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Geographical Analysis of Covid 19: Its Relationship with Socio-Economic Conditions in India

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ABSTRACT

The present paper aims to analyse the spatial variations in spread of corona cases and corona deaths and level of socio-economic conditions in India. The causal relationship between corona cases and corona deaths and twenty selected socio-economic variables has been taken into account. The state/union territory has been taken as the smallest unit of study. The entire research work is based on secondary sources of data. The study reveals states with better socio-economic conditions recorded higher corona cases and states with poor socio-economic conditions recorded lesser corona cases. States such as Maharashtra, Kerala, Andhra Pradesh, Tamil Nadu and Karnataka with better socio-economic conditions recorded a greater number of corona deaths.

KEYWORDS: *Corona Cases, Corona Deaths, Socio-Economic Conditions*

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INTRODUCTION

An outbreak of a novel coronavirus, severe acute respiratory syndrome coronavirus 2 (SARS- CoV-2), emerged in late December 2019 in Wuhan City, Hubei Province in China and caused a typical pneumonia called coronavirus disease 2019 (COVID-19). The disease is characterized by fever, cough, fatigue, and ground-glass opacity on chest tomography etc. SARS-CoV-2 had swept the entire of China, including Hong Kong, Macao, and Taiwan, in only 1 month. It has spread across the entire world and affected people of all ages. WHO issued a public health emergency of international concern on 30 January 2020 and declared COVID-19 as a pandemic on 11 March 2020.

CoVs are enveloped, positive-stranded RNA viruses possessing a comparatively large genome approaching 30 kb and comprising four structural proteins, namely, spike (S), nucleocapsid (N) envelope (E), and membrane (M).

There are four known genera for coronaviruses, namely: alpha-, beta-, gamma-, and delta- coronavirus. All of the four genera are believed to have a zoonotic origin and infect both animals and humans. Whereas the alpha and beta genera originate from bats, the gamma and delta genera are derived from avian and pig gene pools.

Coronaviruses belong to the family of *Coronaviridae*. Bats have been recognized as natural reservoir and vectors of a variety of coronaviruses and the viruses have crossed species barriers to infect humans and many other different kinds of animals, including avians, rodents, and chiropters. Coronavirus may cause respiratory and neurological diseases.

Coronaviruses are important pathogens for human and vertebrates. They can infect respiratory, gastrointestinal, hepatic, and central nervous system of human, livestock, birds, bat, mouse, and many other wild animals. The outbreaks of the severe acute respiratory syndrome (SARS) in 2002-2003 and the Middle East respiratory syndrome (MERS) in 2012 have demonstrated the possibility of animal-to-human and human-to-human transmission of newly emerging coronaviruses. The sporadic emergence and outbreaks of new types of coronaviruses remind us that coronaviruses are a severe global health threat. It is highly likely that new coronaviruses outbreaks are unavoidable in the future due to changes of the climate and ecology, and the increased interactions of human with animals. Most people who develop COVID-19 start noticing symptoms within 2 to 14 days after being exposed to the novel coronavirus known as SARS-CoV-2.

The outbreak of COVID-19 originated from the four admitted patients with pneumonia who had been working in Wuhan Huanan seafood wholesale market, doing business in live poultry, aquatic products, and some wild animals. Wuhan city is a major transportation hub with a population of more than 11 million people. Most of the patients visited the fish and wild animal market in Wuhan. This fish and wild animal market also sold live animals such as poultry, bats, marmots, and snakes. The WHO report claimed that the SARS-CoV-2 could be detected in the environmental samples collected from the seafood market. The current evidence strongly supports that the SARS-CoV-2 was derived from bats. All three epidemics (SARS, MERS, COVID-19) caused by these

three coronaviruses are linked to wild animal markets. SARS and MERS are defined as zoonotic disease, and transmitted by intermediated hosts (palm civets and dromedary camels respectively). Studies have shown that pangolins and snakes at wild animal markets were likely to be intermediate hosts of SARS-CoV-2. Human-to-human transmission was considered as a major transmission mode.

SARS-CoV-2, the virus that causes COVID-19, has had a major impact on human health globally; infecting a large number of people; causing severe disease and associated long-term health sequelae; resulting in death and excess mortality, especially among older and vulnerable populations; interrupting routine healthcare services; disruptions to travel, trade, education and many other societal functions; and more broadly having a negative impact on peoples physical and mental health. Since the start of the COVID-19 pandemic, WHO has received several reports of unusual public health events possibly due to variants of SARS-CoV-2. WHO routinely assesses if variants of SARS-CoV-2 result in changes in transmissibility, clinical presentation and severity, or if they impact on countermeasures, including diagnostics, therapeutics and vaccines. Previous reports of the D614G mutation and the recent reports of virus variants from the Kingdom of Denmark, the United Kingdom of Great Britain and Northern Ireland, and the Republic of South Africa have raised interest and concern in the impact of viral changes.

OBJECTIVES OF THE STUDY

The present study has been undertaken with the following objectives:

