Aishani Anavkar
Roll no: 1806

Semester II

FYBSc. Data Science

Poverty Data Analysis

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Introduction

India is a developing nation. Its economy is growing, poverty is still a major challenge. However, poverty is on the decline in India. It has over a 100.8 million people living in extreme poverty which makes up ~12% of its total population as of early 2021.[1] In May 2012, the World Bank reviewed and proposed revisions to their poverty calculation methodology and purchasing power parity basis for measuring poverty worldwide.[2] It was a minimal 3.6% in terms of percentage. As of 2020, the incidence of multidimensional poverty has significantly reduced from 54.7 percent in 2005 to 27.9 percent in 2015-16.[3] According to United Nations Development Programme Administrator Achim Steiner, India lifted 271 million people out of extreme poverty in a 10-year time period from 2005/06 to 2015/16. A 2020 study from the World Economic Forum found "Some 220 million Indians sustained on an expenditure level of less than Rs 32 / day — the poverty line for rural India — by the last headcount of the poor in India in 2013."[4] More than 800 million people in India are considered poor. Most of them live in the countryside and keep afloat with odd jobs. The lack of employment which provides a liveable wage in rural areas is driving many Indians into rapidly growing metropolitan areas such as Bombay, Delhi, Bangalore or Calcutta. There, most of them expect a life of poverty and despair in the mega-slums, made up of millions of corrugated ironworks, without sufficient drinking water supply, without garbage disposal and in many cases without electricity. The poor hygiene conditions are the cause of diseases such as cholera, typhus and dysentery, in which especially children suffer and die.

In this analysis we are going to study about the poverty of India in the year 2019 and 2020 in detail using a sample data by using R Software as our primary tool to find out the results. R is a programming language and free software environment for statistical computing and graphics supported by the R Foundation for Statistical Computing.[6] The R language is widely used among statisticians and data miners for developing statistical software[7] and data analysis.[8] Polls, data mining surveys, and studies of scholarly literature databases show substantial increases in popularity;[9] as of April 2021, R ranks 16th in the TIOBE index, a measure of popularity of programming languages.[10] *Analysis of Poverty Data by Small Area Estimation* offers an introduction to advanced techniques from both a practical and a methodological perspective, and will prove an invaluable resource for researchers actively engaged in organizing, managing and conducting studies on poverty.

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Sample Data

Year 2019

	A	B	C	D	E	F	G	H	I	J	K	L	M
1		Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19
2	Andhra Pradesh	5.2	5.8	5.2	4	4.4	3.3	4.3	3.7	5.4	3.9	5.1	5.4
3	Assam	5.1	5.4	6.8	5	4.8	5.9	4.1	6.5	5.1	5.8	4.9	0.9
4	Bihar	8.7	11.5	12.3	12.2	10.6	10.6	13.8	11.8	10.1	12.7	13.1	10.7
5	Chhattisgarh	7.9	7.3	8	3.4	9.8	8.1	5.5	5.1	6.6	7.8	4.2	5.4
6	Delhi	12.2	11.6	13.1	4.4	12.3	12.7	14.6	13.6	20.4	12.5	16	11.2
7	Goa	7.5	7.1	8.9	9.3	2.8	10.7	11.8	3.7	3.5	10.4	24.7	11.8
8	Gujarat	5.8	5.5	4.5	3	3.4	5.5	4.8	3.9	6.2	5.2	5.9	4.4
9	Haryana	17.9	21.3	19	1.4	18.3	22.1	19.5	28.7	17.2	23	20.4	27.6
10	Himachal Pradesh	13.9	13.8	18.8	19.6	13.4	12.6	20.7	19.2	15.6	16.7	23.3	20.2
11	Jammu & Kashmir	17.1	5.2	15.2	10.6	16.3	14.7	16.3	22.4	19.9	20.7	14.6	12.5
12	Jharkhand	9.1	6.9	13.6	12.2	9.9	11.7	11.5	14.3	10.3	9.9	10.6	17
13	Karnataka	1.5	2	1.3	0.5	5.9	5.6	1.3	0.7	3.3	5.8	2.2	0.9
14	Kerala	6.6	7.4	6.4	3.3	6.4	6	6.2	9.1	5.4	7.4	5.8	6.2
15	Madhya Pradesh	4.8	2.5	5.4	4.5	3.7	4.9	4.9	5.5	4.4	3.4	3.7	3.9
16	Maharashtra	5.7	3.7	3.3	4.1	4.7	5.3	4.8	5.3	5.5	5.4	5.3	4.9
17	Meghalaya	2.6	6.4	2	2.3	4.1	5.1	1.7	1.6	1.2	4.3	1.8	2.5
18	Odisha	4.2	6.6	2.8	6.4	4	4.3	3	3.6	4.2	4.3	4.3	4.4
19	Puducherry	1.7	0.9	3.9	0.4	0.8	0	0	7.5	0.8	1.2	0.9	4
20	Punjab	10.5	12.4	9.8	7.5	10.7	12.6	10.4	8.7	11.3	13	8.3	8.4
21	Rajasthan	7.7	1.6	9.7	1.3	6.6	11.9	10.2	13.1	7.5	14.2	11.5	11
22	Sikkim	13.2	8.3	6.8	4.8	13.3	7	6.8	2.1	6.4	17.1	9.7	3.3
23	Tamil Nadu	2.2	1.9	1.7	1.2	0.9	1.2	4.8	5.8	1.8	1.3	2.5	5.7
24	Telangana	2.6	2.4	2.5	2.7	2	4.4	2.9	2.4	2	7.1	6.1	2.3
25	Tripura	32.6	6.2	10	5.4	30.9	17.4	23.4	27.9	27.2	27.3	15.8	14.6
26	Uttar Pradesh	9.6	5.5	8.9	6.4	11.3	1.2	9.8	12.3	4.1	10.2	8.1	9.4
27	Uttarakhand	3.5	5.1	5	6.4	3.6	3	6.1	6.5	2.1	4.8	5.8	5.4
28	West Bengal	7	6.5	6.1	2.5	6.4	6.3	6.3	6.1	6.4	7.1	6.1	6.2

Year 2020

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	States	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20
2	Andhra Pradesh	5.5	5.8	5.8	20.5	17.4	3.3	8.3	7	6.4	6.6	6	6.7
3	Assam	4.7	4.4	4.8	11.1	9.6	0.6	3.8	5.5	1.2	3	4	7.6
4	Bihar	10.6	10.3	15.4	46.6	46	17.8	12.8	13.4	11.9	9.8	10	12.7
5	Chhattisgarh	9.7	8.4	7.5	3.4	10.5	14.2	10.3	5.6	2	6.7	3.4	7.2
6	Delhi	22.2	14.8	17	16.7	42.3	18.2	20.3	13.8	12.5	6.3	6.6	7.6
7	Goa	8.9	2.8	5.2	13.3	21.2	10	17.1	16.2	15.4	10.9	15.9	13.2
8	Gujarat	5.5	6.4	6.7	18.7	12.1	3.2	1.8	1.9	3.4	4	3.9	3
9	Haryana	20.3	25.8	25.1	43.2	29	26.7	24.2	33.5	19.3	27.3	25.6	32.5
10	Himachal Pradesh	16.8	16.8	18.8	2.2	26.9	13.5	24.3	15.8	11.4	13.5	15.9	7.9
11	Jammu & Kashmir	21.1	20.8	15.5	NA	18.7	17.9	10.9	11.1	16.2	16.1	8.6	16.6
12	Jharkhand	10.6	11.8	8.2	47.1	59.2	20.9	7.6	9.8	9.3	11.8	9.5	12.4
13	Karnataka	2.9	3.6	3.5	29.8	20	8.4	4	0.5	2.4	1.6	1.9	1.4
14	Kerala	5.3	7.6	9	17	17.9	9.7	7.1	11	5.9	3.9	5.8	6.5
15	Madhya Pradesh	4.1	4.6	2.2	12.4	22	6.5	5.1	4.7	3.9	3.3	4.3	4
16	Maharashtra	5	4.7	5.8	20.9	15.5	9.2	3.9	6.2	4.5	4.2	3	3.9
17	Meghalaya	1.7	3.6	1.6	10	5.9	1.1	2.1	3.7	4.3	4.6	1.1	6.6
18	Odisha	1.9	3.1	13.1	23.8	11.4	3.8	1.9	1.4	2.1	2.2	1.7	0.2
19	Puducherry	0.6	1.8	1.2	75.8	58.2	4.2	15.5	5	10.9	6.2	2.2	2.7
20	Punjab	11.1	11	10.3	2.9	28.3	16.6	9.2	11	9.6	9.8	7.6	4.4
21	Rajasthan	11	15.2	11.9	17.7	15.7	14.4	15.8	17.5	15.3	24.1	18.5	28.2
22	Sikkim	NA	NA	23.6	2.3	24.5	4.5	4.5	12.5	5.7	0.9	1.9	0.7
23	Tamil Nadu	1.6	2.1	6.4	49.8	33.2	12.2	6.8	2.6	5	2.2	1.1	0.5
24	Telangana	5.5	8.3	5.8	6.2	14.7	10.6	5.4	5.8	3.3	2.9	1.6	7
25	Tripura	32.7	28.4	29.9	41.2	21.5	21.7	18.2	27.9	17.4	11.6	13.1	18.2
26	Uttar Pradesh	7.6	9	10.1	21.5	20.4	9.5	5.6	5.8	4.2	3.8	5.2	14.9
27	Uttarakhand	5.5	5	19.9	6.5	8	8.6	12.4	14.3	22.3	9.2	1.5	5.2
28	West Bengal	6.9	4.9	6.9	17.4	17.4	7.3	6.8	14.9	9.3	10.2	11.2	6

