Estimation of Excess in Context of AIDS Deaths and the Probable Causes: 1994-2002"

Introduction Estimating the number of deaths due to AIDS is an ever-growing challenge across the globe. [1] Dynamics of HIV spread is known to vary from region to region.. India with its huge population size would yield a large number of AIDS deaths even with a slight increase in the HIV sero-prevalence rate. It is therefore prudent to try estimating the contribution of HIV/AIDS to overall mortality. In this study, we present estimates of excess deaths in four states of India (Maharashtra, Karnataka, Andhra Pradesh and Tamil Nadu) from 1994 to 2002.

METHOD Kink regression method is used to estimate the excess deaths in the age group of 25-49 years from 1994 to 2002. Mortality rates as given in Sample Registration System (SRS) data have been used. SRS is a large scale demographic survey conducted in India for providing reliable annual estimates of birth rate, death rate and other fertility and mortality indicators at the national and sub-national levels.[9]

A regression analysis of mortality rates from 1982 till 2002 was done. The year 1993 has been used as a cut off because deaths due to AIDS in India can be presumed to have occurred after 1993 after its introduction in the country in 1986. The maximum impact is likely to be observed in the age group of 25 to 49 years, the healthiest age group, where other causes of mortality play relatively little role. Hence, a method to analyze the impact of AIDS on the mortality in this age group was done to ascertain the number of excess deaths occurring compared to the number of deaths that would have occurred if AIDS was not there.

Given below are the steps used in the derivation of the kink regression equation ,used to calculate excess deaths in the age group 25 to 49 years for the years 1994 to 2002. The death rates considered for analysis were from 1982 to 2003. The steps are detailed below-

1. Estimation of population in the age group of 25 to 49 years, segregated as per sex and residence (urban and rural)
2. Estimation of deaths in 25 to 49 years of age group- Age specific death rates were available from Sample Registration System (SRS) data. This was applied to the population calculated to estimate the total deaths in each category.

3. Estimation of clubbed death rate- Total deaths calculated in step 2 was divided by the population derived in step 1 and multiplied by thousand to arrive at the clubbed death rate for urban, rural and male, female population for 4 states Maharashtra, Tamil Nadu, Andhra Pradesh, Karnataka.

4. Further these states were then clubbed on the basis of HIV prevalence and good health indicators.

5. Moving average of clubbed death rate (for the age group under study i.e. 25 to 49 years) was calculated. Natural logarithmic values were calculated for each moving death rate.

6 A mathematical model using kink regression technique was used to calculate the excess deaths.

The study gives the analysis of excess deaths and the probable causes? AIDS? in 4 states of India with HIV prevalence amongst antenatal mothers more than 1% .

Results The analysis takes into account only the trend with regards to time. The difference reflects the excess deaths that have occurred after 1993.. Segregated analysis residence and sex wise was done which for both yielded between 3.1 to 3.3 lakhs deaths in excess .

Discussion India has shown a decline in Crude Death Rate (CDR) over the last few decades. It has fallen from 11.9 in 1982 to 8.0 in 2003. The age group of 25-49 years comprises of a third of India's population, yet contributes to around 11% of the total deaths. The states of Maharashtra, Tamil Nadu, Andhra Pradesh and Karnataka capture 30% of the total deaths of the country. The trend in death rates in India shows a decline since 1982 and is still continuing yet, a regression analysis reveals that the rate has not decreased the way it should have been. There is in fact, an upsurge in the death rate after 1993.

ICMR estimates indicate that there has been no substantial increase in the prevalence rates of CVDs between 1998 and 2004.[10] Estimation yields a death rate of 0.8 per 1000 population for urban areas and 0.4 for rural areas. Though the values represent national data, yet they are based on some studies conducted in these 4 states. When these rates are used for the population of the region, death rate due to IHD varies from 27-29% in urban and 7-10% in rural areas. Stroke contributes around 20% of deaths in urban and 10-15% of deaths in rural areas according to ICMR estimate of a mortality of 0.6/1000 population Contribution of IHD to total mortality is thus consistent, showing no significant increase with time.

ICMR runs a population based cancer registry programme through six centers. Out of these, four are located in this region. Viz. Mumbai, Chennai, Bangalore and Barshi (rural). The cancer data is therefore representative of the actual situation of the region. Extrapolated mortality data for all age groups in 1998 is similar to that of 2004 suggesting thereby that there is no increase in incident or mortality rate due to cancer.[10] Hence, cancer, as a potential factor to cause excess deaths gets ruled out.

Maternal mortality rate has shown a substantial decline between 1990 and 1998 in all the four states.[13] The burden of injuries have increased manifold over the last decade in India. In Tamil Nadu, Karnataka and Maharashtra, percentage of total deaths due to injuries has reduced in the age groups of 25-34 and 35-44 years. But , Andhra Pradesh has witnessed an increase in the deaths caused by injuries from 22% among males aged 25-34 years in 1990 to 43.7% in 1999.[13] A similar trend has been observed among females where it has almost doubled.

Number of AIDS cases and deaths have shown a consistent rise till 2004-5 followed by a fall .It may be noted that there is considerable underreporting of AIDS cases and deaths on account of stigma. Moreover there would a large overlap of AIDS and other opportunistic infections like tuberculosis and many would die undiagnosed.

