

Mathematical Model of Indian Health System Based on Population

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Abstract

The research is about the health system of India and the population of India. Indian population is affected by many factors of India. The health system is one of them. In this research, studying the population of India from 2000 to 2020 and also interrogate the health system of India of same period. After the study of Indian health system and Indian Population, predict the population of India in the year 2060 and finding out the effects of Indian population on Indian health system. Also, predict the need of AIMS hospital, PGI, government district hospital in 2060 as compare to the population of India.

Keywords: Indian health system, AIMS and least square method.

INTRODUCTION

In this world there are total 195 countries and are divided mainly in 6 big parts. 54 countries are belonged in Africa, 48 are in Asia, 44 in Europe, 33 in Latin America and the Caribbean, 14 in Oceania and only 2 countries in northern America. The health system is varied from country to country. Some country has very good health system, some country has so average health system and some country's health system are in very poor condition. many factors' effects health system, population is one of the most effected factors. The total population of the world is 7.9 billion in 2021 (October). In this population, the population of Asia is most high population that is 4,641,054,775, next high population area is Africa that is 1,340,598,147 next one is Europe and the population of Europe is 747,636,026 next highly populated area in the world is Latin America and the Caribbean that is 653,962,331, next highly populated area of the world is Northern America the population is 368,869,647 and the last populated area of the world is Oceania and the population of this area is 42,677,813. When talk about most highly

populated area of the world that is the region is Asia, Asia shares whole world's population's 59.5% population and the most highly populated 2 countries also lies in this region that is China and India. These two countries are very highly populated counties. China is on top position in over population and India is on the 2nd top position in overpopulation. The health system from decent time of India is so good but the system is unbalance due to over population of India. There are many nursing homes, government hospitals, PGI and also AIMS hospitals available for Indian population but when any epidemic is come in India, the health system is properly unbalance and many peoples are going to died due to that epidemic or says due to overpopulation. The research is said about the population of India and the needs of strong health system. In 2060 India needs Mohalla hospitals, government district hospitals, PGI and AIMS hospitals and many more doctors.

Methodology

For achieve the research work of this research paper, using the data of Indian hospitals and the population of India. The secondary data of Indian hospitals and the population of India is calculated from 2000 to the year 2020. For this purpose, using least square method for prediction of hospitals of India as compare to the population of India. Also use here MATLAB software processor for developing the 2-dimension graph of hospitals and population of India. The secondary data of India population is collected from census department of India and the data of Hospitals is collected from Health ministry of India. at last, finding out the effect of Indian population on India's Hospitals and find the how many hospitals need in 2060 in India.

Development of model

In this research work, use least square method [3] to achieve the result.

The method used in order to achieve this work is least square method. Here use some notations given by

x: year of population.

y: population

Let 'a' be the first parameter of the statement

$$a = \frac{\sum y}{N} \text{ where } N = \sum x$$

And the second parameter in this statement is 'b'

$$b = \frac{\sum XY}{\sum X^2}$$

So, by the using of these parameters find out trend value that is

$$Y = a + bX$$

Where X is deviation of x it is coming from the value of x by the use the equation

$$X = x - A$$

Where A is the mid-value of table of x.

This equation is applicable only when the origin at the mid-point that is $\sum X = 0$.

A different equation is becoming in manner that when origin is not sifting that is $\sum X \neq 0$

$$Y = a + bX \quad (1)$$

Now for finding this straight-line taking summation in equation (1), we get

$$\sum Y = na + b \sum X \quad (2)$$

And for second straight-line multiplying equation (1) by X and taking summation on both sides, we get

$$\sum XY = a \sum X + b \sum X^2 \quad (3)$$

On solving these equations (2) and (3) we are getting the value of 'a' and 'b' and by substituting these values of 'a' and 'b' we get the trend value.

