

## Biases in Mortality Rates in West Bengal, India: Economic Inequality, Geographical Contrast, or Sex Differences?

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A long-standing preconception is that Mortality Rates (MR) are biased. Be it the developed nations or the developing ones, these biases have generally been attributed to inequality in income, regional disparity, and bias in sex.

There is increasing evidence of a strong association between income and various measures of health within the advanced developed countries. Mortality is strongly related to the differences in socioeconomic status between classes within the developed countries, the relationship between mortality rates and the standard of living in developed countries is much weaker. Among less developed countries, however, life expectancy rises rapidly with increasing Gross National Product (GNP) per capita [1]. However, in West Bengal, where healthcare has been heavily subsidised by proactive government initiatives, such disparity fails to present any noticeable impact. Supporting such a statement, is data from a cross-sectional study at Howrah General Hospital, West Bengal (where patients of all economic classes and sub-classes are treated) for prescription analysis and assessment of drug dispensing in 341 patients [2]. The analysis revealed that the average number of drugs prescribed per encounter was  $2.98 \pm 1.69$ . A fixed consultation charge of 2 rupees, immediate and short drug dispensing times, and average drug cost per encounter was rupees  $31.32 \pm 30.89$  where antibiotics and injections shared 36.5% and 4.6% of the amount respectively.

Coming to the more holistic concern, a general belief has persisted that in a developing state such as West Bengal, mortality rates are related to modernization of settlements. The misconception that urbanization is positively correlated with better healthcare leading to lower mortality rates has been consistently pushed to the headlines. State reported data, however, says otherwise. Upon examining mortality rates of the past years (2007-2017) a meager difference of 0.3363 is observed (Table 1) between the means of urban mortality rate ( $6.373 \pm 0.2054$ ) and rural mortality rate ( $6.036 \pm 0.2248$ ). A change of geographical location does not necessarily lead to worse healthcare. Appropriate facilities along with qualified professionals are deployed with equal importance to both rural and urban areas in the district. At least, for West Bengal, the above statement rings true.

**Table 1.** Mortality Rates in West Bengal.

Year	Rural	Urban	Total
2007	6.3	6.4	6.3
2008	6.1	6.6	6.2
2009	6.1	6.4	6.2
2010	6	6.3	6
2011	6.1	6.5	6.2
2012	6.3	6.6	6.3
2013	6.3	6.6	6.4
2014	6	6.4	6.1

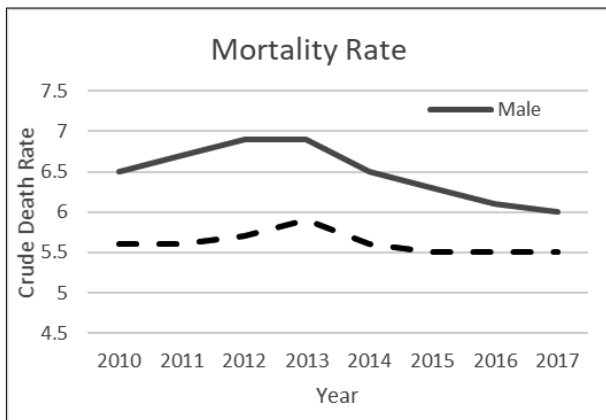
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Year	Rural	Urban	Total
2015	5.8	6.2	5.9
2016	5.7	6.1	5.8
2017	5.7	6	5.8
<b>Mean</b>	6.036364	6.372727	6.109091
<b>SDs</b>	0.224823	0.205382	0.207145

Now, to the age-old notion: why do men typically die earlier than women in westernized societies? Before “why”, is the male mortality rate higher than the female one? The answer is yes. According to the yearly MR Reports published by the government of West Bengal, the male population experienced a mean death rate that was 15% more than females with a MR of 6.4875 ± 0.3399 compared to 5.6125 ± 0.1356 between 2010-2017 (Table 2 & Figure 1).