Data Analysis & Data Visualization

#Analysis 2019

```
pov = read.csv("C:/Users/Aishani Anavkar/Documents/2019.csv", header = TRUE)

pov

> a<- mean(pov$Jan.19)
> a
[1] 8.385185
> b <-mean(pov$Feb.19)
> b
[1] 6.696296
> c <-mean(pov$Mar.19)
> c
[1] 7.814815
> d <-mean(pov$Apr.19)
> d
[1] 5.362963
> e <-mean(pov$May.19)
> e
[1] 8.196296
> f <-mean(pov$Jun.19)
> f
[1] 7.92963
> g <-mean(pov$Jul.19)
> g
[1] 8.5
> h <-mean(pov$Aug.19)
> h
[1] 9.3
> i <-mean(pov$Sep.19)
> i
[1] 7.922222
> j<-mean(pov$Oct.19)
> j
[1] 9.722222
> k <-mean(pov$Nov.19)
> k
[1] 8.914815
> l <-mean(pov$Dec.19)
> l
[1] 8.155556
>
> line1 <-
c(8.385185185,6.696296296,7.814814815,5.362962963,8.196296296,7.92962963,8.5,9.3,7.922222222,9.722222222,8.914814815,8.155555556)
```

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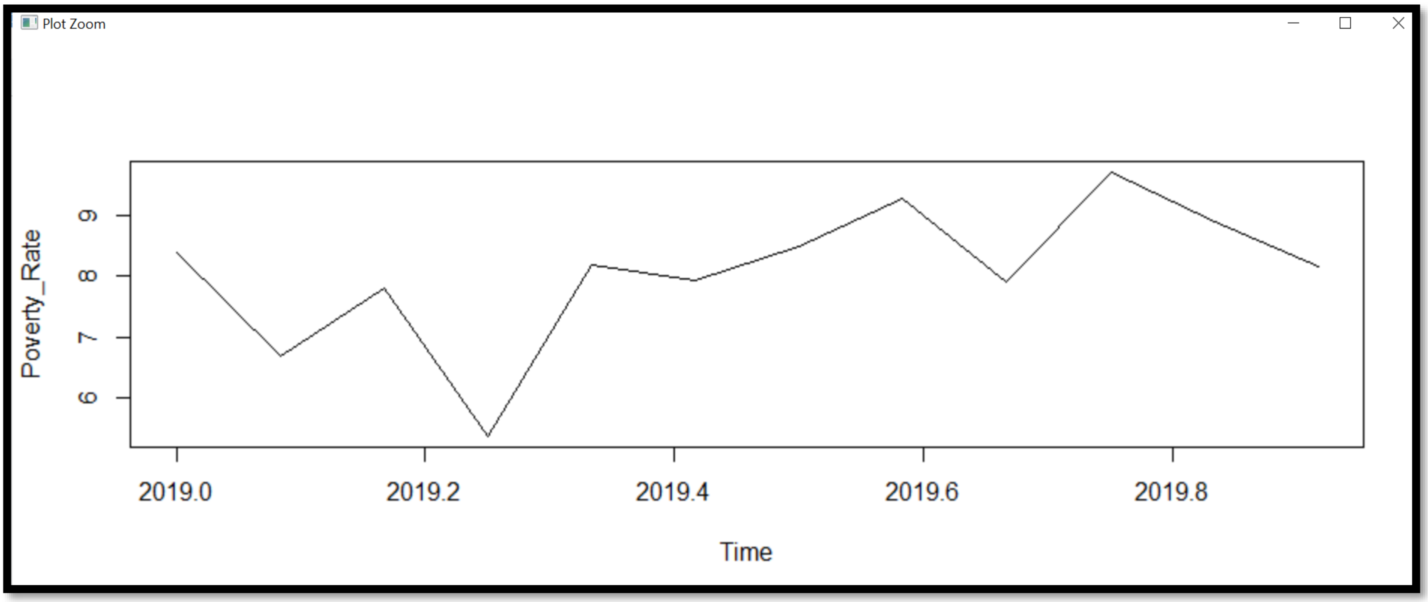
```
> length(line1)
[1] 12
>
> Poverty_Rate<-ts(line1,start=c(2019,1),frequency=12)
> print(Poverty_Rate)
          Jan      Feb      Mar      Apr      May      Jun
2019 8.385185 6.696296 7.814815 5.362963 8.196296 7.929630
          Jul      Aug      Sep      Oct      Nov      Dec
2019 8.500000 9.300000 7.922222 9.722222 8.914815 8.155556
> plot(Poverty_Rate)
>

dev.off()
```



#Analysis 2020

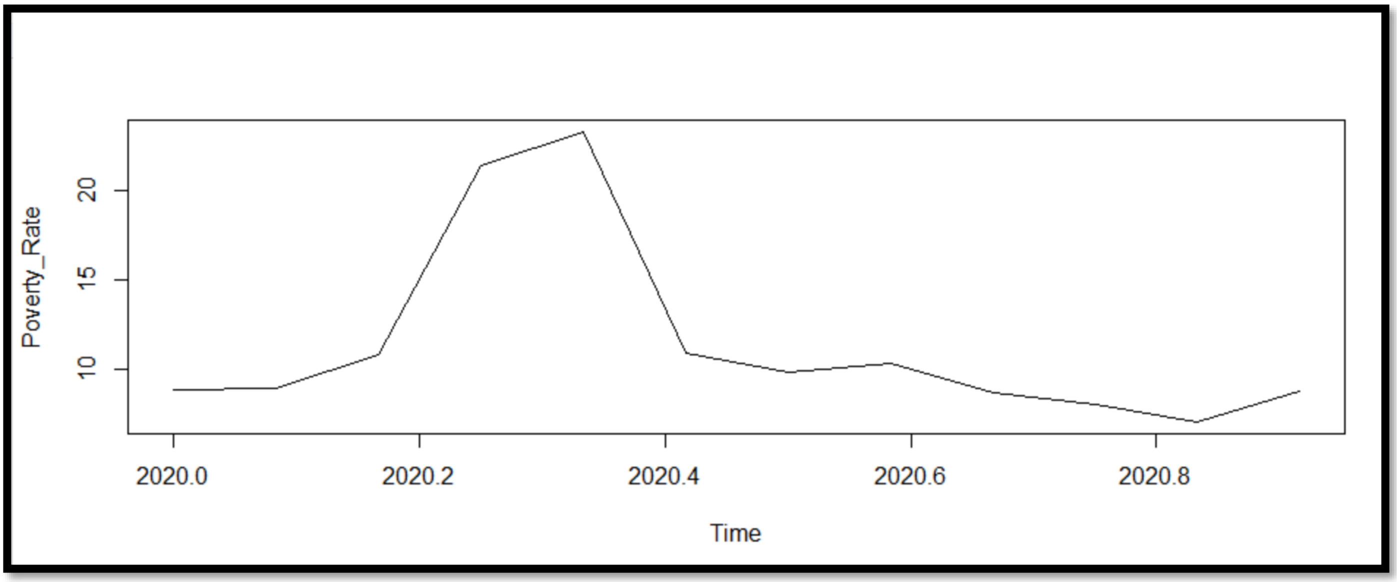
pov2 = read.csv("C:/Users/Aishani Anavkar/Documents/2020.csv")

pov2

na.omit(pov2)

```
> a<- mean(pov2$Jan.20)
> a
[1] NA
> b <-mean(pov2$Feb.20)
> b
[1] NA
> c <-mean(pov2$Mar.20)
> c
[1] 10.78519
> d <-mean(pov2$Apr.20)
> d
[1] NA
> e <-mean(pov2$May.20)
> e
[1] 23.24074
> f <-mean(pov2$Jun.20)
> f
[1] 10.91111
> g <-mean(pov2$Jul.20)
> g
[1] 9.840741
> h <-mean(pov2$Aug.20)
> h
[1] 10.31111
> i <-mean(pov2$Sep.20)
> i
[1] 8.707407
> j<-mean(pov2$Oct.20)
> j
[1] 8.025926
> k <-mean(pov2$Nov.20)
> k
[1] 7.077778
> l <-mean(pov2$Dec.20)
> l
[1] 8.807407
>
> line2 <-
c(8.862962963,8.925925926,10.78518519,21.40740741,23.24074074,10.91111111,9.840740741,10.
31111111,8.707407407,8.025925926,7.077777778,8.807407407)
> length(line2)
[1] 12
```

