



# VISUVALIZATION STUDY OF ZONAL WISE INFANT MORTALITY RATE IN INDIA

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**ABSTRACT:** The Infant Mortality Rate (IMR) is a key indicator of a country's healthcare system and is a measure of the number of infant deaths per 1000 live births. SDG 3 refers to the third Sustainable Development Goal, which is "Good Health and Well-being" set by the United Nations. One of the targets of SDG 3 is to reduce the global neonatal mortality rate to at least as low as 12 per 1,000 live births and under-five mortality rate to at least as low as 25 per 1,000 live births by 2030. In India, there are significant disparities in IMR across different regions and zones. This abstract aims to provide a descriptive summary of the Infant Mortality Rate in India zone-wise. In order to understand why some zones in India have high IMRs, this research will analyze the IMR by zone in India. The IMR is calculated in the study and its historical patterns are examined using secondary data taken from the website of the Reserve Bank of India. The findings demonstrate a large variance in IMR across zones, with the centre zone exhibiting the highest IMR and the southern zone exhibiting the lowest and also give highest and lowest IMR in each zone.

**Keywords :** *Infants, IMR, SDGs, Descriptive Measures.*

## Introduction

**India**, officially the **Republic of India** is a country in the Asian continent of South Asia. India is the 17<sup>th</sup> largest country by area; having the **second-highest population** in the world comprising the 18% of the world population. From 2001 to 2011, its population increased by 17.64% as opposed to 21.54% during the prior decade (1991–2001). According to the 2011 Census, the sex ratio was estimated as 940:1000; i.e. there are 940 females for every 1,000 males. The current fertility rate of India is 2.3 births per woman and has remained constant for the past two decades. At this rate, the population of India is expected to grow up to 1.8

billion by 2050. In India, the average life expectancy is 70 years; for women, it is 71.5 years and for men, it is 68.7 years. 93 doctors are present for every 100,000 persons.

Among the different mortality rates, the child mortality rate in India, for children under the age of five, was 509 deaths per thousand births in 1880. This means that over half of all children born in 1880 did not survive past the age of five, and it remained this way until the twentieth century. India has reduced its infant mortality rate (IMR, deaths per 1,000 live births) by 68%, as we said, in the last 41 years – from 130 in 1975 to 41 in 2015-16, as data from the National Family Health Survey 2015-16 reveal.

One of the most important indicators of the general health of a population is the Infant Mortality Rate (IMR). It is the proportion of infant deaths under one year of age per 1,000 live births. As it reflects the standard of care received, maternal health, and societal conditions, infant mortality rates are a crucial indicator of the health and well-being of a population.

India is divided into six major zones - *North, South, East, West, Northeast, and Central* - based on geographical location. Each zone has its unique social, economic, and healthcare-related challenges that affect the health and well-being of its population. Therefore, analyzing the infant mortality rate zone-wise can help identify the areas with higher infant mortality rates and devise targeted interventions to address the underlying causes. By doing so, India can achieve its goal of reducing infant mortality rates and improve the overall health and well-being of its population.

### **Infant Mortality Rate**

Infant mortality is the rate at which the death of young children takes place under the age of 1. It refers to the death of an infant dying under 1 year of age given a particular time period. This rate is calculated by IMR, an abbreviated form of infant mortality rate. This shows us the probability of the rate of death of young children less than one year of age per 1000 live births.

This rate acts as a physical health indicator of the human community. High IMR shows poor health conditions are there in the country along with other requirements which play a vital role in developing the good health of the child. This rate helps in understanding the causes as well as the extent of deaths of infants in a particular region.

Among the under-five mortality, infant mortality is a significant factor. Infant mortality rates reflect child survival, just like under-five mortality does. They also reflect the social, economic, and environmental contexts in which kids (and other members of society) live, including their access to healthcare.

The number of children born alive and the number of children who were born alive but passed away before becoming one year old must be known in order to compute the IMR. In order to arrive at a standard outcome, the number of newborn deaths is then divided by the number of infant births, and the resulting number is then multiplied by 1000. Also, depending on the desired level of comparison, it can be multiplied by 10,000 or one million. The infant mortality rate is determined by the following formula:

$$\text{IMR} = \frac{\text{the number of infant mortality in a year.}}{\text{the number of live birth in a year}} \times 100$$

## Zonal Map of India

India is divided into six zones, namely the North Zone, South Zone, East Zone, West Zone, Central Zone, and North East Zone, as can be seen by looking at the zonal map of India. 28 states and 8 union territories are all represented in these zones. The sub national administrative divisions of India are made up of a hierarchy of administrative divisions that is nested within one another. For the same level of subdivision, Indian states and territories frequently employ multiple local titles (e.g., the mandals of Andhra Pradesh and Telangana correspond to tensile of Uttar Pradesh and other Hindi-speaking states but to talukas of Gujarat, Goa, Karnataka, Kerala, Maharashtra, and Tamil Nadu). Only rural regions have the smaller subdivisions (villages and blocks). Instead of these rural subdivisions, urban local bodies exist in urban areas.

