2008 X2012 X2000 X1986   
## Min. : 0.01 Min. : 0.05 Min. : 0.26 Min. : 0.00   
## 1st Qu.: 2.82 1st Qu.: 3.03 1st Qu.:12.96 1st Qu.:20.44   
## Median :14.26 Median :13.61 Median :26.79 Median :24.12   
## Mean :24.16 Mean :23.06 Mean :35.98 Mean :38.16   
## 3rd Qu.:37.83 3rd Qu.:37.12 3rd Qu.:56.11 3rd Qu.:60.88   
## Max. :87.54 Max. :90.70 Max. :95.26 Max. :87.28   
## NA's :79 NA's :77 NA's :108 NA's :139   
## X1987 X1991 X1992 X1993   
## Min. : 0.06 Min. : 3.91 Min. : 0.00 Min. : 0.03   
## 1st Qu.:21.98 1st Qu.:31.97 1st Qu.:11.79 1st Qu.:17.61   
## Median :64.18 Median :58.23 Median :27.36 Median :55.84   
## Mean :49.39 Mean :55.78 Mean :36.55 Mean :46.33   
## 3rd Qu.:74.23 3rd Qu.:80.66 3rd Qu.:58.61 3rd Qu.:73.00   
## Max. :91.58 Max. :98.49 Max. :94.39 Max. :87.63   
## NA's :115 NA's :134 NA's :119 NA's :102   
## X1994 X1995 X1997 X1998   
## Min. : 0.54 Min. : 2.28 Min. : 2.370 Min. : 0.00   
## 1st Qu.:16.09 1st Qu.:12.19 1st Qu.: 9.305 1st Qu.:10.23   
## Median :39.75 Median :24.78 Median :28.895 Median :29.88   
## Mean :45.17 Mean :30.81 Mean :30.305 Mean :34.12   
## 3rd Qu.:76.09 3rd Qu.:43.16 3rd Qu.:40.955 3rd Qu.:55.69   
## Max. :93.61 Max. :86.38 Max. :86.010 Max. :94.98   
## NA's :125 NA's :121 NA's :126 NA's :103   
## X1999 X2001 X2003 X2004   
## Min. : 0.27 Min. : 0.18 Min. : 0.00 Min. : 0.000   
## 1st Qu.:20.14 1st Qu.:11.00 1st Qu.: 6.99 1st Qu.: 3.897   
## Median :38.24 Median :25.43 Median :25.18 Median :17.610   
## Mean :41.84 Mean :32.46 Mean :32.80 Mean :24.766   
## 3rd Qu.:66.58 3rd Qu.:51.41 3rd Qu.:60.90 3rd Qu.:36.360   
## Max. :87.14 Max. :84.07 Max. :87.82 Max. :98.350   
## NA's :98 NA's :108 NA's :99 NA's :94   
## X2006 X2007 X2009 X2010   
## Min. : 0.040 Min. : 0.09 Min. : 0.000 Min. : 0.01   
## 1st Qu.: 2.715 1st Qu.: 1.50 1st Qu.: 2.425 1st Qu.: 3.86   
## Median :11.740 Median :11.29 Median :11.660 Median :17.60   
## Mean :19.695 Mean :21.99 Mean :20.241 Mean :27.97   
## 3rd Qu.:23.915 3rd Qu.:32.31 3rd Qu.:27.060 3rd Qu.:47.40   
## Max. :92.170 Max. :90.08 Max. :80.470 Max. :92.91   
## NA's :94 NA's :97 NA's :88 NA's :77   
## X2011 X2013 X2014 X1983   
## Min. : 0.010 Min. : 0.00 Min. : 0.000 Min. :49.17   
## 1st Qu.: 3.225 1st Qu.: 3.52 1st Qu.: 4.105 1st Qu.:65.20   
## Median :15.040 Median :11.53 Median :11.290 Median :81.23   
## Mean :25.978 Mean :21.69 Mean :17.905 Mean :71.36   
## 3rd Qu.:44.540 3rd Qu.:36.88 3rd Qu.:23.060 3rd Qu.:82.45   
## Max. :81.750 Max. :80.60 Max. :75.460 Max. :83.67   
## NA's :77 NA's :95 NA's :117 NA's :145   
## X1985 X1988 X1990 X1981   
## Min. : 0.39 Min. : 0.00 Min. : 4.22 Min. : 3.92   
## 1st Qu.:35.07 1st Qu.: 0.13 1st Qu.:24.61 1st Qu.:55.50   
## Median :42.91 Median : 7.70 Median :62.59 Median :69.91   
## Mean :44.13 Mean :22.14 Mean :51.31 Mean :63.46   
## 3rd Qu.:60.84 3rd Qu.:37.99 3rd Qu.:73.73 3rd Qu.:76.37   
## Max. :76.79 Max. :81.52 Max. :89.20 Max. :99.14   
## NA's :138 NA's :125 NA's :116 NA's :127   
## X1982 X1984 X1989   
## Min. :40.51 Min. :12.01 Min. : 0.080   
## 1st Qu.:40.51 1st Qu.:53.99 1st Qu.: 4.277   
## Median :40.51 Median :70.63 Median :22.815   
## Mean :40.51 Mean :65.15 Mean :29.789   
## 3rd Qu.:40.51 3rd Qu.:83.19 3rd Qu.:50.057   
## Max. :40.51 Max. :95.87 Max. :95.290   
## NA's :147 NA's :125 NA's :130