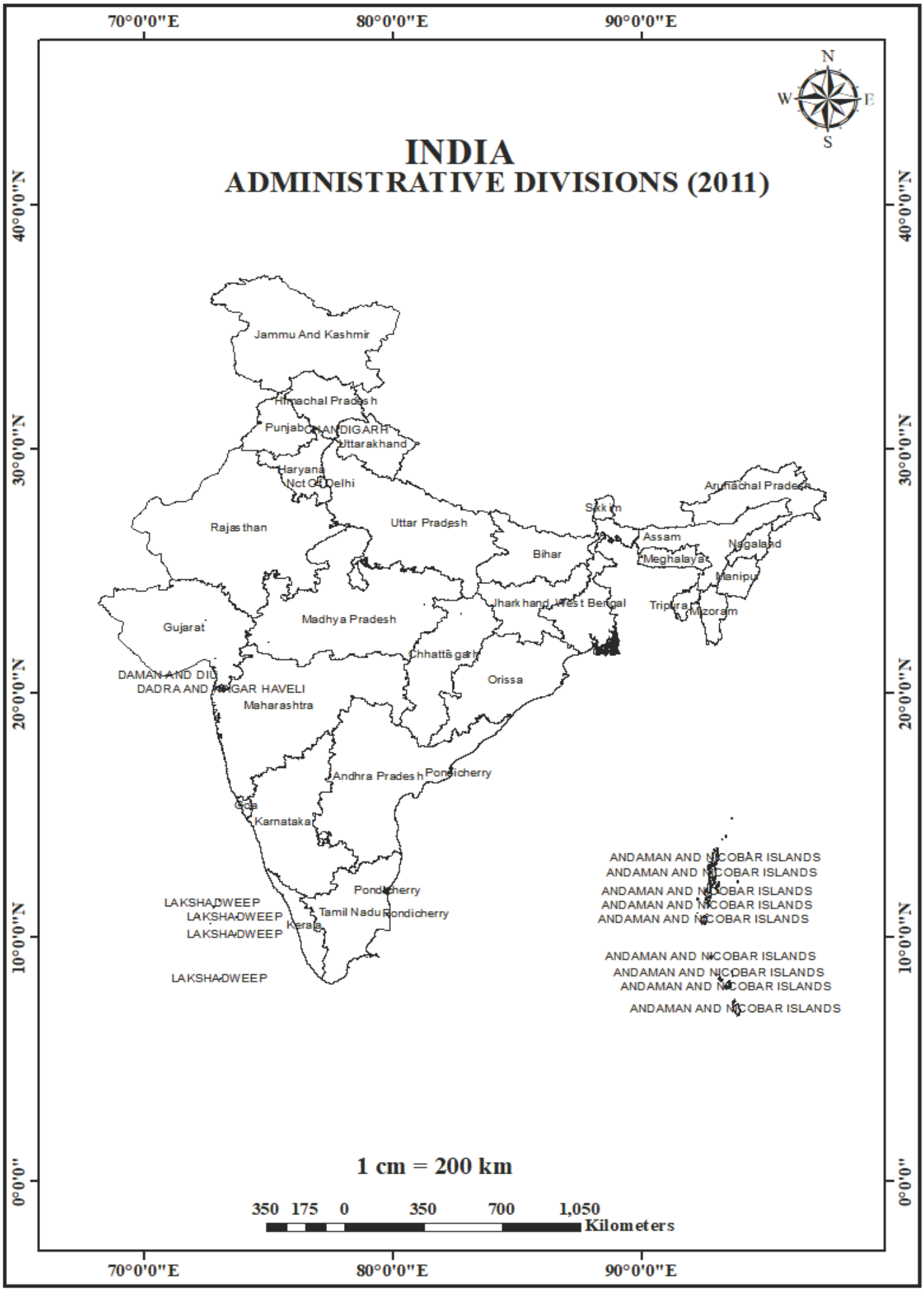
1. To find out the spatial variations of the spread of corona cases, corona deaths and level of socio-economic conditions.
2. To examine the relationship between corona cases, corona deaths (dependent variables) and selected socio-economic variables (independent variables).

STUDY AREA

India as a whole has been chosen as study area for the present research work and the boundary of a State/UT has been considered as the smallest unit of study. With reference to the Census year 2011, India comprises of 28 States and 7 Union Territories. It lies entirely in the Northern Hemisphere. The mainland extends between 8°4'N and 37°6'N latitudes, and 68°7'E and 97°25'E longitudes. The land mass of India has an area of 3.28 million square km. India's total area accounts for about 2.4 per cent of the total geographical area of the world. It is bounded by the Himalayas in the north and Indian ocean in the south, surrounded by Pakistan and Afghanistan in the north-west, China, Bhutan, and Nepal in the north, Bangladesh and Myanmar in the east. The north-south extension of the country is 3,214 kilometres and east-west extension is 2,933 kilometres, the total land frontier is 15,200 kilometres and the total length of the coastline of the mainland, including Andaman and Nicobar and Lakshadweep, is 7,516.6 km.

India is the second most populous country in the world. According to Census of India, 2011, the total population of India is 1,210.2 million (17.5 percent of world's population) of which 68.84 percent is rural and remaining 31.16 percent is classified as urban. The general density of population is 382 persons per square kilometre. The overall sex ratio is 940. The literacy rate is 74.04 percent. The percentage of literacy in rural and urban population is 68.91 percent and 84.98 percent respectively.

The first case in India was detected in Thrissur district of Kerala on 30th January 2020. The patient was a student from Wuhan University, China. As per the medical guidelines, the patient was kept in isolation until his complete recovery as per the Ministry of Health and Family Welfare. The cases have been rising and have crossed the one crore mark (as on 15th January, 2021).



Source: Census of India, 2011

DATABASE AND METHODOLOGY

The present research work is entirely based on secondary sources of data collected from Census of India, 2011, Ministry of Health and Family Welfare, Center for Disease Dynamics, Economics & Policy, Journal of Medical Virology and World Health Organization. The data of number of corona cases, and corona deaths is taken only up to 15th January, 2021. In the present analysis, a set of twenty socio-economic indicators have been taken into account to analyse the geographical variations in the level of socio-economic conditions in India. The relation of socio-economic indicators with total corona cases and total corona deaths has been established with the calculation of z-scores and composite z-scores. Maps have been prepared using ArcGIS 10.7.

Table 1: India: List of variables of Socio-Economic Development

List	Definition of variables
X1	Number of Covid testing labs/total population of state
X2	Total testing conducted/total population of state
X3	Number of hospital beds/total population of state
X4	Number of hospitals/total population of state
X5	Number of ICU beds/total population of state
X6	Number of ventilators/total population of state
X7	Per Capita Income
X8	Total literacyrate
X9	Male literacyrate
X10	Female literacyrate
X11	Rural literacyrate
X12	Urban literacyrate
X13	Population density
X14	Percentage of total populationof state to total population of India
X15	Percentage of total male population to total populationof state
X16	Percentage of total female populationto total populationof state
X17	Percentage of urban populationtototal populationof state
X18	Percentage of rural populationto total populationof state
X19	Percentage of elderly populationto total populationof state
X20	Length of roads/sq. km of state

In the first step, the raw data for each variable which determines the areal variations of levels of socio-economic development have been computed into standard score. It is generally known as Z-value or Z-score. The score quantifies the departure of individual observations, expressed in a comparable form. This means it becomes a linear transformation of the original data (Smith, 1973: 85). It may be expressed as:

$$Z_{ij} = (X_{ij} - \bar{X}_i)/\sigma$$

Where,
Zij = Standardized value of the variable *i* in state *j*.
Xij = Actual value of variable *i* in state *j*.
$\bar{X}i$ = Mean value of variable *i* in all states.
σi= Standard deviation of variable *i* all states.