**Table 2.** Sex-specific Mortality Rates in West Bengal.

Year	Male	Female
2010	6.5	5.6
2011	6.7	5.6
2012	6.9	5.7
2013	6.9	5.9
2014	6.5	5.6
2015	6.3	5.5
2016	6.1	5.5
2017	6	5.5
<b>Mean</b>	6.4875	5.6125
<b>SDs</b>	0.339905	0.13562



**Fig 1.** Sex-specific Mortality Rates in West Bengal.

The traditional explanation has been that men undertake more risky behavior than women. Supporting this risk-prone behavior are demographic data showing that men are more likely to die of motor vehicle accidents, homicide, suicide, or accidents caused by firearms. An observational study undertaken among all cases of unlawful homicidal deaths during one year in Malda district of West Bengal found that most of the female victims are in reproductive age-group mostly by manual and ligature strangulation whereas the male victims of homicide were mostly in economically productive age group, mostly killed by mechanical injuries like incised wound, penetrating wound, head injury and gunshot injuries. The difference between males and females regarding cause of death was significant. The antecedent history of illicit sexual relations leading to homicide was significantly more among females. It was also seen that illicit sexual behaviour led to homicide in most of the unmarried or divorced female victims whereas in case of married woman, illicit sexual behaviour of the husband led to homicide of that woman in about 50% of the cases [3].

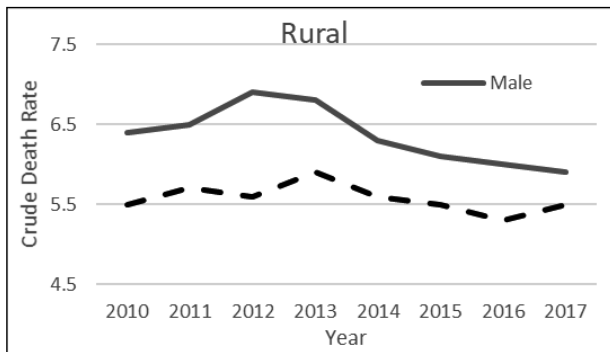
Another study pertaining to the analysis of murder rates led to the deduction of three significant patterns. First, murder rates in India bore no significant relation with urbanization or poverty. Second, the existence of a negative association between literacy and criminal violence. And third, murder rates in India were highly correlated with the female-male ratio in the population: districts with higher female-male ratios have lower murder rates [4].

**Table 3.** Sex-specific Mortality Rates in urban and rural settings in West Bengal.

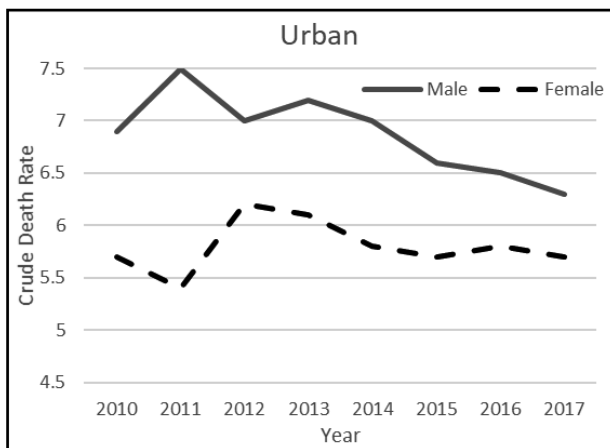
Year	Rural		Urban	
	Male	Female	Male	Female
2010	6.4	5.5	6.9	5.7
2011	6.5	5.7	7.5	5.4
2012	6.9	5.6	7	6.2
2013	6.8	5.9	7.2	6.1
2014	6.3	5.6	7	5.8
2015	6.1	5.5	6.6	5.7
2016	6	5.3	6.5	5.8
2017	5.9	5.5	6.3	5.7

Year	Rural		Urban	
	Male	Female	Male	Female
Mean	6.3625	5.575	6.875	5.8
SDs	0.362284	0.175255	0.391882	0.250713

The final nail on the coffin of male-biasedness is that the trend continues to persist even when considering different geographies. Over a period of 7 years from 2010-2017, the difference in male-female mortality rate observed was 14% ( $6.3625 \pm 0.3623$  vs  $5.575 \pm 0.1752$ ) in the rural setting and 18% ( $6.875 \pm 0.3919$  vs  $5.8 \pm 0.2507$ ) in the urban setting (Table 3). Rural or urban, a consistent and considerable difference can be seen in the MRs of males and females (Figures 2 & 3).



**Fig 2.** Sex-specific Mortality Rates in rural areas in West Bengal.



**Fig 3.** Sex-specific Mortality Rates in urban areas in West Bengal.

Not only in the human population, traditionally male-biased mortality among nonhuman mammals has also been explained in terms of more risky behaviors by males when compared with their feminine counterparts. Empirical studies of species in which males fight one another for access to females have shown repeatedly that such male-male competition results quite costly in terms of survival. Likewise, comparative studies demonstrate that the species with the greatest male bias in mortality tend to be those in which male-male competition is the fiercest [5]. All-inclusive, even if economic disparity or significance of locality present almost negligible importance, the concept that a male-bias exists in Mortality Rates, still holds firm ground.

## References

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