So, the value of a is,

$$a = \frac{\sum X \sum X^2 - \sum X^3 - \sum X \sum XY (\sum X^2) \sum Y}{\sum X^2 - (\sum X)^2} \quad (4)$$

and value of b is

$$b = \frac{\sum XY - \sum X \sum Y}{\sum X^2 - (\sum X)^2} \quad (5)$$

So, using these values of parameters 'a' and 'b' from equations (4) and (5) in equation

$Y = a + bX$ to find the trend value for different year in a table. We are just changing the value of X , the trend value of that year automatically comes from the table.

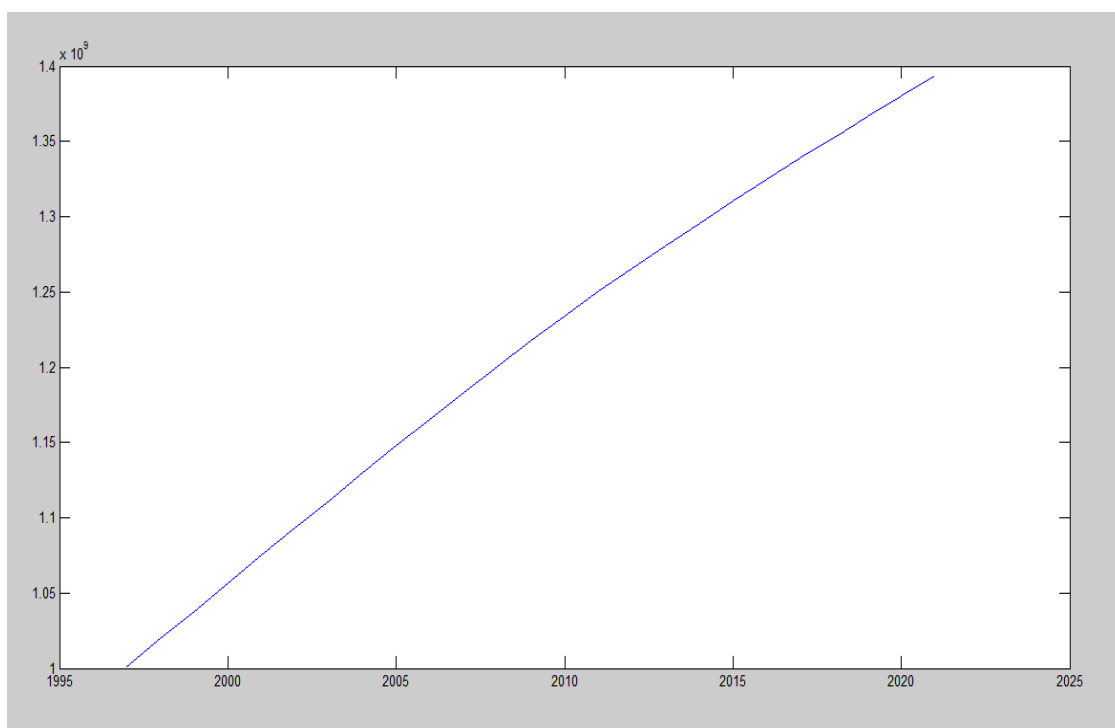
India is a highly populated country. It is 7th largest country in the world and the total area is 3,287,263 square kilometers. India has total 28 states and 8 union territories. In these states and union territories there are 718 total number of districts and the total number of villages in all over India are 664,369 in 2020. The estimated population of India in 2020 [14] is 1,378,252,645 approx. The data for population [14] and Hospital of India is collected from Census department and health ministry of India.