In the second step, the z-scores of all variables have been added statewise and the average has been taken out for these variables which may be called as Composite Score (CS) for each state and may be algebraically expressed as:

$$CS = \Sigma Z_{ij}/N$$

Where,
CS = Composite Score
N = Number of variables
ΣZ_{ij} = Z-scores of all variables *i* in state *j*.

The positive values relating to the states's z-score explain high level of socio-economic development and negative values indicate the low level of socio-economic development in the study area.

RESULTS AND DISCUSSION

SPATIAL VARIATION IN THE SPREAD OF CORONA CASES

Table 2: Total corona cases in various States and Union Territories

STATES AND UNION TERRITORIES	TOTAL CORONA CASES
MAHARASHTRA	19,81,623
ANDHRA PRADESH (INCLUDING TELANGANA)	11,76,734
KARNATAKA	9,29,960
KERALA	8,31,259
TAMIL NADU	8,28,952
DELHI	6,31,589
UTTAR PRADESH	5,95,142
WEST BENGAL	5,63,475
ORISSA	3,32,763
RAJASTHAN	3,14,372
CHHATTISGARH	2,92,091
HARYANA	2,65,803
BIHAR	2,56,895
GUJARAT	2,54,314
MADHYA PRADESH	2,50,429
ASSAM	2,16,762
PUNJAB	1,69,950
JAMMU & KASHMIR(INCLUDING LADAKH)	1,32,610
JHARKHAND	1,17,384
UTTARAKHAND	94,324
HIMACHAL PRADESH	56,751
GOA	52,182
PUDUCHERRY	38,567
TRIPURA	33,325
MANIPUR	28,787
CHANDIGARH	20,438
ARUNACHAL PRADESH	16,798
MEGHALAYA	13,687
NAGALAND	12,035
SIKKIM	6,011
ANDAMAN & NICOBAR ISLANDS	4,976
MIZORAM	4,310
DAMAN & DIU	1,723
DADRA & NAGAR HAVELI	1,650
LAKSHADWEEP	0

Source: Ministry of Health and Family Welfare (data as on 15th January, 2021).

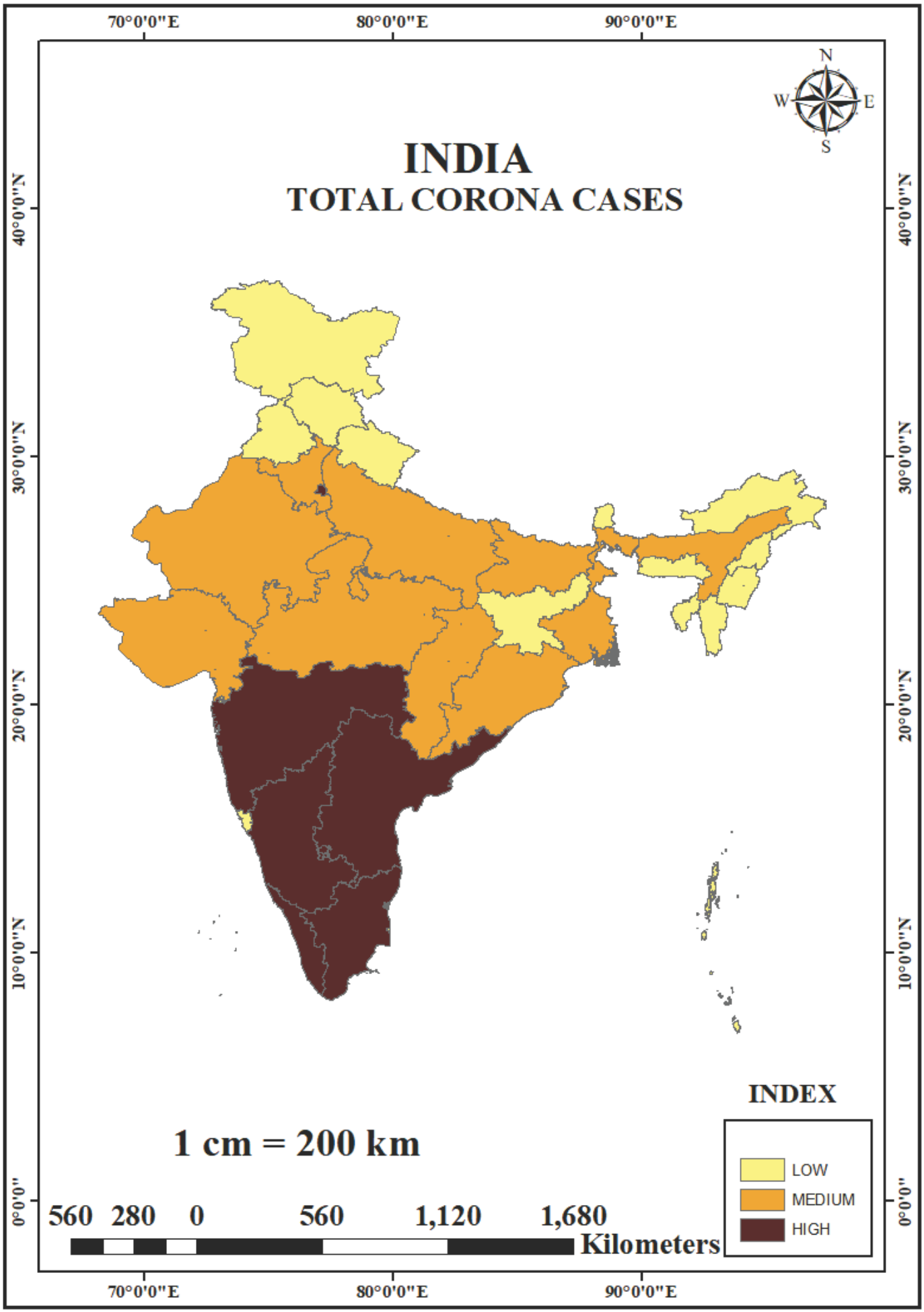
Table 2 shows the state and union territory wise spread of corona cases in India. The whole range of spatial variations may be arranged into three categories such as, high, medium and low as given in Table 3.