*Northern Zonal Council*, comprising Chandigarh, Delhi, Haryana, Himachal Pradesh, Jammu and Kashmir, utter Pradesh, Punjab, and Rajasthan.

*North Eastern Council*, comprising Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland and Tripura; The State of Sikkim has also been included in the North Eastern Council

*Central Zonal council* comprising the States of Uttar Pradesh, Uttarakhand, Madhya Pradesh, and Chhattisgarh.

*Eastern Zonal Council*, which consists of West Bengal, Bihar, Jharkhand, and Odisha.

*Western Zonal Council*, which consist of Dadra and Nagar Haveli and Daman and Diu, Goa, Gujarat, and Maharashtra

*Southern Zonal Council* comprising the sates of Andhra Pradesh, Karnataka, Kerala, Pondicherry, Tamil Nadu, and Telangana.

## Source of Data

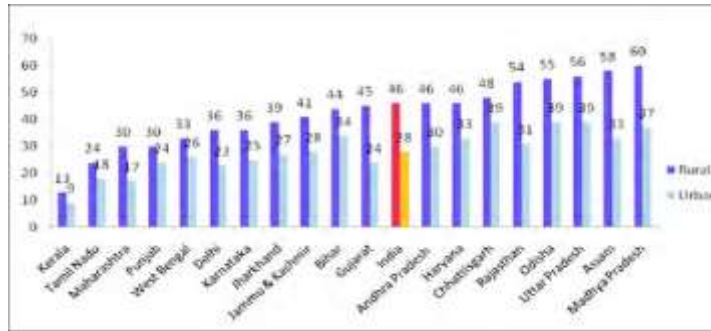
The analysis makes use of secondary data, including state-by-state infant mortality rates from 2011 to 2020.

## Exploratory Data Analysis

Methods of describing the characteristics of a data set. Helps exploring and making conclusions about the data in order to make rational decisions.

- Descriptive Statistics involves describing, summarizing and organizing the data so it can be easily understood.
- Graphical displays are often used along with the quantitative measures to enable clarity of communication.

With 32 infant deaths per 1,000 live births, India is neither among the countries with the highest nor among those with the lowest infant mortality rate. Its decrease indicates an increase



**FIG:1 Infant Mortality Rate of Indian States**

Its decrease indicates an increase in medical care and hygiene, as well as a decrease in female infanticide. In India the state with lowest infant mortality rate is Kerala. It is recorded as 12, which means 12 infants die per 1000 live birth. Madhya Pradesh has the highest infant mortality rate in India of about 47/1,000

**Zonal Wise Infant Mortality Rate in India**

**Table:1 South Zone**

	Mean	Std. Deviation
Andhra Pradesh	34.30	6.651
Karnataka	26.70	5.143
Kerala	9.90	2.601
Tamil Nadu	17.90	3.107
Telangana	20.00	14.461

**Table:4 East Zone**

	Mean	Std. Deviation
Bihar	37.40	6.257
Jharkhand	32.00	4.830
Odisha	45.50	6.916
West Bengal	25.90	4.795
Valid N (listwise)		

**Table:2 Northern Zone**

	Mean	Std. Deviation
Himachal Pradesh	27.10	7.810
Haryana	34.70	6.093
Punjab	23.00	3.972
Uttarakhand	32.10	4.095
Uttar Pradesh	46.00	5.981
Valid N (list wise)		

**Table:5 Central Zone**

	Mean	Std. Deviation
Chhattisgarh	42.10	3.725
Madhya Pradesh	50.20	4.984
Valid N (listwise)		

