Tracking and Projection of the Changes in Leading Causes of Deaths in India, 1990-2031: Evidence from Urban Maharashtra

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1. Introduction

- Like other developing countries, India is also experiencing rapid changes in socioeconomic, demographic, and causes of death transition
- Availability of good quality demographic data from India's census and sample registration system (SRS) leads to examining the trends and a notable shift in fertility, mortality, migration, and population growth.
- Nonetheless, data also suggest that India has been experiencing a remarkable decline in childhood and young age mortality, thus observe a considerable advancement in life expectancy.
- Consequently, these changes were expected to bring the potential transition in the morbidity pattern and cause-specific mortality, mainly from communicable diseases to noncommunicable diseases.
- For the recent period, between 1990 and 2016, although the burden of communicable diseases is still as high as 30%, the number of DALYs and DALY rates dropped substantially for most communicable, maternal, and neonatal deaths, while increased substantially for NCDs, and injuries

2. Need of the study

- An inadequate number of studies had investigated cause-specific mortality because of data limitations.
- Understanding the shift in the age-specific morbidity and cause-specific mortality is essential for drafting changes in public health care policy, allocation of health care finances and human resources, thereby avert premature deaths.
- On the other hand, the information on trends and patterns of CoD is essential in order to caution against potential future health policy challenges. There are not many studies in India that address this critical issue in recent times.
- From this literature review, it is also evident that prior research mainly focused on the level and significant shift in the causes of morbidity and mortality using survey-based data or modelling-based estimates. However, not many used unified disease classification following the standard International Classification of Diseases (ICD)-10 scheme for a longer period to make a robust assessment of the epidemiological transition in India.

3. Objectives

The foremost objectives of the study is-

- First, investigate the trends in a major cause of death in India from 1990 to 2018.
- Second, estimate the relative contribution of the major cause of death among different age groups stratified by sex.
- Third, projecting the leading cause of death by broad groups separately for male and female through 2031.

4. Data source and selection of Urban Maharashtra

- For the analysis, the records of the MCCD scheme in urban areas of Maharashtra for the period 1990–2018 was used. The MCCD scheme was introduced in India under the provisions of the Registration of Births and Deaths (RBD) Act, 1969 Section 10 (2) and Section 10 (3), for certification of causes of death by a medical practitioner with the responsibility of Registrar General of India (RGI) to ensure that all deaths had a medical certificate stating the CoD.
- Apart from MCCD data, the age-sex wise distribution of the population for the same period from the sample registration system (SRS) was taken. The projected age-sex wise distribution of the population was taken from the expert committee population projection reports available from the office of Registrar General of India and Census Commissioner of India
- Quality of MCCD data is much better in the urban areas of Maharashtra. The reported MCCD in 2018 coverage is almost 67% for urban deaths which is reasonably good quality data compared to the rest of India. Therefore, this study used MCCD based CoD information of urban Maharashtra. The state of Maharashtra also represents a significant portion of the Indian population in terms of size and socioeconomic, demographic, and health transition. Maharashtra is the second largest state in India and accounts for almost half of the total population that lives in urban areas. Moreover, three big cities including Mumbai, Pune, and Nagpur in the state have huge migrant populations from a number of states in India. Therefore, findings based on this population can roughly be generalized to India.

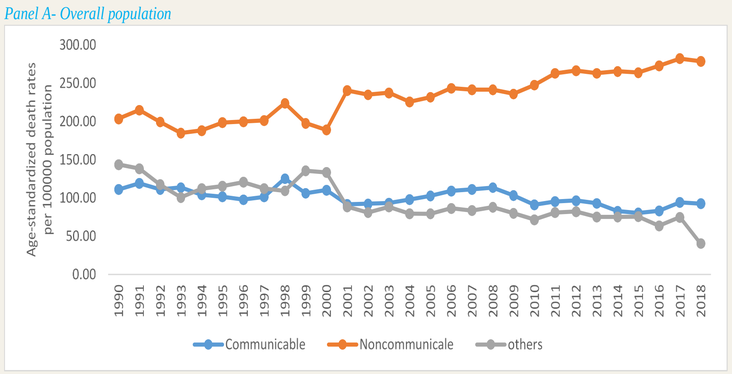
5. Methods

- First, the cause specific age-standardization death rate is calculated using standard age-structure of the population of Maharashtra given by from expert committee projected population (1996– 2031) by age and sex based on Censuses 1991 and 2001 (Office of RGI and Census Commissioner, 2006).
- Secondly, The exponential regression model was used for projecting trends of the major causes of death at the 95% level of confidence interval.