Table 3 indicates that six states and union territories (Maharashtra, Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, NCT of Delhi) recorded high corona cases and form an extensive contiguous region in the southern part of India. Ten states and union territories (Uttar Pradesh, West Bengal, Orissa, Rajasthan, Chhattisgarh, Haryana, Bihar, Gujarat, Madhya Pradesh, Assam) recorded medium corona cases and form an extensive contiguous region in the central part of India. Nineteen states and union territories (Punjab, Jammu and Kashmir, Jharkhand, Uttarakhand, Himachal Pradesh, Goa, Pondicherry, Tripura, Manipur, Chandigarh, Arunachal Pradesh, Meghalaya, Nagaland, Sikkim, Andaman and Nicobar Islands, Mizoram, Daman and Diu, Dadra and Nagar Haveli, Lakshadweep) recorded low corona cases and spread over the northern and north-eastern part of India.

Table 3: Spatial variation in the spread of corona cases

Category	Corona Cases	Number of States and UTs	States and UTs
High	More than 6,00,000	6	Maharashtra, Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, NCT of Delhi
Medium	2,00,000 to 6,00,000	10	Uttar Pradesh, West Bengal, Orissa, Rajasthan, Chhattisgarh, Haryana, Bihar, Gujarat, Madhya Pradesh, Assam
Low	Less than 2,00,000	19	Punjab, Jammu and Kashmir, Jharkhand, Uttarakhand, Himachal Pradesh, Goa, Pondicherry, Tripura, Manipur, Chandigarh, Arunachal Pradesh, Meghalaya, Nagaland, Sikkim, Andaman and Nicobar Islands, Mizoram, Daman and Diu, Dadra and Nagar Haveli, Lakshadweep

Source: Based on Table 2



Source: Based on Table 3

SPATIAL VARIATION IN THE SPREAD OF CORONA DEATHS

Table 4: Total corona deaths in various States and Union Territories

STATES AND UNION TERRITORIES	TOTAL CORONA DEATHS
MAHARASHTRA	50,291
TAMIL NADU	12,246
KARNATAKA	12,155
DELHI	10,722
WEST BENGAL	10,010
ANDHRA PRADESH (INCLUDING TELANGANA)	8,712
UTTAR PRADESH	8,543
PUNJAB	5,473
GUJARAT	4,357
MADHYA PRADESH	3,740
CHHATTISGARH	3,537
KERALA	3,392
HARYANA	2,972
RAJASTHAN	2,744
JAMMU & KASHMIR(INCLUDING LADAKH)	2,043
ORISSA	1,896
UTTARAKHAND	1,596
BIHAR	1,447
ASSAM	1,065
JHARKHAND	1,048
HIMACHAL PRADESH	963
GOA	752
PUDUCHERRY	640
TRIPURA	390
MANIPUR	365
CHANDIGARH	330
MEGHALAYA	144
SIKKIM	130
NAGALAND	86
ANDAMAN & NICOBAR ISLANDS	62
ARUNACHAL PRADESH	56
MIZORAM	9
DAMAN & DIU	1
DADRA & NAGAR HAVELI	1
LAKSHADWEEP	0

Source: Ministry of Health and Family Welfare (data as on 15th January, 2021).

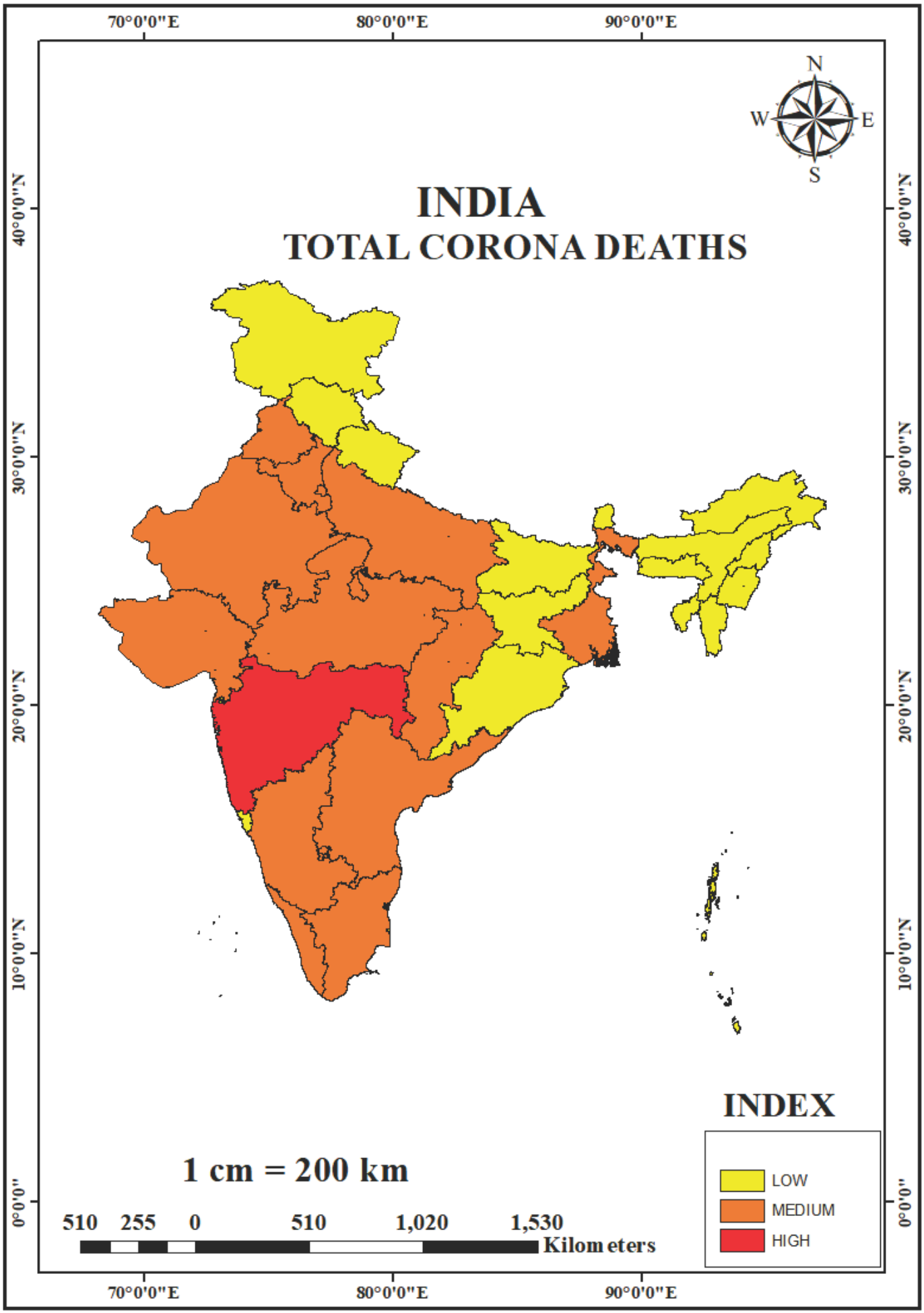
Table 4 shows the state and union territory wise spread of corona deaths in India. The whole range of spatial variations may be arranged into three categories such as, high, medium and low as given in Table 5.

