



Mortality and Its impact on population dynamics: A case study of south 24 Parganas, West Bengal, India

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Abstract

Mortality plays a pivotal role in shaping the growth, structure, and composition of populations, significantly influencing demographic transitions. This research explores the causes of mortality and its connection to demographic shifts, with a particular focus on the trends in South 24 Parganas, West Bengal, India. By examining the crude death rate (CDR) from 2008 to 2017, the study uncovers patterns, regional disparities, and trends in mortality, emphasizing how factors such as age, sex, and socioeconomic conditions affect mortality rates. The study highlights the decreasing trend in mortality in the region, with special attention to infant mortality rates and regional variations. Furthermore, the research underscores the implications of these trends for public health policy and future demographic planning.

Keywords: Mortality, Demographic Transition, Crude Death Rate, Infant Mortality, South 24 Parganas, Public Health, Population Dynamics, Socioeconomic Factors

Introduction

Mortality is a fundamental element in population dynamics, significantly influencing the growth, structure, and composition of populations. This outlines the characteristics of demographic transition variations. The growth of any community's population is primarily influenced by a significant reduction in mortality rather than an increase in fertility.

The United Nations and World Health Organization define death as the irreversible cessation of all vital signs occurring at any moment after birth, characterized by the inability to restore essential functions (United Nations, 1962, p. 69-111). The provided definition asserts that death can transpire alone after life commences. A substantial link may exist between death and the emergence of life. Mortality excludes deaths that occur before to live delivery, which are classified as stillbirths. Throughout history, individuals have contemplated death more than birth since the inception of humanity. Demographic factors, including age and sex, together with causes of mortality, are crucial for the formulation, implementation, and evaluation of public health programs.

Mortality is affected by various causes, including biological, social, cultural, and economic elements. Mortality factors can be classified into hereditary, constitutional, and environmental variables. The demographic analysis typically excludes the genetic factor. The final two criteria are acknowledged as the foundation for mortality analysis. The constitutional aspects encompass the physical, physiological, anatomical, and psychological traits of individuals, particularly emphasizing age and sex. Environmental impacts include both natural physical surroundings and the social and economic circumstances of humans (Clarke, 1972, p.118) [1]. In general, death control is regarded as more acceptable than birth control. The reduction in mortality or the extension of longevity within the population typically contributes to the apprehended "population explosion." The geographical examination of mortality has underscored its significance in medical geography. This renewed area of geography depends on

"causes of death" data instead of "causes of illness." The occurrence of death is a notable event frequently documented via the registration of vital events. The insufficient registration presents a considerable obstacle for mortality analysis.

In the absence of adequate data, the National Census, demographic sample surveys, and National Family Health Surveys function as alternative sources of mortality-related information at the national or state level.

Review of Literature

Mortality, historically and scientifically, has been a topic of deep consideration due to its vital role in determining population dynamics. Studies have shown that mortality is affected by various biological, social, cultural, and economic factors (Clarke, 1972) [1]. Researchers such as Bhende and Kanitkar (2004) [2] have emphasized the importance of crude mortality rates as a key metric for assessing population health. Similarly, demographic surveys and census data have highlighted the critical role of age, sex, and socioeconomic conditions in mortality outcomes. Public health programs worldwide are continuously developed and evaluated through the lens of mortality data, which assists in understanding the factors influencing health disparities (United Nations, 1962).

Additionally, advancements in medical geography have emphasized the necessity of investigating mortality at regional and local levels, noting disparities across districts, such as those found in South 24 Parganas. Mortality trends are also influenced by improved healthcare systems, literacy, and the availability of medical infrastructure (Clarke, 1972) [1]. These factors shape regional variations and trends observed in mortality statistics over time.

Objectives

1. To analyze the trends in mortality in South 24 Parganas from 2008 to 2017 and compare them with state and national trends.
2. To examine the demographic and socioeconomic factors influencing mortality rates in the region.