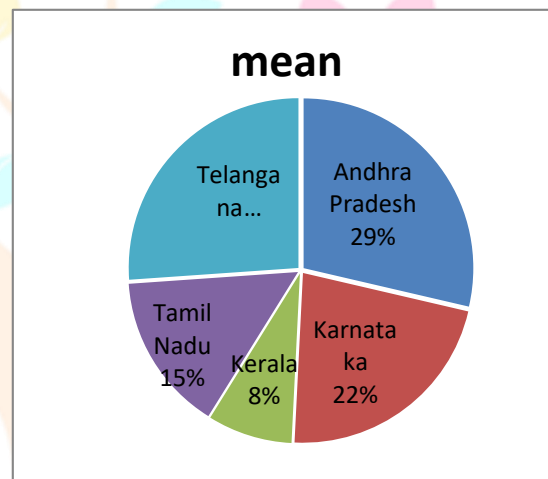
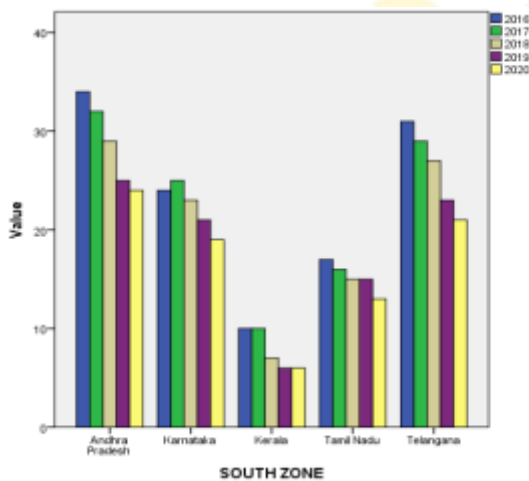
**Table:3 West Zone**

	Mean	Std. Deviation
Goa	8.60	1.713
Gujarat	31.90	5.744
Rajasthan	42.00	6.515
Maharashtra	20.70	3.234
Valid N (list wise)		

**Table:6 Northeast zone**

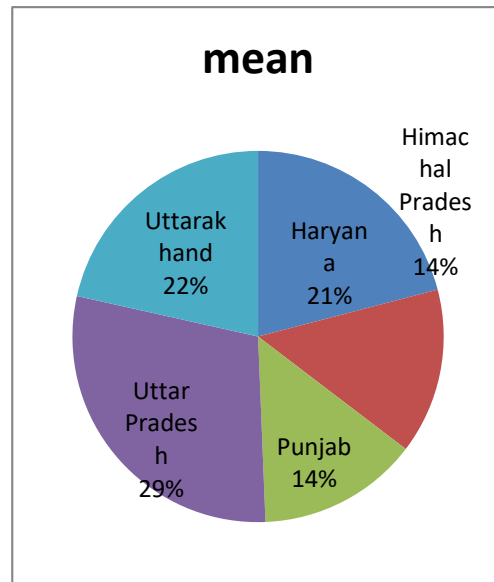
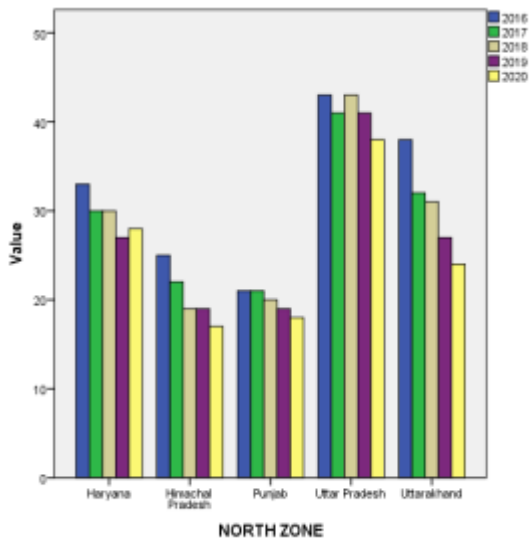
	Mean	Std. Deviation
Arunachal Pradesh	32.20	5.574
Assam	46.50	6.687
Manipur	10.10	1.663
Meghalaya	40.90	7.651
Mizoram	22.10	14.012
Nagaland	11.30	6.550
Tripura	24.30	4.057
Sikkim	15.40	7.806