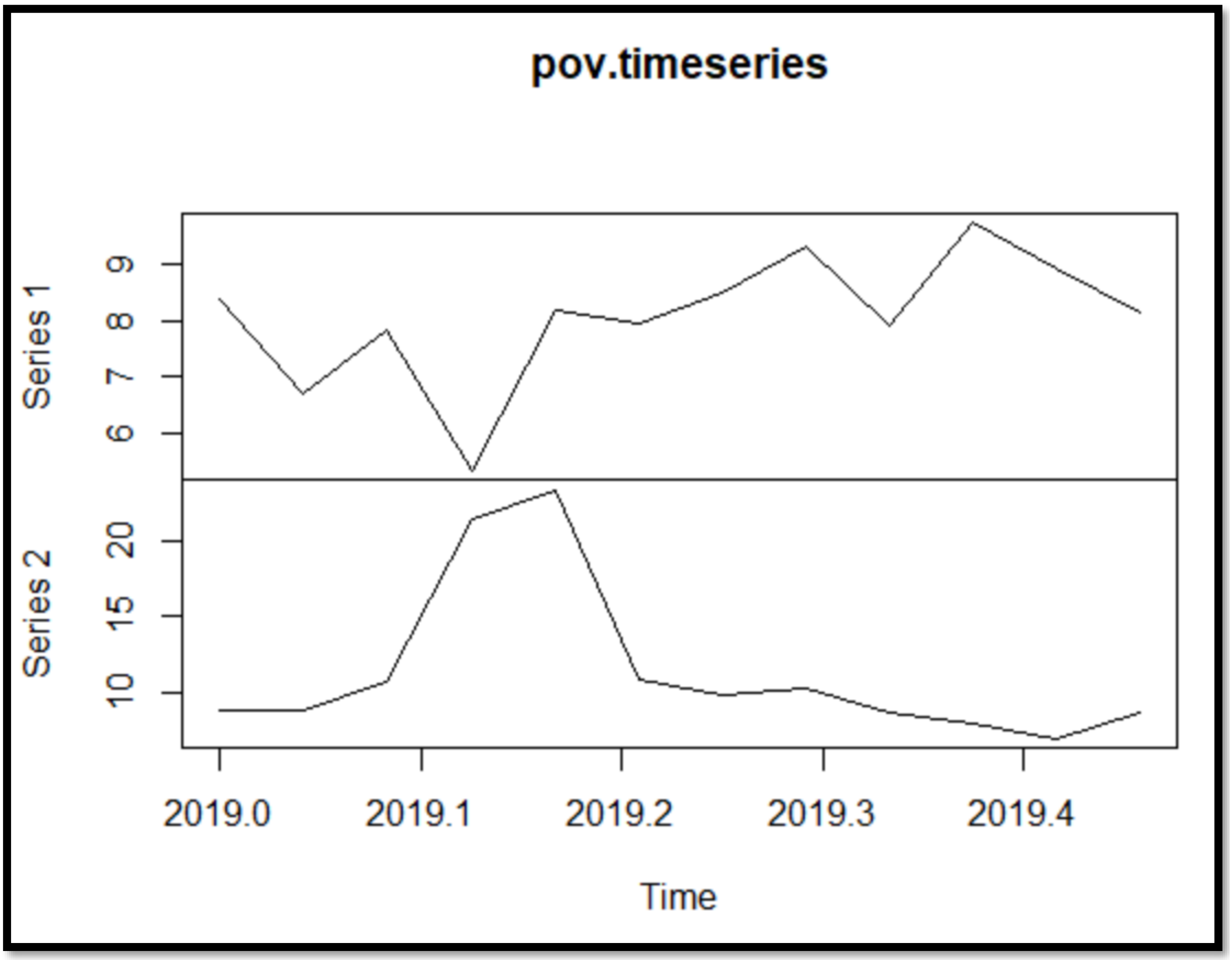
```
>
> Poverty_Rate<-ts(line2,start=c(2019,1),frequency=12)
> print(Poverty_Rate)
        Jan      Feb      Mar      Apr      May
2019  8.862963  8.925926 10.785185 21.407407 23.240741
        Jun      Jul      Aug      Sep      Oct
2019 10.911111  9.840741 10.311111  8.707407  8.025926
        Nov      Dec
2019  7.077778  8.807407
> plot(Poverty_Rate)
```



#Multiple ts

```
> line1 <-
c(      8.385185185,6.696296296,7.814814815,5.362962963,8.196296296,7.92962963,8.5,9.3,7.922
222222,9.722222222,8.914814815,8.155555556)
> line2 <-
c(8.862962963,8.925925926,10.78518519,21.40740741,23.24074074,10.91111111,9.840740741,10.
31111111,8.707407407,8.025925926,7.077777778,8.807407407)
>
> combined.poverty <- matrix(c(line1,line2),nrow = 12)
> pov.timeseries<-ts(combined.poverty,start=c(2019,1),frequency=24)
> print(pov.timeseries)
Time Series:
Start = c(2019, 1)
End = c(2019, 12)
Frequency = 24
         Series 1  Series 2
2019.000 8.385185  8.862963
2019.042 6.696296  8.925926
2019.083 7.814815 10.785185
2019.125 5.362963 21.407407
2019.167 8.196296 23.240741
```

```
2019.208 7.929630 10.911111
2019.250 8.500000  9.840741
2019.292 9.300000 10.311111
2019.333 7.922222  8.707407
2019.375 9.722222  8.025926
2019.417 8.914815  7.077778
2019.458 8.155556  8.807407
> plot(pov.timeseries)
```



#state wise poverty graph

```
data1<- read.csv("C:/Users/Aishani Anavkar/Documents/2019.csv")
data1
na.omit(data1)

#row median
data1$row_median = apply(data1[,-1], 1, median)
data1
plot(data1$row_median)

#row mean
data1$row_mean = apply(data1[,-1], 1, mean)
data1
plot(data1$row_mean)
plot(data1$row_mean,type = "o",pch= 19,col = "red",xlab = "month", ylab = "Poverty Rate", main=
"State-wise Poverty in 2019")
axis(1, seq(0,25,1))

data2<- read.csv("C:/Users/Aishani Anavkar/Documents/2020.csv")
data2
na.omit(data2)
#row mean
data2$row_mean = apply(data2[,-1], 1, mean)
data2
plot(data2$row_mean)
plot(data2$row_mean,type = "o",pch=19,col = "green",xlab = "month", ylab = "Poverty Rate", main=
"State-wise Poverty in 2020")
axis(1, seq(0,25,1))

data2$row_mean
d1<-
c(8.275000,5.025000,18.108333,7.408333,16.525000,12.508333,5.883333,27.708333,15.316667,NA
,18.183333,6.666667,8.891667,6.425000,7.233333,3.858333,5.550000,15.358333,10.983333,17.108
333,NA,10.291667,6.425000,23.483333,9.800000,9.866667,9.933333)
data1$row_mean
d2<-
c(4.641667,5.030357,11.501786,6.578571,12.894048,9.346429,4.841667,19.916667,17.316667,15.5
77381,11.416667,2.541667,6.416071,4.350000,4.838095,2.933333,4.338690,1.752976,10.307143,9.
110714,8.097619,2.534524,3.251190,20.677976,8.297024,4.826190,6.122619)
plot(d1, col = "red", type = "o", pch = 19,xlab= "States", ylab = "Poverty rate", main = "Combined
State-wise poverty")
lines(d2, col = "green", type = "o", pch = 19)
```