- To assess the regional variations in mortality trends across different blocks of South 24 Parganas.
- To explore the impact of public health programs and healthcare accessibility on reducing mortality rates in the region.
- To investigate infant mortality trends and their correlation with socioeconomic conditions in the district.

Discussion and Major Findings
Mortality Trends in South 24 Parganas (2008-2017), West Bengal, and India (1984-2017)

The mortality trends, indicated by the crude death rate, exhibited a pattern analogous to that of the birth rate. The persistent decrease in the death rate is significant evidence of considerable improvement in mortality conditions compared to both the state and the nation. The enduring disparity and similar trajectory between the country and the state indicate that the state has sustained a consistent health status divergence over the past thirty years.

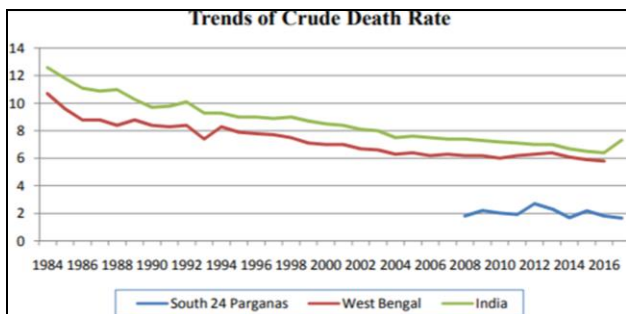


Fig 1: The district has achieved enhanced health status, resulting in a reduced mortality rate.

Crude Mortality Rate Statistics for South 24 Parganas, 2008-2017

Mortality rates are intricately linked to age, gender, socioeconomic level, employment trends, and geographic location, which are regarded as factors of mortality throughout different periods and regions. Due to the constraints in accessing specific numerical data at the sub-district level, only the crude birth rate has been analyzed during a decade-long period. The crude death rate is a crucial metric for assessing natural population increase and functions as a readily accessible indicator of mortality rates. This approach omits the impact of age demographics, which significantly affect mortality variability (Bhende and Kanitkar, 2004 [2], p.193). The overall reduction in the crude death rate at the sub-district level indicates an improvement in the demographic conditions of the studied area. All sub-districts (blocks) exhibited varied trends and generally experienced a drop till 2017 (Table 8.6). During the initial decade (2008-2017), crude birth rates were notably elevated in the rural areas of the district's southern section.

Significant disparities in mortality trends underscore the variations in healthcare facilities and health literacy among different sections of the studied region. The region has attained a significantly low moral standard; yet, a notable exception arises when examining the state and national crude death rates. The maps of crude birth rate exhibit a moderate degree of homogeneity across the blocks.