**Visualization of Zone Wise IMR & Mean IMR during 2015 to 2020**



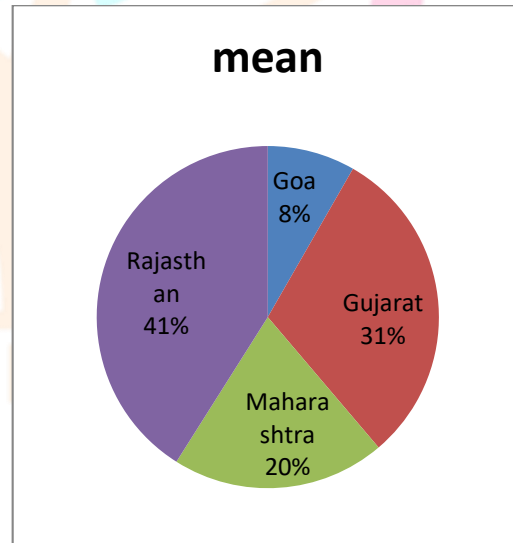
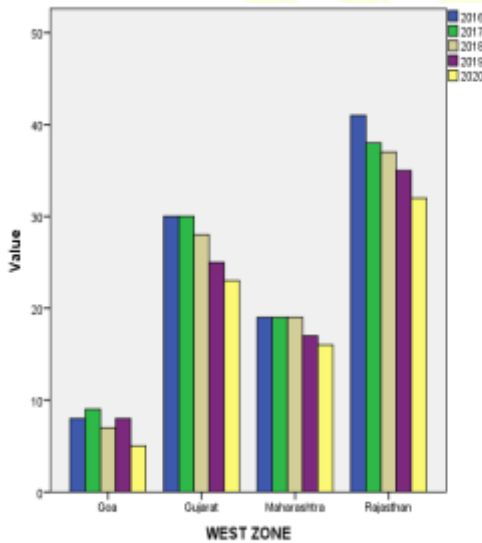
**FIGURE:1 Southern Zone IMR**

**Interpretation:** According to the above charts, infant mortality in southern states of India decreased between 2016 and 2020 and In southern zone Andhra Pradesh has higher IMR and kerala has lower IMR.



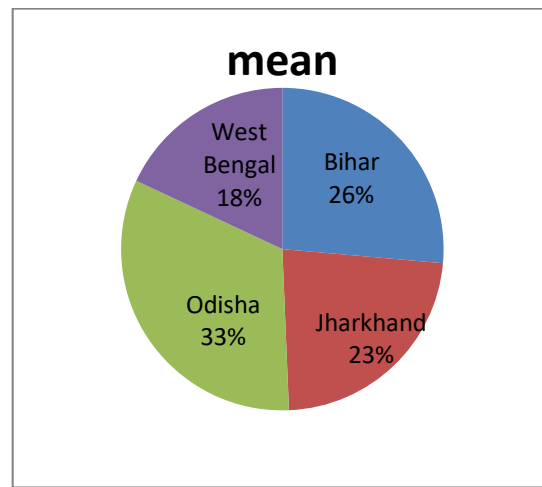
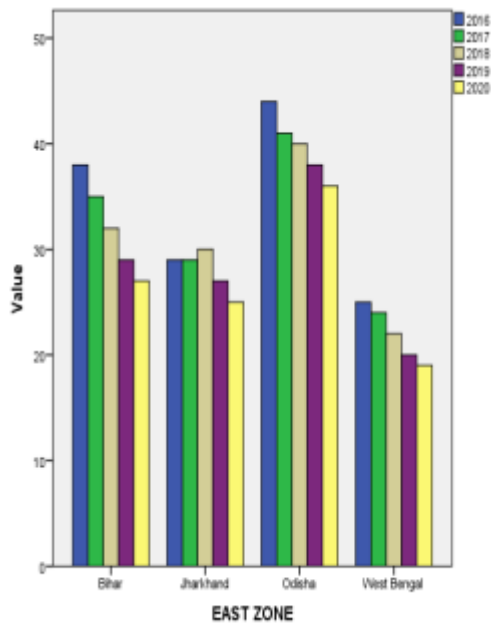
**FIGURE:2 Northern Zone IMR**

**Interpretation:** According to the above bar graph, infant mortality in north states of India decreased between 2016 and 2020 and in north zone Uttar Pradesh has higher IMR and Punjab has lower IMR.