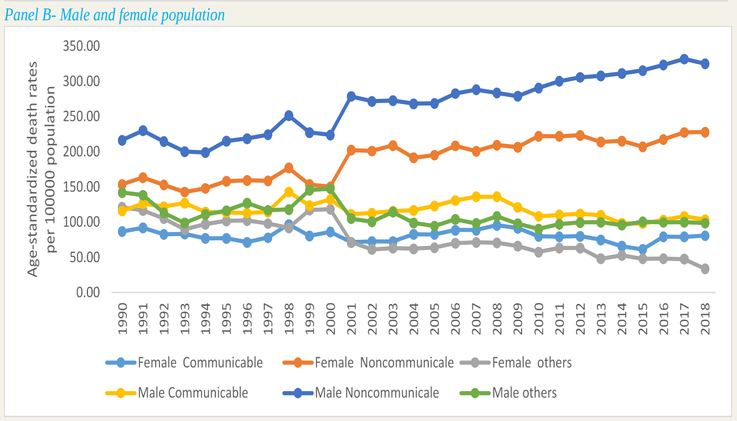
6.1 Result-*Age-standardised death rate from broad diseases groups from 1990 to 2018*

Figure 1: Age-standardised death rate from broad diseases groups in urban Maharashtra, 1990–2018.

Panel A- Overall population



Panel B- Male and female population



The figure 1 suggested that irrespective of sex, death due to communicable disease declined and NCDs had increased, However, among the male, the death due to NCDs was much higher and increased greater than female.

6.2 Result- *Leading causes of death in different age group by sex from 1990 to 2018*

- "Certain conditions originating in the prenatal period" was the leading cause of death, contributing 41% death in 1990 to 72% in 2018 among infants, and by gender, the trend was almost identical.
- In the case of children, "Infectious and Parasitic Diseases" contribution had reduced from 27% in 1990 to 18% in 2018."Diseases of the Respiratory System" was the second leading cause of death in the child population with no significant change in its contribution during the study period.
- Among the youth population, the "Injury and Poisoning" was the leading cause of death in 1990, with 40% deaths among youth due to this cause. However, there was a drop of 12% in "injury and poisoning" deaths contribution to the total deaths among the youth population from 1990 to 2018. As compared to females, males had a higher share of deaths due to "injury and poisoning".
- The main cause of death for adults (25-64 years of age) was "Diseases of the Circulatory System", and this had remained the same for the last 27 years in urban Maharashtra.
- Among the elderly population, "Diseases of the Circulatory System" was the primary cause of death, followed by "Symptoms, Signs and Ill-Defined Conditions".

6.3 Result- *Projected cause-specific death rate from broad diseases groups*

Table 3: Actual and projected death rates from broad diseases groups, urban Maharashtra, 1990–2031

Causes of death	1990	1996	2001	2006	2011	2018	2022	2027	2031
Total									
Communicable	111.1	97.9	94.6	109.2	95.5	94.3	**85.80 (78.60-93.06)**	**81.61 (72.69-90.52)**	**78.23 (67.93-88.53)**
Non communicable	203.6	199.9	248	243.7	263.1	282.4	**291.17 (281.01-301.18)**	**307.32 (294.91-319.78)**	**317.1 (303.22-330.97)**
Others	143.9	120.8	91.1	86.6	81	74.9	**55.02 (44.65-65.69)**	**43.71 (30.55-56.86)**	**36.92 (22.24-51.60)**
Male									
Communicable	115.6	112.9	111.2	130.8	110.2	108.1	**105.81(97.02-114.61)**	**102.65 (91.81-113.50)**	**100.12 (87.60-112.65)**
Non communicable	216.6	218.7	278.7	282.7	300.3	331.8	**350.07 (339.33-360.70)**	**373.21 (360.03-386.38)**	**391.76 (376.55-406.76)**
Others	142	126.9	104.8	103.9	97.2	99.9	**88.13 (77.23-99.02)**	**82.14 (68.71-95.57)**	**77.35 (61.84-92.87)**
Female									
Communicable	86.7	71.4	71.5	88.7	79.3	79	**75.5 (68.46-82.55)**	**74.14 (64.45-82.83)**	**73.05 (63.01-83.08)**
Non communicable	153.7	159.3	202.2	208.4	222	227.6	**245.87 (235.13-256.62)**	**261.30 (248.05-274.55)**	**273.65 (258.35-288.95)**
Others	121.2	102.2	71.4	70	63.2	47.3	**39.2 (31.03-47.26)**	**28.48 (18.60-38.63)**	**23.15 (12.36-33.94)**

Note: bolded figures are projected age-standardised death rates; 95% level of confidence interval in parentheses

7. Conclusion

- The analysis of the cause of death for all age group populations suggest that urban Maharashtra is approximately experiencing the onset of the third stage of epidemiological transition, but disaggregated analyses by age-groups possibly differ with this.
- The unique feature of changes in leading causes of death in urban Maharashtra is that though communicable disease deaths are decreasing over time, they are still predominant among infants, children, youth, and adult populations. Thus, urban Maharashtra is experiencing the double burden of diseases.
- Our findings can play a key role in overhauling the health systems in India in general and urban Maharashtra in particular in line with the disease burden.

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