Table1: Level of crude birth rate

Sl.No		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
1	Thakurpukur-Mahestala	2.47	2.93	1.27	0.49	11.76	5.71	0.34	0.35	0.14	0.11
2	Bishnupur-I	1.47	1.90	1.70	2.90	2.82	3.34	2.89	0.86	3.04	1.70
3	Bishnupur-II	0.36	0.83	1.68	3.21	1.58	1.50	1.09	0.40	0.81	N.A
4	Budge Budge-I	2.56	2.56	2.57	1.37	2.00	2.68	2.09	2.05	1.39	1.67
5	Budge Budge-II	1.64	2.26	1.35	1.21	1.64	2.43	2.65	2.46	0.11	0.16
6	Sonarpur	0.69	0.51	0.81	1.09	1.30	1.25	0.67	0.67	4.29	3.95
7	Jaynagar-I	2.85	2.65	2.32	2.00	2.45	2.72	2.45	2.83	2.10	2.96
8	Jaynagar-II	1.03	1.53	1.61	1.27	0.72	1.14	0.59	2.92	1.04	0.88
9	Kultali	1.82	2.08	1.33	1.86	1.77	1.40	1.38	1.82	1.21	1.32
10	Baruipur	1.74	2.14	1.81	1.92	1.23	1.93	1.79	2.16	1.77	1.35
11	Bhangar-I	N.A	0.45	0.83	1.14	1.56	1.91	2.02	3.08	1.62	2.20
12	Bhangar-II	1.07	1.54	0.81	1.12	1.05	1.27	1.11	0.87	1.16	0.86
13	Canning-I	1.16	1.42	1.32	1.96	1.55	0.74	0.75	1.99	N.A	N.A
14	Canning-II	0.16	1.11	0.79	0.63	0.32	0.13	0.25	2.13	1.59	1.60
15	Basanti	N.A	N.A	N.A	N.A	N.A	N.A	N.A	1.27	0.17	N.A
16	Gosaba	1.39	0.93	2.79	2.22	3.06	3.06	0.85	0.19	N.A	N.A
17	Mograhat-I	2.28	3.02	2.74	1.94	2.91	2.38	2.07	1.77	2.49	0.57
18	Mograhat-II	2.07	2.31	2.21	2.73	2.12	2.77	2.66	2.97	3.19	3.08
19	Mandirbazar	1.39	2.09	1.43	1.31	1.58	0.95	0.39	0.66	0.42	N.A
20	Kulpi	1.80	3.24	4.06	1.60	1.74	0.94	1.34	2.29	0.23	N.A
21	Falta	2.13	3.47	3.63	3.49	3.05	1.91	2.21	1.96	2.28	2.01
22	Diamond Harbour-I	2.76	2.91	2.42	3.57	5.15	6.62	6.08	7.85	3.84	0.47
23	Diamond Harbour-II	2.29	2.98	2.41	2.38	3.19	2.12	2.88	3.25	1.62	N.A
24	Mathurapur-I	2.92	2.47	2.95	3.47	3.32	3.98	3.29	3.68	2.90	3.57
25	Mathurapur-II	3.83	4.55	3.77	1.69	N.A	N.A	N.A	4.71	0.25	N.A
26	Kakdwip	2.90	3.34	3.36	3.49	3.58	3.15	2.95	3.08	2.35	5.50
27	Namkhana	3.20	3.47	2.98	2.76	0.72	1.57	1.79	2.66	3.51	3.08
28	Sagar	2.24	2.86	2.52	2.87	3.55	3.66	3.19	3.83	4.58	4.04
29	Patharpratima	3.72	4.54	4.40	4.14	3.71	4.12	3.79	4.71	3.62	4.36
	S24P	1.82	2.22	2.02	1.92	2.72	2.32	1.68	2.18	1.82	1.66

Source: Chief Medical Officer of Health, Dy-II, South 24 Parganas, Annual Vital Statistics, 2008-2017

Average Crude Death Rate from 2008 to 2012 and from 2013 to 2017

The district's average crude death rate is 2.03, which is three times lower than West Bengal's rate of 6.12 and three and a half times lower than the national rate of 6.99 from 2008 to 2017 (Figure 8.7). The projected average crude death rate for the five-year interval from 2008 to 2012 is 2.14. Patharpratima (4.10), Thakurpukur Maheshtala (3.79), Diamond Harbour-I (3.36), Kakdwip (3.33), Falta (3.16), and Mathurapur-I (3.02) demonstrate an average crude death rate over three throughout this timeframe. All previously indicated blocks, save Thakurpukur Maheshtala, continuously demonstrated an average crude death rate over three from 2013 to 2017. Throughout this interval, the average crude death rate was 1.93. Nonetheless, the rural agricultural region in the southern area demonstrated a consistently high death rate.

A significant component in the declining death rates is the participation of all demographic segments across different levels of crude birth rates, reflecting a distinct temporal variation.

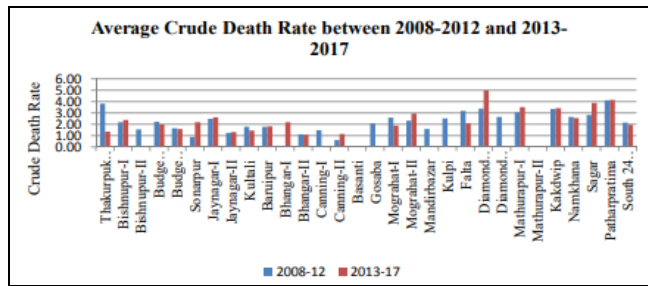


Fig 2

Percentage Variation in Average Crude Death Rate from 2008-2012 to 2013-2017

The study area has decreased its crude death rate by 9.81 percentage points, with just 5 blocks experiencing an increase above 25 percent, while the remaining blocks have had a decline of less than 25 percentage points.