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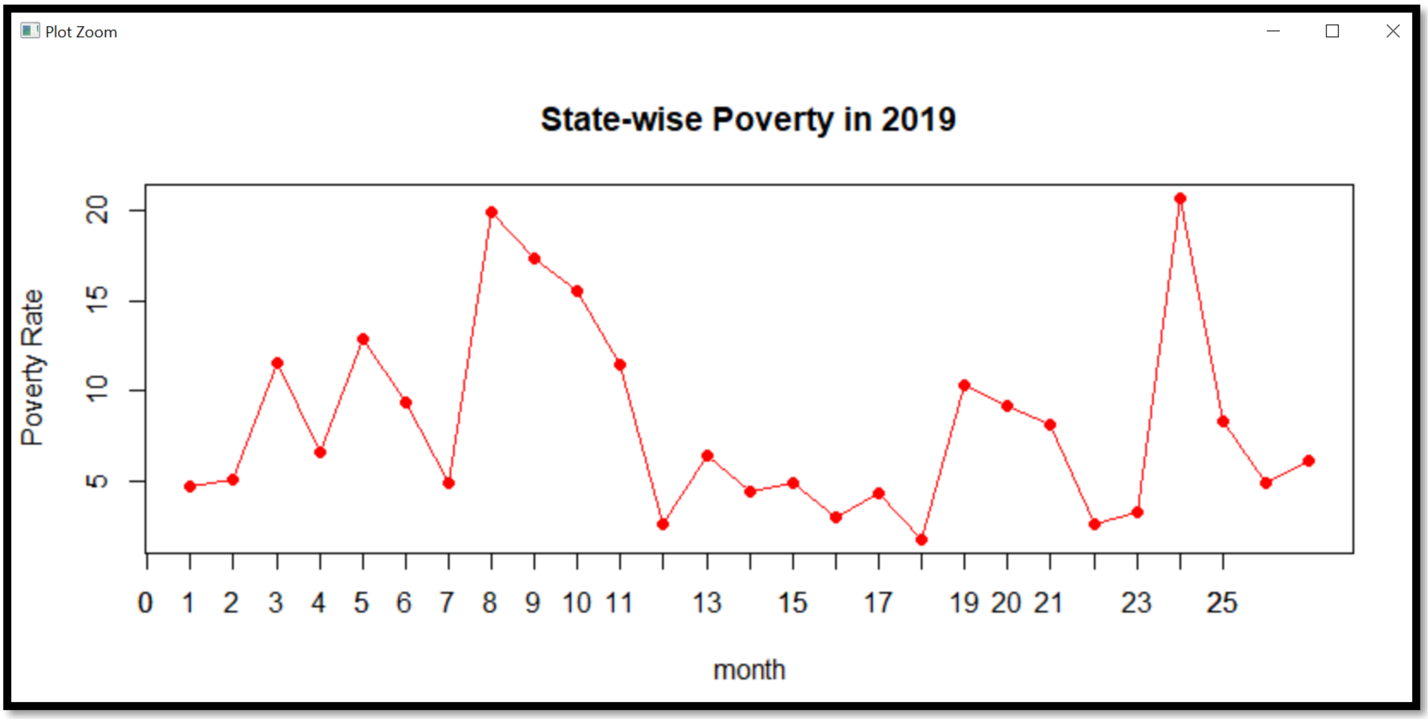
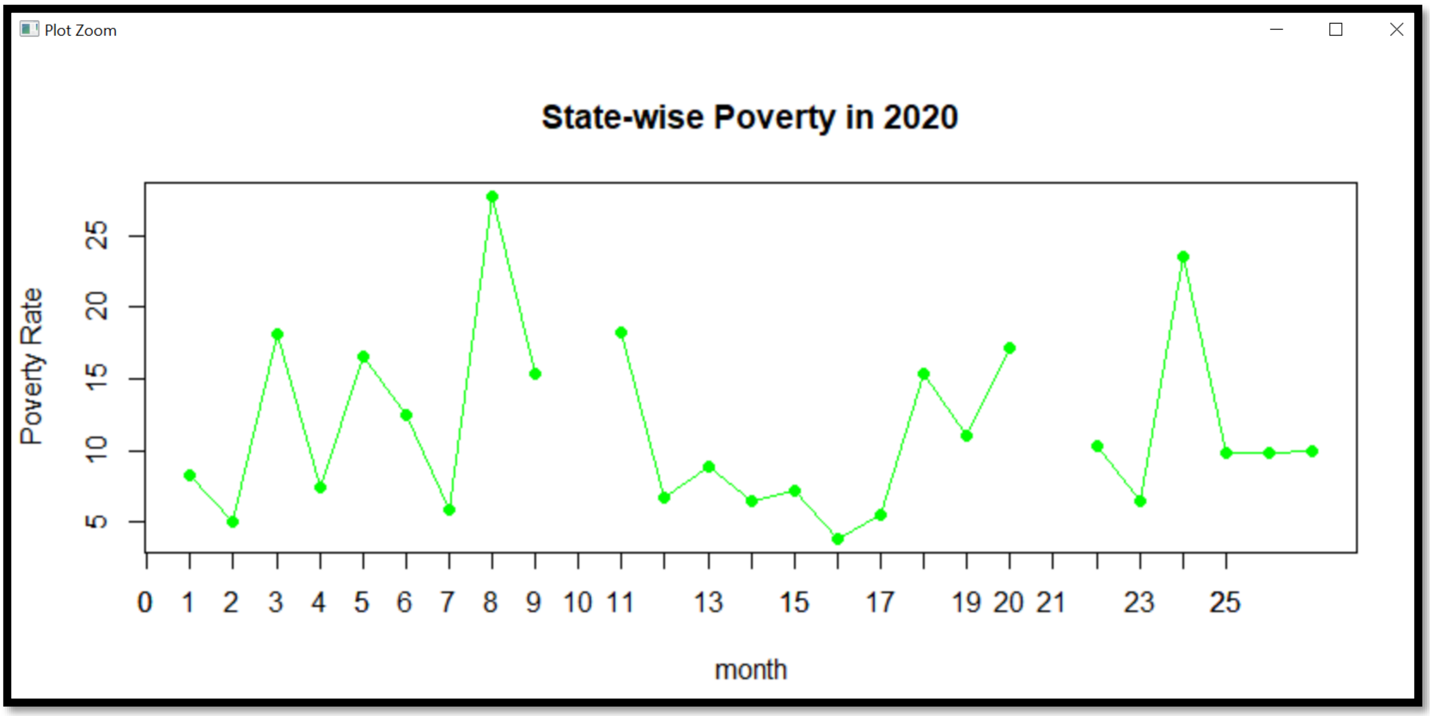
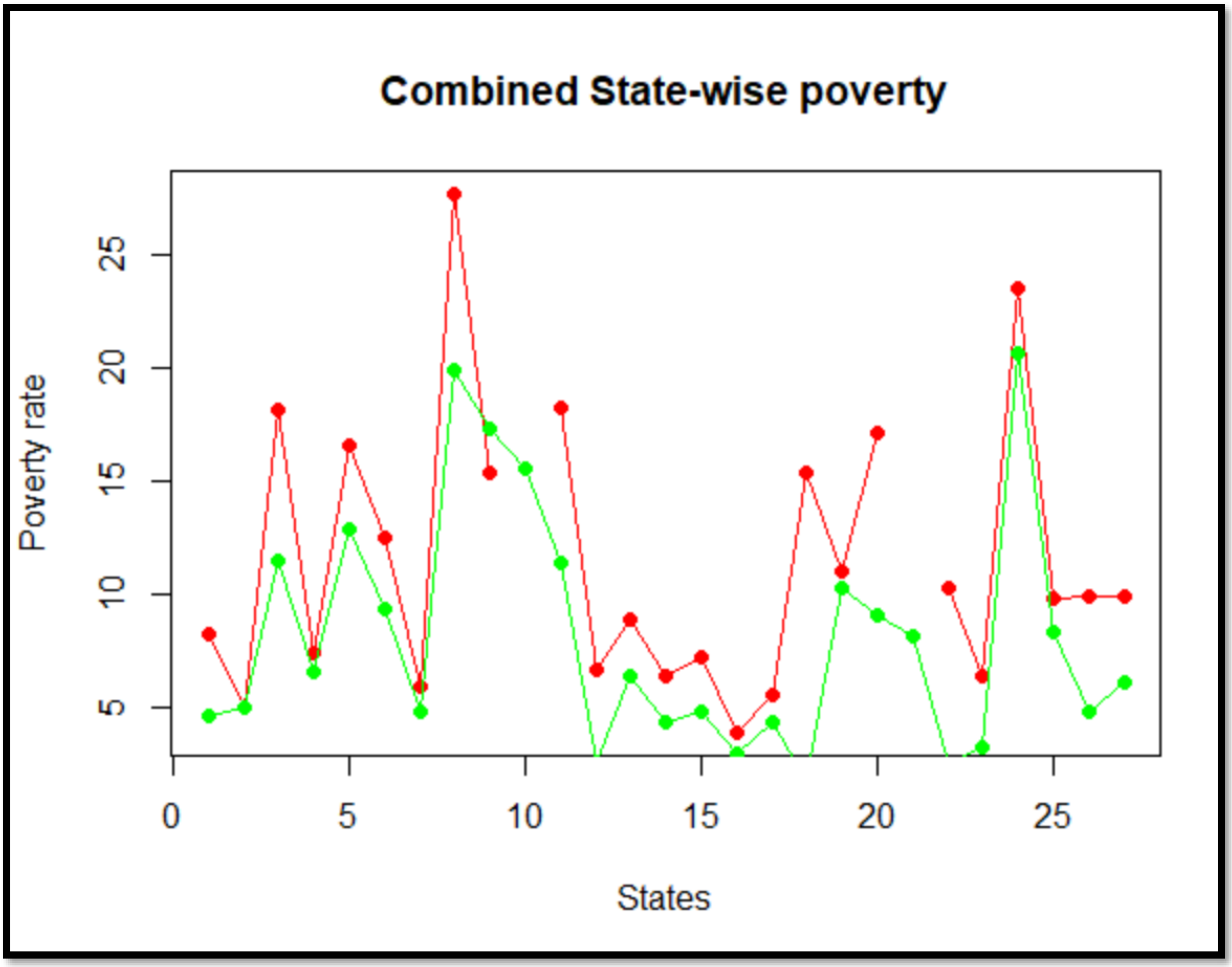