Conceptual Analysis of Results

Table 1: *table of year, population and annual growth of Indian population.*

Sr. No.	year	Population	Annual Growth in %
1	2000	1,056,575,549	1.78%
2	2001	1,075,000,085	1.74%
3	2002	1,093,317,189	1.70%
4	2003	1,111,523,144	1.67%
5	2004	1,129,623,456	1.63%
6	2005	1,147,609,927	1.59%
7	2006	1,165,486,291	1.56%
8	2007	1,183,209,472	1.52%
9	2008	1,200,669,765	1.48%
10	2009	1,217,726,215	1.42%
11	2010	1,234,281,170	1.36%
12	2011	1,250,287,943	1.30%
13	2012	1,265,780,247	1.24%
14	2013	1,280,842,125	1.19%
15	2014	1,295,600,772	1.15%
16	2015	1,310,152,403	1.12%
17	2016	1,324,517,249	1.10%
18	2017	1,338,676,785	1.07%
19	2018	1,352,642,280	1.04%
20	2019	1,366,417,754	1.02%
21	2020	1,380,004,385	0.99%

Graph 1: graph between year and population of India



India is highly populated and a very big country. India has total 28 states and 8 union territories. In these states and union territories there are 718 total number of districts and the total number of villages in all over India are 664,369 in 2020. In these 28 states there are 10 states which are small in area and also in population. In western

India there are 8 small states by name Sikkim, Arunachala Pradesh, Assam, Meghalaya, Nagaland, marjoram, Manipur and Tripura and 18 are other big states and 8 union territories.

The total number of AIIMS hospitals which are functional on the October 2021 are 9. List of these 9 AIIMS hospital are given below.

Sr. No.	Name of hospital	State	Status
1	AIIMS new India	Delhi	functional
2	AIIMS Bhopal	Madhya Pradesh	Functional
3	AIIMS Bhubaneswar	Odisha	Functional
4	AIIMS jodhpur	Rajasthan	Functional
5	AIIMS Patna	Bihar	Functional
6	AIIMS Raipur	Chhattisgarh	Functional
7	AIIMS Rishikesh	Uttarakhand	Functional
8	AIIMS Raebareli	Uttar Pradesh	Functional
9	AIIMS Deogarh	Jharkhand	Functional

some other AIIMS hospital are under construction and some AIIMS hospital are partially functional. The counting of under construction and partially functional AIIMS hospital are 13. So, the total number of AIIMS hospital in India is 22.

Sr. No.	Name of hospital	state	status
1	AIIMS mangalagiri	Andhra Pradesh	Partially functional
2	AIIMS	Maharashtra	Partially

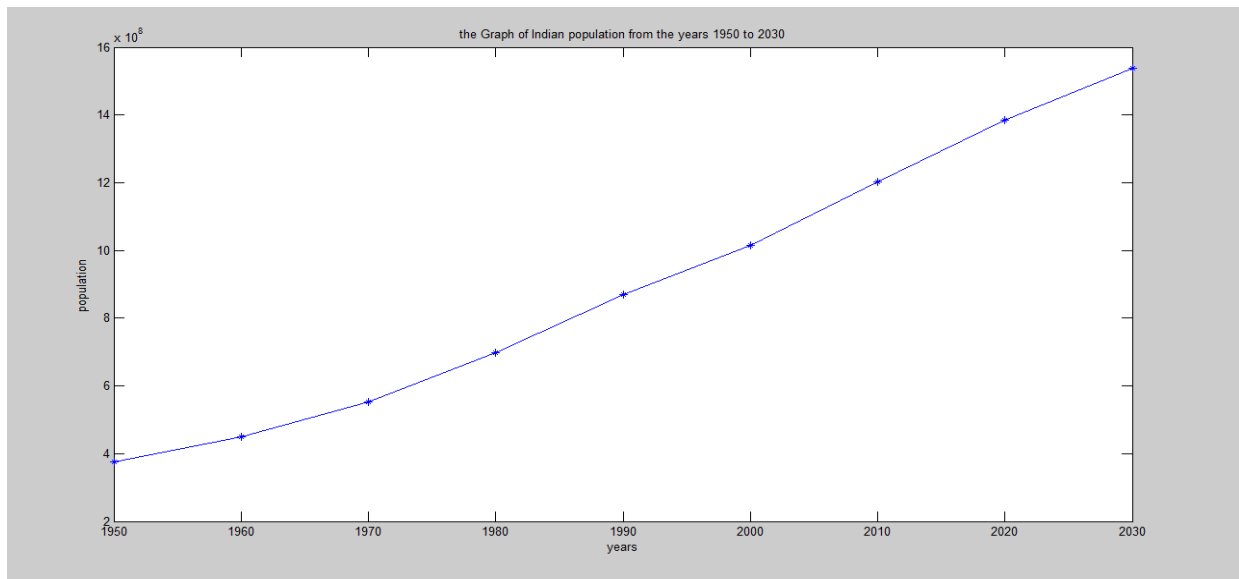
	Nagpur		functional
3	AIIMS Gorakhpur	Uttar Pradesh	Partially functional
4	AIIMS Kalyani	West Bengal	Partially functional
5	AIIMS Bathinda	Punjab	Partially functional
6	AIIMS Guwahati	Assam	Partially functional
7	AIIMS Vijay Pur	Jammu and Kashmir	Partially functional
8	AIIMS Bilaspur	Himachal Pradesh	Partially functional
9	AIIMS Madurai	Tamil Nadu	Have not started
10	AIIMS Darbhanga	Bihar	Under construction
11	AIIMS Kashmir	Jammu and Kashmir	Under construction