#pivot to make tidy  
mortality\_tidy <- mortality %>%   
 pivot\_longer(!country, names\_to="year", values\_to = "mrate") %>%  
 mutate(year = as.numeric(gsub("X","",year)))  
poverty\_tidy <- poverty %>%   
 pivot\_longer(!country, names\_to="year", values\_to = "prate") %>%  
 mutate(year = as.numeric(gsub("X","",year)))  
  
#join the dataframes to form data   
data <- inner\_join(mortality\_tidy,poverty\_tidy,by=c("country"="country","year"="year")) %>% na.omit(data)  
  
#calculate the correlation  
corr <- cor(data$mrate,data$prate)  
corr

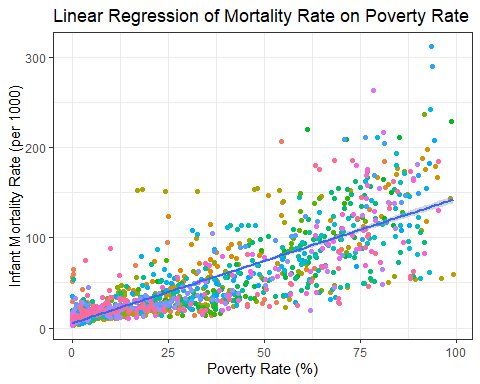
## [1] 0.8107156

#calculate the regression model  
reg <- lm(data$mrate ~ data$prate)   
#show the coefficients   
reg$coefficients

## (Intercept) data$prate   
## 5.472942 1.379177

#plot the model  
data %>% ggplot(aes(prate,mrate)) +  
 geom\_point(aes(color=factor(country)),show.legend = F) +  
 geom\_smooth(method = "lm") +  
 theme\_bw() +  
 labs(title = "Linear Regression of Mortality Rate on Poverty Rate",  
 x = "Poverty Rate (%)",  
 y = "Infant Mortality Rate (per 1000)")

## `geom\_smooth()` using formula 'y ~ x'



#calculate the opposite regression model  
reg2 <- lm(data$prate ~ data$mrate)   
#show the coefficients   
reg2$coefficients

## (Intercept) data$mrate   
## 8.1727704 0.4765594

#get summary of regression  
summary(reg)

##   
## Call:  
## lm(formula = data$mrate ~ data$prate)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -83.095 -12.554 -0.739 7.996 177.340   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 5.47294 1.16893 4.682 3.14e-06 \*\*\*  
## data$prate 1.37918 0.02779 49.621 < 2e-16 \*\*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 27.83 on 1284 degrees of freedom  
## Multiple R-squared: 0.6573, Adjusted R-squared: 0.657   
## F-statistic: 2462 on 1 and 1284 DF, p-value: < 2.2e-16

#get summary of 2nd regression  
summary(reg2)

##   
## Call:  
## lm(formula = data$prate ~ data$mrate)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -63.66 -10.67 -3.37 8.78 62.61   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 8.172770 0.654359 12.49 <2e-16 \*\*\*  
## data$mrate 0.476559 0.009604 49.62 <2e-16 \*\*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 16.36 on 1284 degrees of freedom  
## Multiple R-squared: 0.6573, Adjusted R-squared: 0.657   
## F-statistic: 2462 on 1 and 1284 DF, p-value: < 2.2e-16