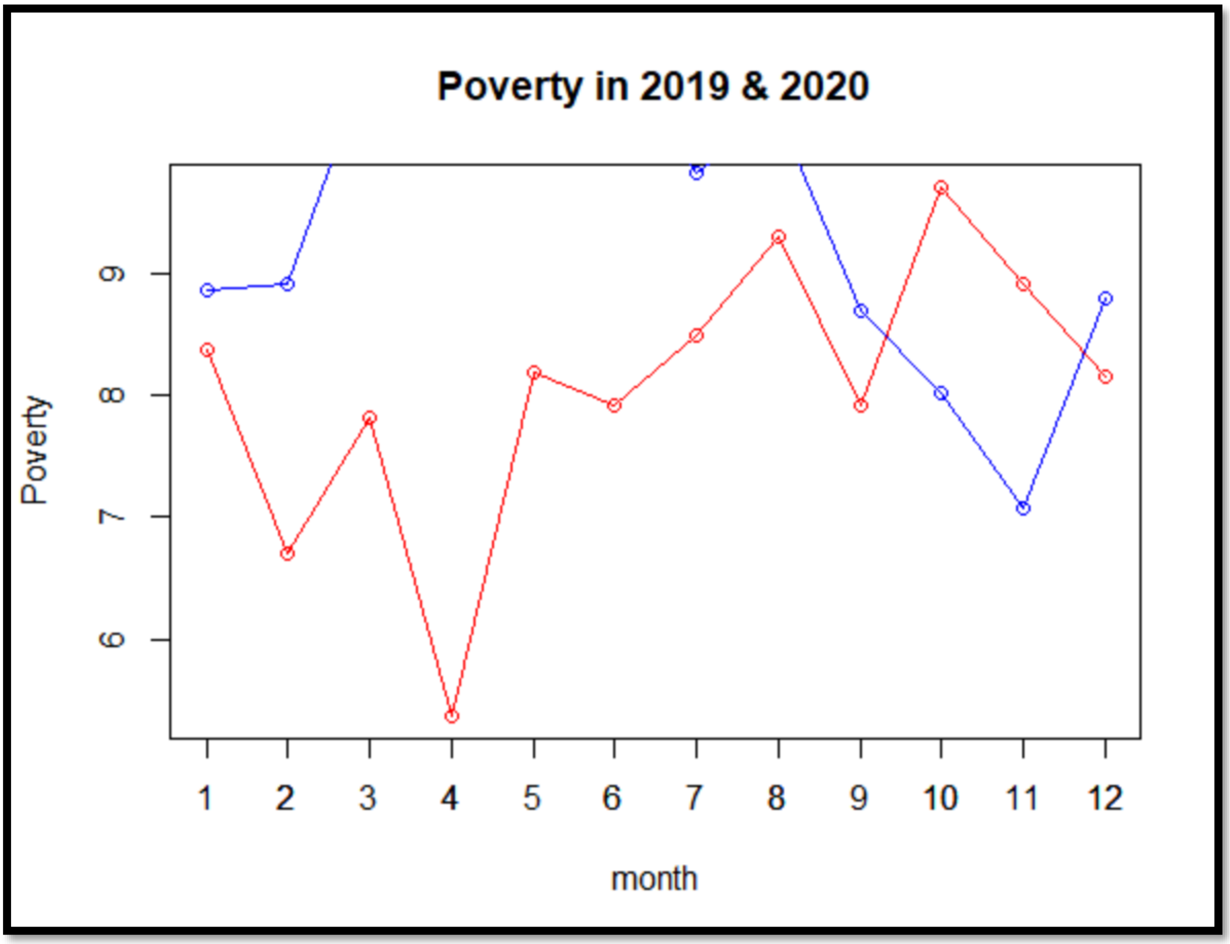
#line graph

```
line1 <- c(
        8.385185185,6.696296296,7.814814815,5.362962963,8.196296296,7.92962963,8.5,9.3,7.92
2222222,9.722222222,8.914814815,8.155555556)

line2 <-
c(8.862962963,8.925925926,10.78518519,21.40740741,23.24074074,10.91111111,9.840740741,10.
31111111,8.707407407,8.025925926,7.077777778,8.807407407)

plot(line1,type = "o",col = "red",xlab = "month", ylab = "Poverty", main= "Poverty in 2019 & 2020")

lines(line2, type ="o",col = "blue" )
```



#Calculations

```
> y1 <-
c(  8.385185185,6.696296296,7.814814815,5.362962963,8.196296296,7.92962963,8.5,9.3,7.922222222,9.722222222,8.914814815,8.155555556)
> m1 = mean(y1)
> cat("Mean is ",m1)
Mean is  8.075> med1 = median(y1)
> cat("Median is ",med)
Median is  9.383333> getmode <- function(y1) {
+   uniqv <- unique(y1)
+   uniqv[which.max(tabulate(match(y1, uniqv)))]
+ }
> result1 <- getmode(y1)
> print(result1)
[1] 8.385185
> q3.1 = quantile(y1,0.75)
> cat("Q3 is ",q3.1)
Q3 is  8.603704> q1.1 = quantile(y1,0.25)
> cat("Q1 is ",q1.1)
Q1 is  7.89537> qd1 = (q3.1-q1.1)/2
> cat("Quartile deviation is ", qd1)
Quartile deviation is  0.3541667> cqd1 = (q3.1-q1.1)/(q3.1+q1.1)
> cat("coefficient of quartile deviation is ", cqd1)
```

```
coefficient of quartile deviation is  0.0429317> n = sum(f)
> n
[1] 7.92963
> md1 = sum(f*abs(y1-m1))/n
> cat("Mean Deviation is ",md1)
Mean Deviation is  9.298148> cmd1 = md1/m1
> cat("coefficient of mean deviation is ",cmd1)
coefficient of mean deviation is  1.151473> variance1 = sum(f*(y1-m1)^2)/n
> cat("Variance is ",variance1)
Variance is  14.58544> sd1 = sqrt(variance1)
> cat("Standard Deviation is ",sd1)
Standard Deviation is  3.819088> cv1 = sd*100/m1
> cat("Coefficient of Variation is ",cv1)
Coefficient of Variation is  214.9167> range1 = max(y1)-min(y1)
> cat("Range is ",range1)
Range is  4.359259> cr1 = range/max(y1)+min(y1)
> cat("Coefficient of range is ",cr1)
Coefficient of range is  7.025439


> install.packages("moments")
Installing package into 'C:/Users/Aishani Anavkar/Documents/R/win-library/4.0'
(as 'lib' is unspecified)
trying URL 'https://cran.rstudio.com/bin/windows/contrib/4.0/moments_0.14.zip'
Content type 'application/zip' length 56149 bytes (54 KB)
downloaded 54 KB

package 'moments' successfully unpacked and MD5 sums checked

The downloaded binary packages are in
        C:\Users\Aishani Anavkar\AppData\Local\Temp\RtmpuKZJ49\downloaded_packages
> library("moments")
Warning message:
package 'moments' was built under R version 4.0.3
> skewness(y1)
[1] -0.9691102
> kurtosis(y1)
[1] 3.828456

> data.frame(m1,med1,result1,q3.1,q1.1,qd1,cqd1,n,md1,cmd1,variance1,sd1,cv1,range1,cr1)
       m1     med1  result1     q3.1    q1.1       qd1      cqd1       n      md1
75% 8.075 8.175926 8.385185 8.603704 7.89537 0.3541667 0.0429317 7.92963 9.298148
        cmd1 variance1      sd1      cv1   range1      cr1
75% 1.151473  14.58544 3.819088 214.9167 4.359259 7.025439
```

Mean	8.075
Median	8.175926
Mode	8.385185
Q1	8.603704
Q3	7.89537
Quartile Deviation	0.3541667
Coefficient of Quartile Deviation	0.0429317

Mean Deviation	9.298148
Coefficient of Mean Deviation	1.151473
Variance	14.58544
Standard Deviation	3.819088
Coefficient of Variation	214.9167
Range	4.359259
Coefficient of Range	7.025439

#2020

```
> y2 <-
c(8.862962963,8.925925926,10.78518519,21.40740741,23.24074074,10.91111111,9.840740741,10.
31111111,8.707407407,8.025925926,7.077777778,8.807407407)
> m2 = mean(y2)
> cat("Mean is ",m2)
Mean is  11.40864> med2 = median(y2)
> cat("Median is ",med2)
Median is  9.383333> getmode <- function(y2) {
+   uniqv <- unique(y2)
+   uniqv[which.max(tabulate(match(y2, uniqv)))]
+ }
> result2 <- getmode(y2)
> print(result2)
[1] 8.862963
> q3.2 = quantile(y2,0.75)
> cat("Q3 is ",q3.2)
Q3 is  10.81667> q1.2 = quantile(y2,0.25)
> cat("Q1 is ",q1.2)
Q1 is  8.782407> qd2= (q3.2-q1.2)/2
> cat("Quartile deviation is ", qd2)
Quartile deviation is  1.01713> cqd2 = (q3.2-q1.2)/(q3.2+q1.2)
> cat("coefficient of quartile deviation is ", cqd2)
coefficient of quartile deviation is  0.1037936> n = sum(f)
> n
[1] 7.92963
> md2 = sum(f*abs(y2-m2))/n
> cat("Mean Deviation is ",md2)
Mean Deviation is  43.66173> cmd2 = md2/m2
> cat("coefficient of mean deviation is ",cmd2)
coefficient of mean deviation is  3.827075> variance2 = sum(f*(y2-m)^2)/n
> cat("Variance is ",variance2)
Variance is  1244.012> sd2 = sqrt(variance2)
> cat("Standard Deviation is ",sd2)
Standard Deviation is  35.27055> cv2 = sd2*100/m2
> cat("Coefficient of Variation is ",cv2)
Coefficient of Variation is  309.1564> range2 = max(y2)-min(y2)
> cat("Range is ",range2)
Range is  16.16296> cr2 = range2/max(y2)+min(y2)
> cat("Coefficient of range is ",cr2)
```

```
Coefficient of range is  7.773236
> skewness(y2)
[1] 1.631378
> kurtosis(y2)
[1] 4.003669

> data.frame(m2,med2,result2,q3.2,q1.2,qd2,cqd2,n,md2,cmd2,variance2,sd2,cv2,range2,cr2)
          m2     med2  result2     q3.2     q1.2     qd2      cqd2       n      md2
75% 11.40864 9.383333 8.862963 10.81667 8.782407 1.01713 0.1037936 7.92963 43.66173
        cmd2 variance2      sd2      cv2   range2      cr2
75% 3.827075  1244.012 35.27055 309.1564 16.16296 7.773236
```