Table 5 indicates that only Maharashtra recorded high corona deaths. Thirteen states and union territories (Tamil Nadu, Karnataka, NCT of Delhi, West Bengal, Andhra Pradesh, Uttar Pradesh, Punjab, Gujarat, Madhya Pradesh, Chhattisgarh, Kerala, Haryana, Rajasthan) recorded medium corona deaths and spread over the southern, central and western parts of India. Twenty-one states and union territories (Jammu and Kashmir, Orissa, Uttarakhand, Bihar, Assam, Jharkhand, Himachal Pradesh, Goa, Pondicherry, Tripura, Manipur, Chandigarh, Meghalaya, Sikkim, Nagaland, Andaman and Nicobar Islands, Arunachal Pradesh, Mizoram, Dadra and Nagar Haveli, Daman and Diu and Lakshadweep) recorded low corona deaths and spread over the northern, eastern and north-eastern parts of India.

Table 5: Spatial variation in the spread of corona deaths

Category	Corona Deaths	Number of States and UTs	States and UTs
High	More than 25,000	1	Maharashtra
Medium	2,500 to 25,000	13	Tamil Nadu, Karnataka, NCT of Delhi, West Bengal, Andhra Pradesh, Uttar Pradesh, Punjab, Gujarat, Madhya Pradesh, Chhattisgarh, Kerala, Haryana, Rajasthan
Low	Less than 2,500	21	Jammu and Kashmir, Orissa, Uttarakhand, Bihar, Assam, Jharkhand, Himachal Pradesh, Goa, Pondicherry, Tripura, Manipur, Chandigarh, Meghalaya, Sikkim, Nagaland, Andaman and Nicobar Islands, Arunachal Pradesh, Mizoram, Dadra and Nagar Haveli, Daman and Diu and Lakshadweep

Source: Based on Table 4



Source: Based on Table 5

GEOGRAPHICAL VARIATIONS IN THE LEVEL OF SOCIO-ECONOMIC CONDITIONS

Table 6: Composite Z-Score of various socio-economic indicators in various States and Union Territories

STATES AND UTS	COMPOSITE Z-SCORE
ANDAMAN AND NICOBAR ISLANDS	-0.18
ANDHRA PRADESH (INCLUDING TELANGANA)	0.40
ARUNACHAL PRADESH	-0.79
ASSAM	-0.21
BIHAR	-0.20
CHANDIGARH	0.01
CHHATTISGARH	-0.43
DADRA AND NAGAR HAVELI	-0.53
DAMAN AND DIU	-0.17
GOA	0.12
GUJARAT	0.17
HARYANA	-0.14
HIMACHAL PRADESH	-0.03
JAMMU AND KASHMIR (INCLUDING LADAKH)	-0.65
JHARKHAND	-0.49
KARNATAKA	0.72
KERALA	0.80
LAKSHADWEEP	0.11
MADHYA PRADESH	-0.07
MAHARASHTRA	1.12
MANIPUR	-0.41
MEGHALAYA	-0.53
MIZORAM	-0.03
NAGALAND	-0.41
NCT OF DELHI	0.34
ORISSA	-0.09
PONDICHERRY	-0.02
PUNJAB	-0.07
RAJASTHAN	-0.11
SIKKIM	-0.23
TAMIL NADU	0.67
TRIPURA	-0.08
UTTAR PRADESH	1.19
UTTARAKHAND	-0.16
WEST BENGAL	0.34

Source: Computed from data obtained from Census of India, Center for Disease Dynamics, Economics & Policy and Ministry of Health and Family Welfare

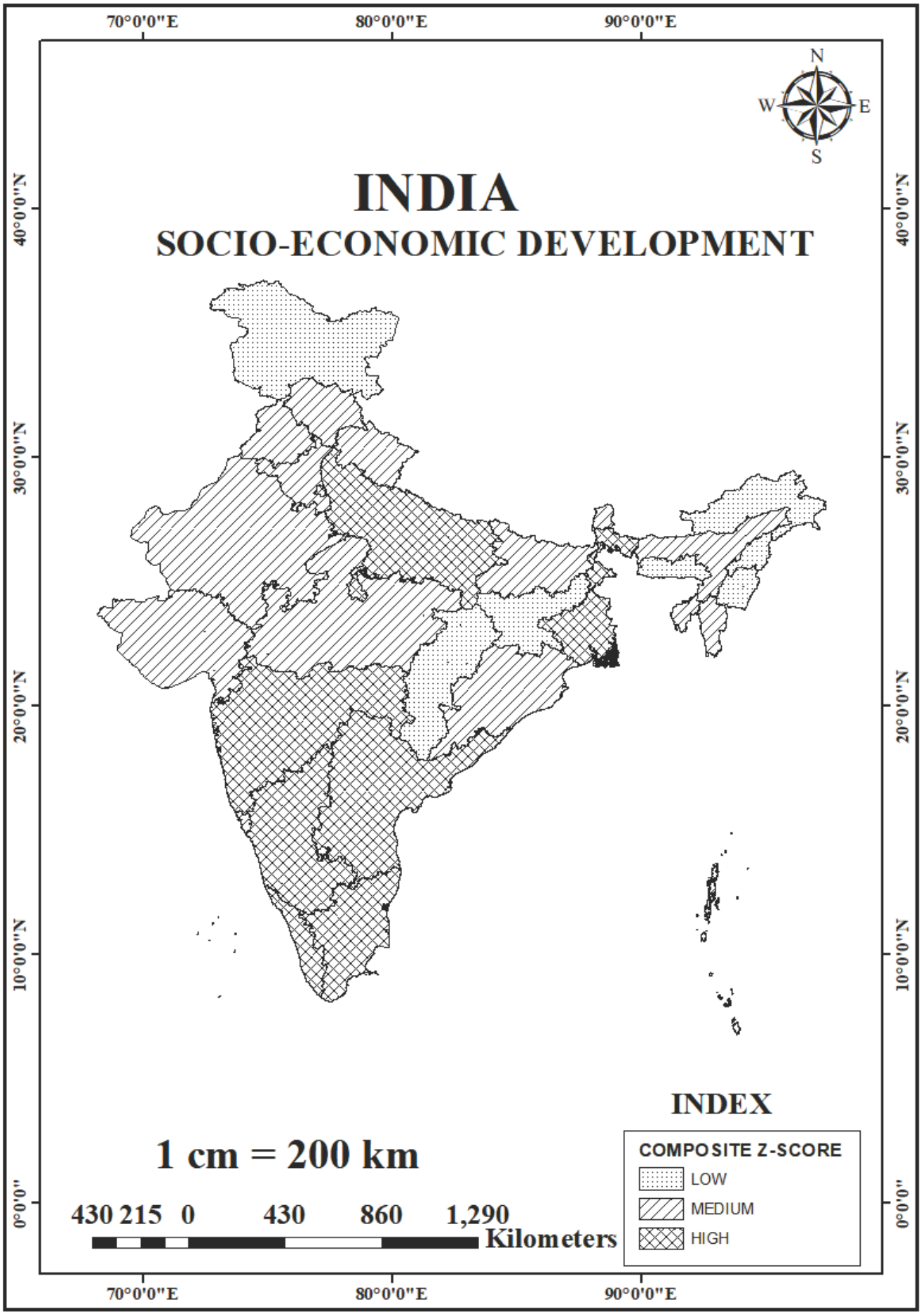
Table 6 shows the state and union territory wise level of socio-economic development in India. The whole range of geographical variations may be arranged into three categories such as, high (above 0.18 z-score), medium (-0.40 to 0.18 z-score) and low (below -0.40 z-score) as given in Table 7.