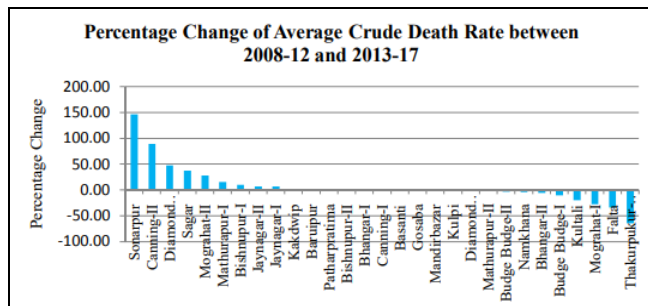


Fig 3

The evolving trends of the crude death rate exhibit a significant divergence from the crude birth rate to a certain degree. Of the total blocks, twelve shown an increase in mortality, while eight displayed a decline in the crude death rate. Sonarpur has achieved the highest positive percentage improvement at 146.56 percent, followed by Canning-II at 89.45 percent, while both Diamond Harbour-I and Sagar registered 37.61 percent, among others. Only two blocks exhibited a significantly elevated percentage change in crude death rate, attaining 75 percent, while three blocks—Diamond Harbour-I, Sagar, and Mograhat-II—surpassed the 25 percent barrier.

Thakurpukur Maheshtala (-64.86 per cent point), Falta (-34.25 per cent point), Mograhat-I (-28.07), and Kultali (-19.65 per cent point) had the highest likelihood of seeing a fall in the crude death rate. As a result, blocks with a developing tendency make up a comparatively larger percentage (41%) than blocks with a diminishing status (28%).

Infant Mortality Trends

One significant form of mortality that explains a child's death within the first year of life is infant mortality. According to the Chief Medical Officer of Health's yearly vital statistical data, the district's infant mortality status tended to be lower than the state and national average, much like the crude birth rate and death rate (Table 8.8, Figure 8.9).

Infant mortality

Patterns are a significant form of mortality that explains a child's death within the first year of life. Compared to the southern blocks, the majority of the northern blocks had comparatively low fatality rates, as shown in Table 8.9 for the years 2008–2017. Socioeconomic variation is the primary factor influencing the diversity in infant mortality, and these dissimilar patterns reflect different demographic growth trends.

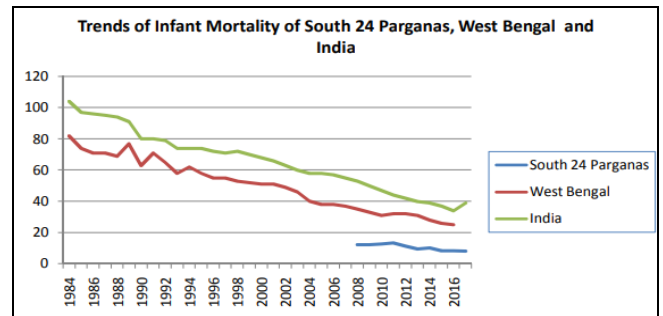


Fig 4

Conclusion

The findings of this study underscore the importance of mortality data in understanding population dynamics and formulating effective public health policies. The significant reduction in the crude death rate in South 24 Parganas between 2008 and 2017 reflects improvements in healthcare infrastructure, health literacy, and socioeconomic conditions. However, regional disparities persist, particularly between rural and urban areas, indicating the need for targeted interventions in underdeveloped regions. The study also emphasizes the importance of monitoring infant mortality trends as an indicator of overall health system effectiveness. Ultimately, reducing mortality requires a holistic approach, incorporating both healthcare reforms and socioeconomic development.

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