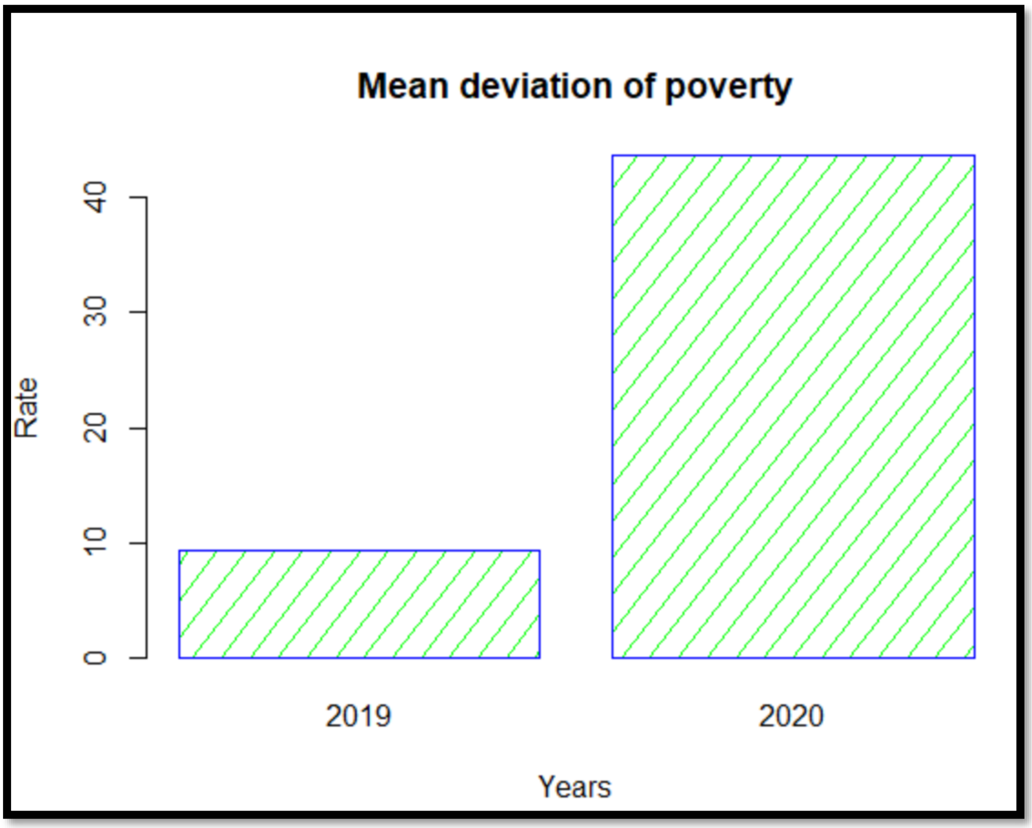
Mean	11.40864
Median	9.383333
Mode	8.862963
Q1	10.81667
Q3	8.782407
Quartile Deviation	1.01713
Coefficient of Quartile Deviation	0.1037936
Mean Deviation	43.66173
Coefficient of Mean Deviation	3.827075
Variance	1244.012
Standard Deviation	35.27055
Coefficient of Variation	309.1564
Range	16.16296
Coefficient of Range	7.773236

#mean dev graph

abc <- c(md1,md2)

years<- c("2019","2020")

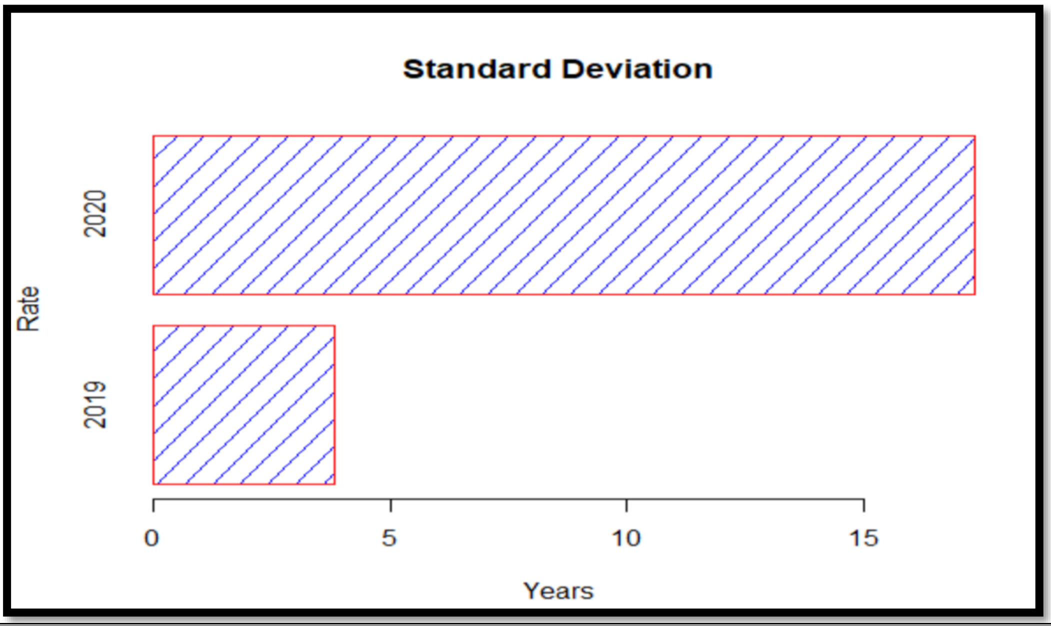
barplot(abc, main="Mean deviation of poverty", xlab = "Years", ylab = "Rate", border = "blue", names.arg = years, col = "green", density = 15, horiz = FALSE)



#standard dev graph

pqr <- c(sd1,sd2)

barplot(pqr, main = "Standard Deviation", xlab = "Years", ylab = "Rate", border = "red", names.arg = years, col = "blue", density = 15, horiz = TRUE)