Table 7 indicates that eight states and union territories (Uttar Pradesh, Maharashtra, Kerala, Karnataka, Tamil Nadu, Andhra Pradesh, West Bengal, NCT of Delhi, Gujarat) have high (above 0.18 z-score) level of socio-economic development and spread mainly over southern part of India. Nineteen states and union territories (Gujarat, Goa, Lakshadweep, Chandigarh, Pondicherry, Himachal Pradesh, Assam, Mizoram, Punjab, Madhya Pradesh, Tripura, Orissa, Rajasthan, Haryana, Uttarakhand, Daman and Diu, Bihar, Andaman and Nicobar Islands, Sikkim) have medium (-0.40 to 0.18 z-score) level of socio-economic development and spread mainly over western, central, northern and north-eastern parts of India. Eight states and union territories (Manipur, Nagaland, Chhattisgarh, Jharkhand, Dadra and Nagar Haveli, Meghalaya, Jammu and Kashmir, Arunachal Pradesh) have low (below -0.40 z-score) level of socio-economic development and spread mainly over extreme northern, north-eastern and some parts of central India.

Table 7: Geographical variations in the level of socio-economic conditions

Category	Z-score	Number of States and UTs	States and UTs
High	Above 0.18	8	Uttar Pradesh, Maharashtra, Kerala, Karnataka, Tamil Nadu, Andhra Pradesh, West Bengal, NCT of Delhi,
Medium	-0.40 to 0.18	19	Gujarat, Goa, Lakshadweep, Chandigarh, Pondicherry, Himachal Pradesh, Assam, Mizoram, Punjab, Madhya Pradesh, Tripura, Orissa, Rajasthan, Haryana, Uttarakhand, Daman and Diu, Bihar, Andaman and Nicobar Islands, Sikkim
Low	Below -0.40	8	Manipur, Nagaland, Chhattisgarh, Jharkhand, Dadra and Nagar Haveli, Meghalaya, Jammu and Kashmir, Arunachal Pradesh