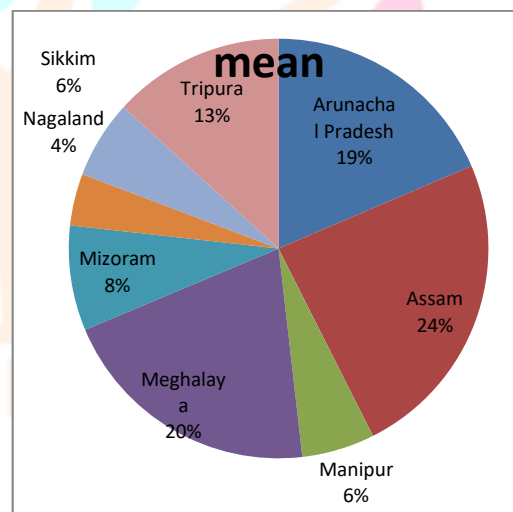
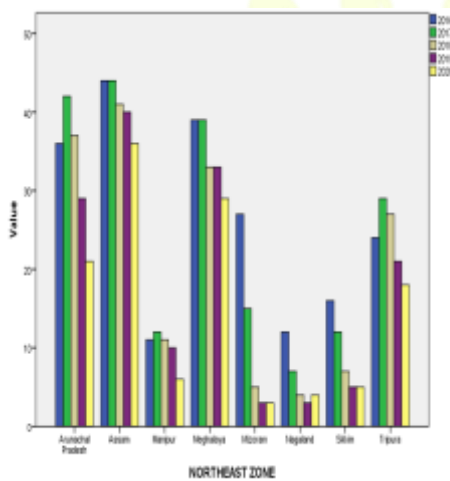
**FIGURE:3 West Zone IMR**

**Interpretation:** According to the above chart, infant mortality in west states of India decreased between 2016 and 2020 and In west zone Rajasthan has higher IMR and Goa has lower IMR.



**FIGURE :4 East Zone IMR**

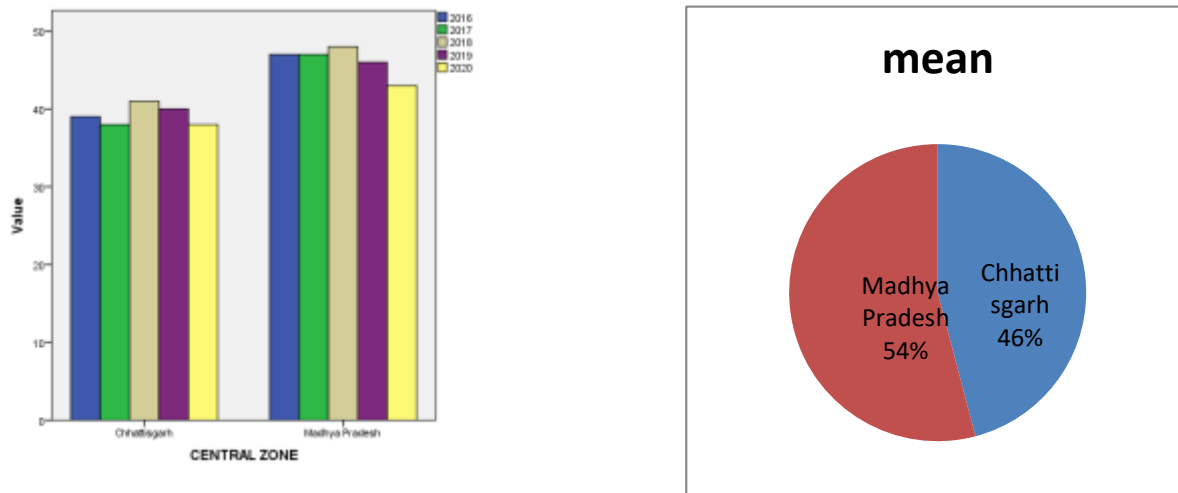
**Interpretation:** According to the above chart, infant mortality in East states of India decreased between 2015 and 2020 and In East zone Odisha has higher IMR and Jharkhand has lower IMR



**FIGURE:5 Northeast Zone IMR**

**Interpretation:** According to the above chart, infant mortality in Northeast states of India decreased between 2016 and 2020 and In Northeast zone Assam has higher IMR and Mizoram has lower IMR

Research Through Innovation



**FIGURE 6 Central Zone IMR**

**Interpretation:** According to the above chart, infant mortality in central states of India decreased between 2016 and 2020 and in central zone Madhya Pradesh has higher IMR and Chhattisgarh has lower IMR.

### Conclusion

In India, Kerala is the state with least infant mortality rate (9.90%) in South Zone and the state Madhya Pradesh is having the highest Infant mortality rate (50.20%) which indicates that the literacy plays a major role where Kerala is the highest literacy rate. Hence the government has to take initiative in order to increase the literacy in other parts of the India. These data can be used to compare the relative levels of infant mortality in each zone, able to understand and assess the distribution of infant mortality rates across different zones, and spot any patterns or trends suitable to the region.

Overall, descriptive statistics can be a helpful tool for summarizing and analyzing data especially visualization of the data with charts and tables provides more envisioned effects on infant mortality, but more investigation and interpretation may be required to fully comprehend the causes of these trends and to guide the development of policies aimed at lowering infant death.

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