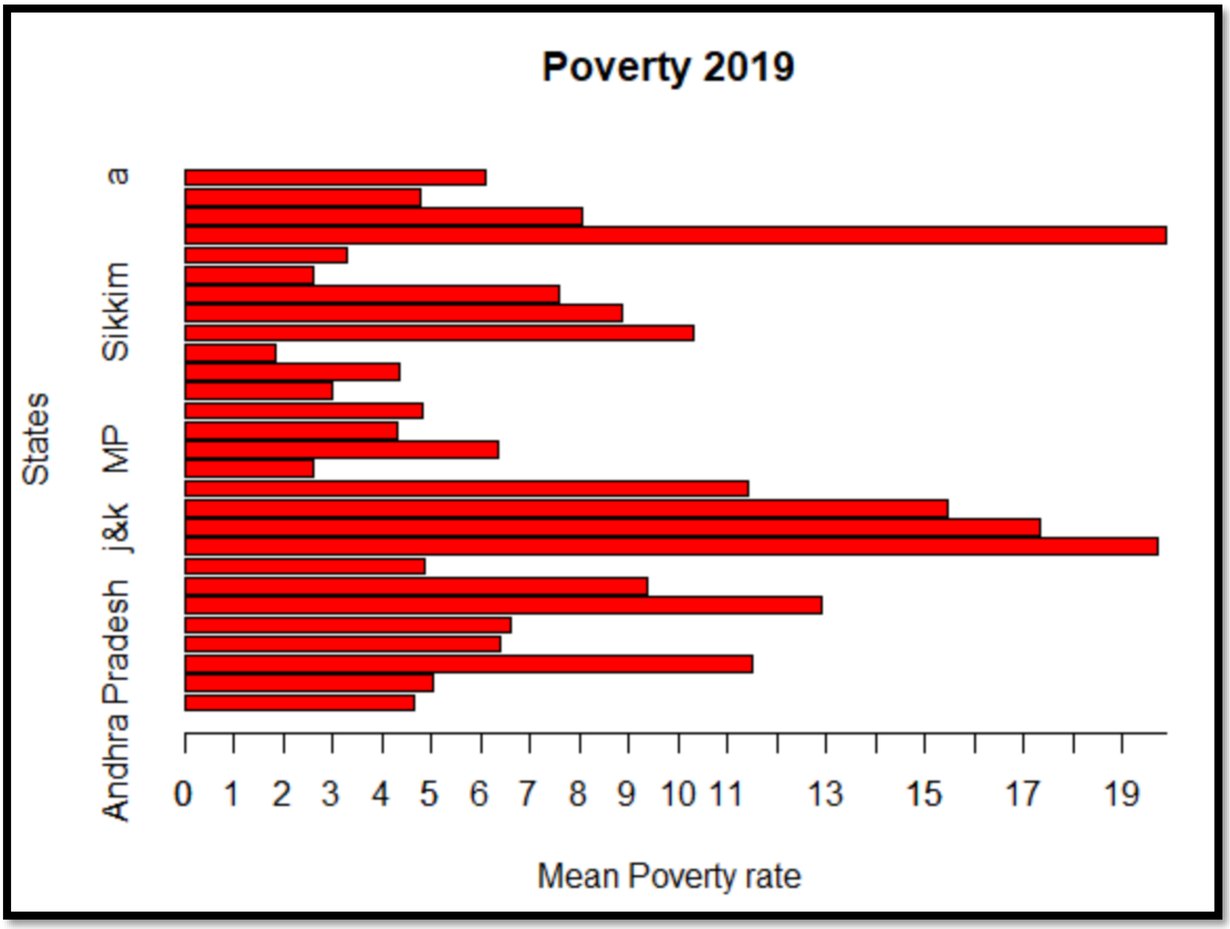
```
> pov = read.csv("C:/Users/Aishani Anavkar/Desktop/Data Science Sem 2/2019.csv")
> pov
                  X Jan.19 Feb.19 Mar.19 Apr.19 May.19
1    Andhra Pradesh    5.2    5.8    5.2    4.0    4.4
2             Assam    5.1    5.4    6.8    5.0    4.8
3             Bihar    8.7   11.5   12.3   12.2   10.6
4      Chhattisgarh    7.9    7.3    8.0    3.4    9.8
5             Delhi   12.2   11.6   13.1    4.4   12.3
6               Goa    7.5    7.1    8.9    9.3    2.8
7           Gujarat    5.8    5.5    4.5    3.0    3.4
8           Haryana   17.9   21.3   19.0    1.4   18.3
9  Himachal Pradesh   13.9   13.8   18.8   19.6   13.4
10  Jammu & Kashmir   17.1    5.2   15.2   10.6   16.3
11        Jharkhand    9.1    6.9   13.6   12.2    9.9
12        Karnataka    1.5    2.0    1.3    0.5    5.9
13           Kerala    6.6    7.4    6.4    3.3    6.4
14   Madhya Pradesh    4.8    2.5    5.4    4.5    3.7
15      Maharashtra    5.7    3.7    3.3    4.1    4.7
16        Meghalaya    2.6    6.4    2.0    2.3    4.1
17           Odisha    4.2    6.6    2.8    6.4    4.0
18       Puducherry    1.7    0.9    3.9    0.4    0.8
19           Punjab   10.5   12.4    9.8    7.5   10.7
20        Rajasthan    7.7    1.6    9.7    1.3    6.6
21           Sikkim   13.2    8.3    6.8    4.8   13.3
22       Tamil Nadu    2.2    1.9    1.7    1.2    0.9
23        Telangana    2.6    2.4    2.5    2.7    2.0
24          Tripura   32.6    6.2   10.0    5.4   30.9
25    Uttar Pradesh    9.6    5.5    8.9    6.4   11.3
26      Uttarakhand    3.5    5.1    5.0    6.4    3.6
27      West Bengal    7.0    6.5    6.1    2.5    6.4
   Jun.19 Jul.19 Aug.19 Sep.19 Oct.19 Nov.19 Dec.19
1     3.3    4.3    3.7    5.4    3.9    5.1    5.4
2     5.9    4.1    6.5    5.1    5.8    4.9    0.9
3    10.6   13.8   11.8   10.1   12.7   13.1   10.7
4     8.1    5.5    5.1    6.6    7.8    4.2    5.4
5    12.7   14.6   13.6   20.4   12.5   16.0   11.2
6    10.7   11.8    3.7    3.5   10.4   24.7   11.8
7     5.5    4.8    3.9    6.2    5.2    5.9    4.4
8    22.1   19.5   28.7   17.2   23.0   20.4   27.6
9    12.6   20.7   19.2   15.6   16.7   23.3   20.2
10   14.7   16.3   22.4   19.9   20.7   14.6   12.5
11   11.7   11.5   14.3   10.3    9.9   10.6   17.0
12    5.6    1.3    0.7    3.3    5.8    2.2    0.9
13    6.0    6.2    9.1    5.4    7.4    5.8    6.2
14    4.9    4.9    5.5    4.4    3.4    3.7    3.9
15    5.3    4.8    5.3    5.5    5.4    5.3    4.9
16    5.1    1.7    1.6    1.2    4.3    1.8    2.5
17    4.3    3.0    3.6    4.2    4.3    4.3    4.4
18    0.0    0.0    7.5    0.8    1.2    0.9    4.0
19   12.6   10.4    8.7   11.3   13.0    8.3    8.4
```

```
20  11.9  10.2  13.1   7.5  14.2  11.5  11.0
21   7.0   6.8   2.1   6.4  17.1   9.7   3.3
22   1.2   4.8   5.8   1.8   1.3   2.5   5.7
23   4.4   2.9   2.4   2.0   7.1   6.1   2.3
24  17.4  23.4  27.9  27.2  27.3  15.8  14.6
25   1.2   9.8  12.3   4.1  10.2   8.1   9.4
26   3.0   6.1   6.5   2.1   4.8   5.8   5.4
27   6.3   6.3   6.1   6.4   7.1   6.1   6.2
> a<- c(5.2,5.8,5.2,4,4.4,3.3,4.3,3.7,5.4,3.9,5.1,5.4)
> length(a)
[1] 12
> ma<- mean(a)
> ma
[1] 4.641667
> b<- c(5.1,5.4,6.8,5,4.8,5.9,4.1,6.5,5.1,5.8,4.9,0.9)
> length(b)
[1] 12
> mb<- mean(b)
> mb
[1] 5.025
> c<- c(8.7,11.5,12.3,12.2,10.6,10.6,13.8,11.8,10.1,12.7,13.1,10.7)
> length(c)
[1] 12
> mc<- mean(c)
> mc
[1] 11.50833
> d<- c(7.9,7.3,3.7,3.4,9.8,8.1,5.5,5.1,8.6,7.8,4.2,5.4)
> length(d)
[1] 12
> md<- mean(d)
> md
[1] 6.4
> e<- c(7.9,7.3,8,3.4,9.8,8.1,5.5,5.1,6.6,7.8,4.2,5.4)
> length(e)
[1] 12
> me<- mean(e)
> me
[1] 6.591667
> f<- c(12.2,11.6,13.1,4.4,12.3,12.7,14.6,13.6,20.4,12.5,16,11.2)
> length(f)
[1] 12
> mf<- mean(f)
> mf
[1] 12.88333
> g<- c(7.5,7.1,8.9,9.3,2.8,10.7,11.8,3.7,3.5,10.4,24.7,11.8)
> length(g)
[1] 12
> mg<- mean(g)
> mg
[1] 9.35
> h<- c(5.8,5.5,4.5,3,3.4,5.5,4.8,3.9,6.2,5.2,5.9,4.4)
```