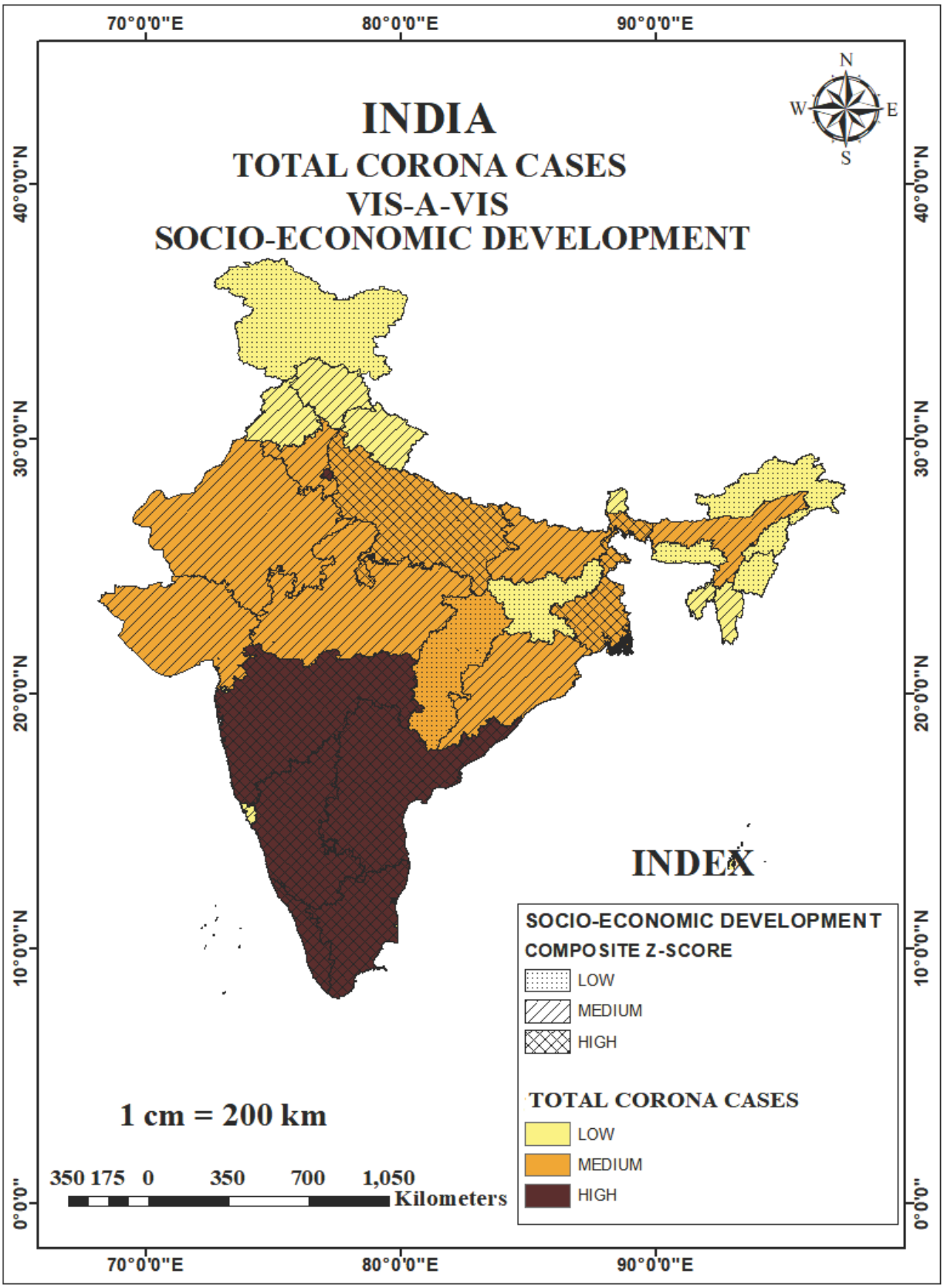
Source: Based on Table 6



Source: Based on Table 7

RELATIONSHIP BETWEEN CORONA CASES AND LEVEL OF SOCIO-ECONOMIC DEVELOPMENT

The relationship between corona cases and level of socio-economic development among the states and union territories of India is shown in the following figure.



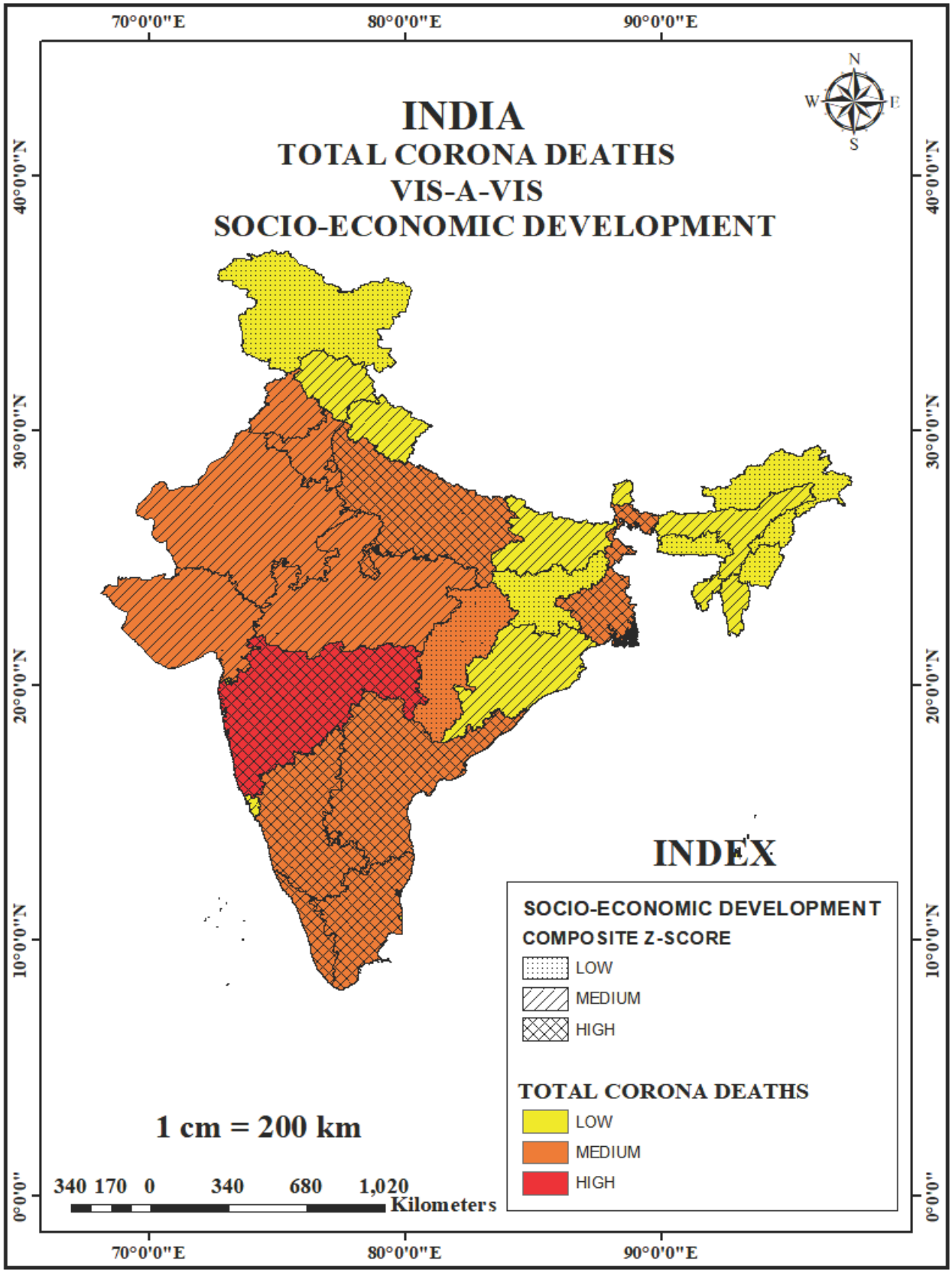
States like Kerala, Tamil Nadu, Andhra Pradesh (including Telangana), Karnataka, Maharashtra and Delhi having high (high composite z-score) socio-economic development recorded high corona cases. Rajasthan, Gujarat, Haryana, Madhya Pradesh, Orissa, Bihar and Assam having medium (medium composite z-score) socio-economic development recorded medium corona cases. Jammu and Kashmir (including Ladakh), Jharkhand, Arunachal Pradesh, Meghalaya, Nagaland and Manipur having low (low composite z-score) socio-economic development recorded low corona cases. States like Uttar Pradesh and West Bengal having high (high composite z-score) socio-economic development recorded medium corona cases. Chhattisgarh having low (low composite z-score) socio-economic development recorded medium corona cases. States like Punjab, Himachal Pradesh, Uttarakhand, Tripura, Mizoram, Goa and Sikkim having medium (medium composite z-score) socio-economic development recorded low corona cases.