12	AIIMS Rajkot	Gujrat	Partially functional
13	AIIMS Bibinagar	Telangana	Partially functional
14	AIIMS Manethi	Haryana	Under construction

Conclusion

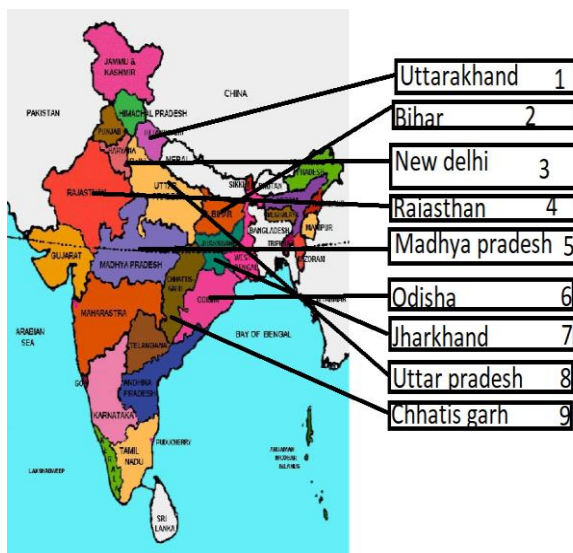
The population of India is increase year by year. Population of India in the year 1950 is 376,325,200 and this population is increased by 1,384,845,360 in the year 2020. As compare to the population there are 25,778 government hospital and 43,486 total number of private hospitals, 542 total number of medical collages and 64 PGI also the total number of AIM hospitals are 23 in all over India 9 are functional, 6 are partially functional and 8 are under construction.

Years (x)	Populations (y)	Deviation A=1985, X=x-A	X^2	XY
1950	376,325,200	-35	1225	-13,171,382,000
1960	449,480,608	-25	625	-11,237,015,200
1970	553,578,513	-15	225	-8,303,677,695
1980	696,783,517	-5	25	-3,483,917,585
1990	870,133,480	5	25	4,350,667,400
2000	1,015,974,042	15	225	15,239,610,630
2010	1,203,098,691	25	625	30,077,467,275
2020	1,384,845,360	35	1225	48,469,587,600



The graph of increasing population as compare to the years from 1950-2030.

Functional AIIMS hospital in all over India



Arithmetical increase method

Results

In this research, by using the data of Indian population from the year 2000 in this year the population of India is calculated in trillions. By the use of data of Indian population from the year 2000 to 2020. the prediction of India population in 2025 is 1,388,994,345. As compare to the population there are 542 total number of medical collages and 64 PGI also the total number of AIM hospitals are 23 in all over India 9 are functional, 6 are partially functional and 8 are under construction. In 2060, India

needed 154 PGI and 36 AIIMS hospitals, In the comparison of Indian population in the year of 2060.

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