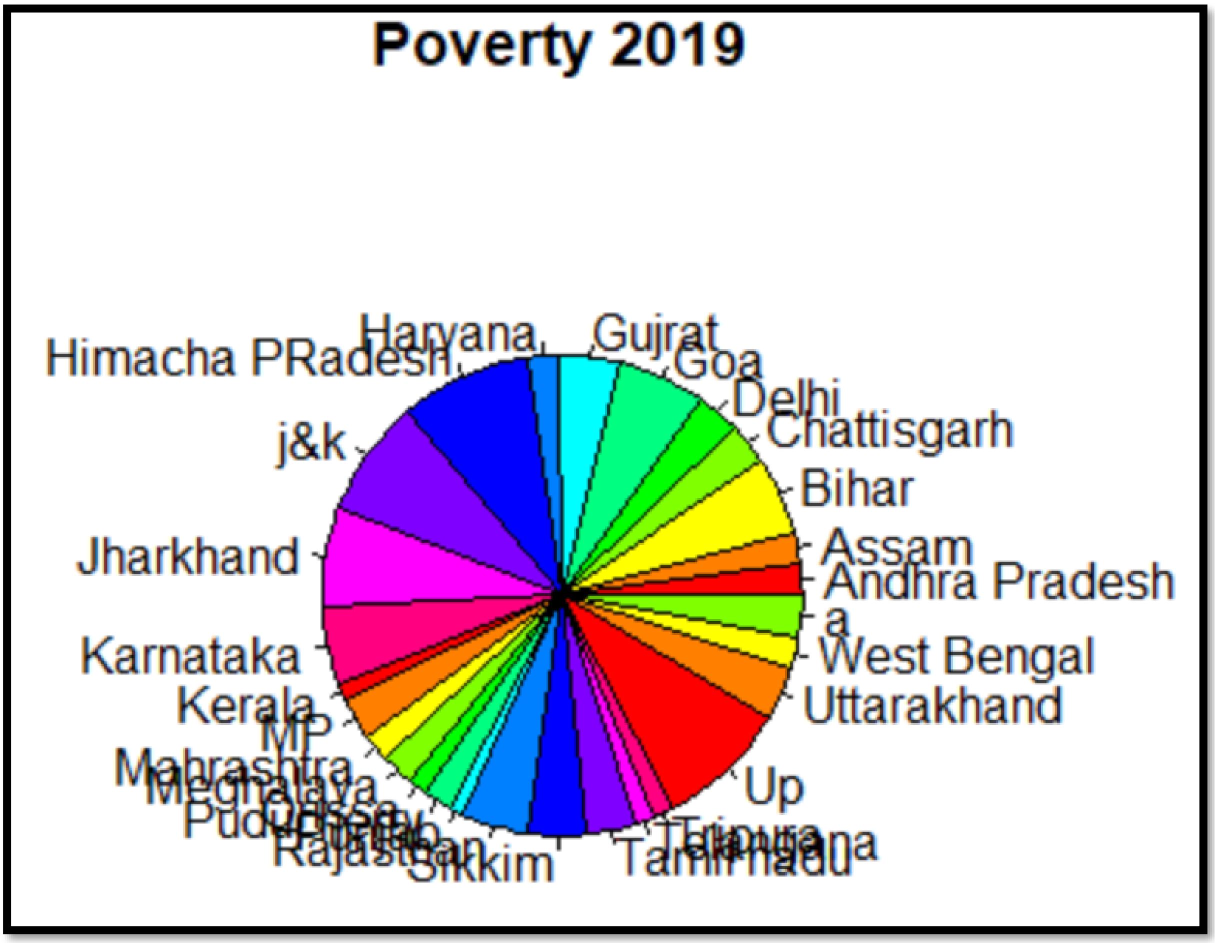
```
> length(h)
[1] 12
> mh<- mean(h)
> mh
[1] 4.841667
> i<- c(17.9,21.3,19,1.4,18.3,22.1,19.5,28.7,17.2,23,20.4,27.6)
> length(i)
[1] 12
> mi<- mean(i)
> mi
[1] 19.7
> j<- c(13.9,13.8,18.8,19.6,13.4,12.6,20.7,19.2,15.6,16.7,23.3,20.2)
> length(j)
[1] 12
> mj<- mean(j)
> mj
[1] 17.31667
> k<- c(17.1,5.2,15.2,10.6,16.3,14.7,16.3,22.4,19.9,20.7,14.6,12.5)
> length(k)
[1] 12
> mk<- mean(k)
> mk
[1] 15.45833
> l<- c(9.1,6.9,13.6,12.2,9.9,11.7,11.5,14.3,10.3,9.9,10.6,17)
> length(l)
[1] 12
> ml<- mean(l)
> ml
[1] 11.41667
> m<- c(1.5,2,1.3,0.5,5.9,5.6,1.3,0.7,3.3,5.8,2.2,0.9)
> length(m)
[1] 12
> mm<- mean(m)
> mm
[1] 2.583333
> o<- c(6.6,7.4,6.4,3.3,6.4,6,6.2,9.1,5.4,7.4,5.8,6.2)
> length(o)
[1] 12
> mo<- mean(o)
> mo
[1] 6.35
> p<- c(4.8,2.5,5.4,4.5,3.7,4.9,4.9,5.5,4.4,3.4,3.7,3.9)
> length(p)
[1] 12
> mp<- mean(p)
> mp
[1] 4.3
> q<- c(5.7,3.7,3.3,4.1,4.7,5.3,4.8,5.3,5.5,5.4,5.3,4.9)
> length(q)
[1] 12
> mq<- mean(q)
```

```
> mq
[1] 4.833333
> r<- c(2.6,6.4,2,2.3,4.1,5.1,1.7,1.6,1.2,4.3,1.8,2.5)
> length(r)
[1] 12
> mr<- mean(r)
> mr
[1] 2.966667
> s<- c(4.2,6.6,2.8,6.4,4,4.3,3,3.6,4.2,4.3,4.3,4.4)
> length(s)
[1] 12
> ms<- mean(s)
> ms
[1] 4.341667
> t<- c(1.7,0.9,3.9,0.4,0.8,0,0,7.5,0.8,1.2,0.9,4)
> length(t)
[1] 12
> mt<- mean(t)
> mt
[1] 1.841667
> u<- c(10.5,12.4,9.8,7.5,10.7,12.6,10.4,8.7,11.3,13,8.3,8.4)
> length(u)
[1] 12
> mu<- mean(u)
> mu
[1] 10.3
> v<- c(7.7,1.6,9.7,1.3,6.6,11.9,10.2,13.1,7.5,14.2,11.5,11)
> length(v)
[1] 12
> mv<- mean(v)
> mv
[1] 8.858333
> w<- c(13.2,8.3,6.8,4.8,13.3,9,6.8,2.1,6.4,7.1,9.7,3.3)
> length(w)
[1] 12
> mw<- mean(w)
> mw
[1] 7.566667
> x<- c(2.2,1.9,1.7,1.2,0.9,1.2,4.8,5.8,1.8,1.3,2.5,5.7)
> length(x)
[1] 12
> mx<- mean(x)
> mx
[1] 2.583333
> y<- c(2.6,2.4,2.5,2.7,2,4.4,2.9,2.4,2,7.1,6.1,2.3)
> length(y)
[1] 12
> my<- mean(y)
> my
[1] 3.283333
> z<- c(32.6,6.2,10,5.4,30.9,17.4,23.4,27.9,27.2,27.3,15.8,14.6)
```

```
> length(z)
[1] 12
> mz<- mean(z)
> mz
[1] 19.89167
> aa<- c(9.6,5.5,8.9,6.4,11.3,1.2,9.8,12.3,4.1,10.2,8.1,9.4)
> length(aa)
[1] 12
> maa<- mean(aa)
> maa
[1] 8.066667
> ab<- c(3.5,5.1,5,6.4,3.6,3,6.1,6.5,2.1,4.8,5.8,5.4)
> length(ab)
[1] 12
> mab<- mean(ab)
> mab
[1] 4.775
> ac<- c(7,6.5,6.1,2.5,6.4,6.3,6.3,6.1,6.4,7.1,6.1,6.2)
> length(ac)
[1] 12
> mac<- mean(ac)
> mac
[1] 6.083333
>
> #plotting graph
> library(plotrix)
> group =
c(ma,mb,mc,md,me,mf,mg,mh,mi,mj,mk,ml,mm,mo,mp,mq,mr,ms,mt,mu,mv,mw,mx,my,mz,maa,
mab,mac)
> group
 [1]  4.641667  5.025000 11.508333  6.400000  6.591667
 [6] 12.883333  9.350000  4.841667 19.700000 17.316667
[11] 15.458333 11.416667  2.583333  6.350000  4.300000
[16]  4.833333  2.966667  4.341667  1.841667 10.300000
[21]  8.858333  7.566667  2.583333  3.283333 19.891667
[26]  8.066667  4.775000  6.083333
> place = c("Andhra Pradesh",'Assam','Bihar','Chattisgarh','Delhi','Goa','Gujrat','Haryana','Himacha
PRadesh','j&k','Jharkhand','Karnataka','Kerala','MP','Mahrashtra','Meghalaya','Orissa','Puducherry','P
unjab','Rajasthan','Sikkim','Tamil nadu','Telangana','Tripura','Up','Uttarakhand',"West Bengal",'a')
> length(place)
[1] 28
> barplot(group,names.arg = place, xlab = "Mean Poverty rate", ylab = "States", col = "red", main =
"Poverty 2019",horiz = TRUE)
> axis(1, seq(0,25,1))
```




```
> #plotting pie chart
> library(plotrix)
> group =
c(ma,mb,mc,md,me,mf,mg,mh,mi,mj,mk,ml,mm,mo,mp,mq,mr,ms,mt,mu,mv,mw,mx,my,mz,maa,
mab,mac)
> group
 [1]  4.641667  5.025000 11.508333  6.400000  6.591667
 [6] 12.883333  9.350000  4.841667 19.700000 17.316667
[11] 15.458333 11.416667  2.583333  6.350000  4.300000
[16]  4.833333  2.966667  4.341667  1.841667 10.300000
[21]  8.858333  7.566667  2.583333  3.283333 19.891667
[26]  8.066667  4.775000  6.083333
> place = c("Andhra Pradesh",'Assam','Bihar','Chattisgarh','Delhi','Goa','Gujrat','Haryana','Himacha
PRadesh','j&k','Jharkhand','Karnataka','Kerala','MP','Mahrashtra','Meghalaya','Orissa','Puducherry','P
unjab','Rajasthan','Sikkim','Tamil nadu','Telangana','Tripura','Up','Uttarakhand',"West Bengal",'a')
> pie(group,labels = place, main = "Poverty 2019", col = rainbow(length(x)))
```



Conclusion

In 2019, Uttar Pradesh showed the highest poverty rate and Odisha showed the lowest poverty rate. Whereas, in 2020, Gujrat showed the highest poverty rate and Maharashtra showed the lowest poverty rate.

In 2019, the month of around Feb to April showed the lowest poverty rate whereas in this period of 2020, India went through the highest poverty rate.

Poverty increased by the rate of 44% in 2020.

2019 data is skewed to the left and 2020 data is skewed to the right. The kurtosis for both the data are light tailed. Skewness is a measure of symmetry, or more precisely, the lack of symmetry.