It was analysed that the states who had more testing labs (i.e., higher testing capacity) conducted higher testing and recorded higher corona cases. States who had less testing labs (i.e., lower testing capacity) conducted less testing and recorded lower

corona cases. States who are more urbanized, recorded more number of corona cases owing to higher population density in the urban areas and vice-versa. States having higher number of elderly people (aged 60+) recorded more number of corona cases and vice-versa. More than 50% of cases have occurred in the people of above 60 years of age. States where people have higher per capita income recorded more corona cases, because people having higher income can easily afford the costs of tests. Poor people cannot afford the costs of tests. States having higher literacy recorded more number of corona cases. People in such states are more aware, they went to the hospitals and got tested. States having lower literacy recorded lesser number of corona cases as illiterate people keep ignoring the symptoms of any disease in their body.

RELATIONSHIP BETWEEN CORONA DEATHS AND LEVEL OF SOCIO-ECONOMIC DEVELOPMENT

The relationship between corona deaths and level of socio-economic development among the states and union territories of India is shown in the following figure.



Maharashtra having high (high composite z-score) socio-economic development recorded high corona deaths. States like Kerala, Tamil Nadu, Karnataka, Andhra Pradesh (including Telangana), Uttar Pradesh, Delhi and West Bengal having high (high composite z-score) socio-economic development recorded medium corona deaths. Gujarat, Rajasthan, Madhya Pradesh, Punjab and Haryana having medium (medium composite z-score) socio-economic development recorded medium corona deaths. States like Himachal Pradesh, Uttarakhand, Bihar, Orissa, Goa, Sikkim, Assam, Tripura and Mizoram having medium (medium composite z-score) socio-economic development recorded low corona deaths. State like Chhattisgarh having low (low composite z-score) socio-economic development recorded medium corona deaths. Jammu and Kashmir (including Ladakh), Jharkhand, Meghalaya, Arunachal Pradesh, Manipur and Nagaland having low (low composite z-score) socio-economic development recorded low corona deaths.

CONCLUSION

The overall analysis of the study reveals that the southern states recorded higher corona cases. Central and western parts of India recorded medium corona cases. Extreme northern and north-eastern parts recorded lower corona cases. Southern, central and western parts of India recorded medium corona deaths. Extreme northern, eastern and north-eastern parts recorded lower corona deaths. Southern states have high socio-economic development. Central, western and northern parts of India have medium socio-economic development. Jammu and Kashmir, parts of Central India, parts of north-eastern India have low socio-economic development. Nineteen states have positive relation between socio-economic development and corona cases. Twelve states have positive relation between socio-economic development and corona deaths. States having more testing labs, higher percentage of urban population, higher percentage of elderly people, higher literacy, higher per capita income recorded more number of corona cases and vice-versa.

REFERENCES

[1] Chen Y, Liu Q, Guo D. Emerging coronaviruses: Genome structure, replication, and pathogenesis. *J Med Virol.* 2020; 92:418–423. https://doi.org/10.1002/jmv.25681

[2] Dey SK, Rahman MM, Siddiqi UR, Howlader A. Analyzing the epidemiological outbreak of COVID-19: A visual exploratory data analysis approach. *J Med Virol*. 2020; 92:632–638. https://doi.org/10.1002/jmv.25743

[3] He F, Deng Y, Li W. Coronavirus disease 2019: What we know? *J Med Virol*. 2020; 92:719–725. https://doi.org/10.1002/jmv.25766

[4] https://cddep.org/wp-content/uploads/2020/04/State-wise-estimates-of-current-beds-and-ventilators_24Apr2020.pdf

[5] https://censusindia.gov.in/2011-common/censusdata2011.html

[6] https://www.mohfw.gov.in/

[7] Dr. Jabir Hasan Khan & Tarique Hassan & Shamshad, 2014. "Incidence of Poverty and Level of Socio-Economic Deprivation in India," Journal of Developing Areas, Tennessee State University, College of Business, vol. 48(2), pages 21-38, April-Jun.

[8] Kandeel M, Ibrahim A, Fayez M, Al-Nazawi M. From SARS and MERS CoVs to SARS-CoV-2: Moving toward more biased codon usage in viral structural and nonstructural genes. *J Med Virol*. 2020; 92:660–666. https://doi.org/10.1002/jmv.25754

[9] Kofi Ayittey F, Dzuvor C, Kormla Ayittey M, Bennita Chiwero N, Habib A. Updates on Wuhan 2019 novel coronavirus epidemic. *J Med Virol*. 2020; 92:403– 407. https://doi.org/10.1002/jmv.25695

[10] Li G, Fan Y, Lai Y, et al. Coronavirus infections and immune responses. *J Med Virol.* 2020; 92: 424-432. https://doi.org/10.1002/jmv.25685

[11] Lu H, Stratton CW, Tang Y-W. Outbreak of pneumonia of unknown etiology in Wuhan, China: The mystery and the miracle. *J Med Virol*. 2020;92:401– 402. https://doi.org/10.1002/jmv.25678

[12] Lu H, Stratton CW, Tang Y-W. The Wuhan SARS-CoV-2—What's next for China. *J Med Virol*. 2020; 92:546–547. https://doi.org/10.1002/jmv.25738

[13] Smith, D. M. (1973), *the Geography of Social Well-Being in the United States: An Introduction to Territorial Social Indicators*, New York: McGraw-Hill, 85.

[14] Sun P, Lu X, Xu C, Sun W, Pan B. Understanding of COVID-19 based on current evidence. *J Med Virol*. 2020; 92:548-549. https://doi.org/10.1002/jmv.25722

[15] Wang Y, Wang Y, Chen Y, Qin Q. Unique epidemiological and clinical features of the emerging 2019 novel coronavirus pneumonia (COVID-19) implicate special control measures. *J Med Virol.* 2020; 92:568–576. https://doi.org/10.1002/jmv.25748

[16] Yang Y, Shang W, Rao X. Facing the COVID-19 outbreak: What should we know and what could we do? *J Med Virol.* 2020; 92:536 537. https://doi.org/10.1002/jmv.25720

[17] Zhang L, Liu Y. Potential interventions for novel coronavirus in China: A systematic review. *J Med Virol.* 2020; 92:479–490. https://doi.org/10.1002/jmv.25707

[18] Zhang N, Wang L, Deng X, et al. Recent advances in the detection of respiratory virus infection in humans. *J Med Virol.* 2020;92:408–417. https://doi.org/10.1002/jmv.25674