Yet another indirect evidence is that of ill-defined illness that has shown an increase in Karnataka and Maharashtra.[13] Emergence of multidrug resistant tuberculosis in new TB cases could be another finding. Its prevalence in fact has shown an increase from 1.4% in 1985-89 to 3% in 1999-2000 in studies conducted in diverse locations in these four states.[21] A resurgence of TB has occurred in Mumbai since 1990, characterized by a 70-140% increase in the rate of TB related deaths among adults aged 25-44 years. A recent review of autopsy reports from Mumbai showed that 59% of adult patients with AIDS were diagnosed with pulmonary TB. The city has reported a high prevalence of multidrug resistant tuberculosis; 11% in 1991-95 to 58% in 1994-5 in two reference mycobacterial laboratories in private hospitals.[22] Increase in the prevalence, incidence and mortality due to tuberculosis is not evident due to the ongoing Revised National Tuberculosis Control Programme (RNTCP).[23] However, a modest decline in life expectancy has been seen in Andhra Pradesh between 1995-99 and 1996-2001 among males and females.[24]

A high HIV prevalence of >1% in antenatal mothers has been found in these four states. HIV seroprevalence rates among antenatal cases that is representative of general population has shown an increase since 1992 followed by a gradual decline after 2002.

The number of AIDS cases and deaths are highly underreported due to the stigma associated with it. Numbers reported may represent only the tip of the iceberg. AIDS deaths as reported to the Government of India in the state of Maharashtra was 257 till 2000. But in an independent study conducted in Sangli, a high prevalence district, the number of AIDS deaths was 257.[25] Maharashtra had a toll of around 915 which is more than 3.5 times the number reported. Mumbai and Sangli district accounted for more than half the total deaths occurring in the state.

To conclude, excess deaths have taken place and a large proportion could be due to AIDS even though other factors could be playing some role.

Diagrams and REFRENCES ARE GIVEN IN THE FULL PAPER

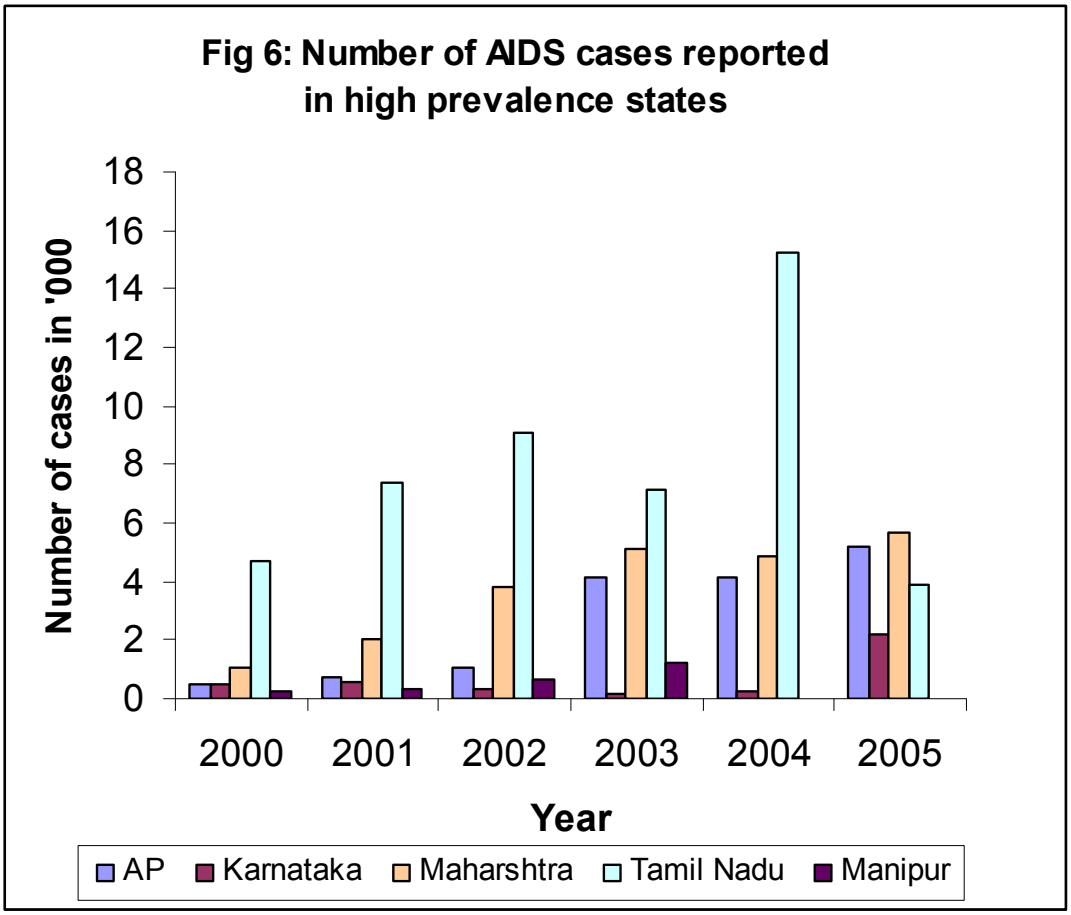
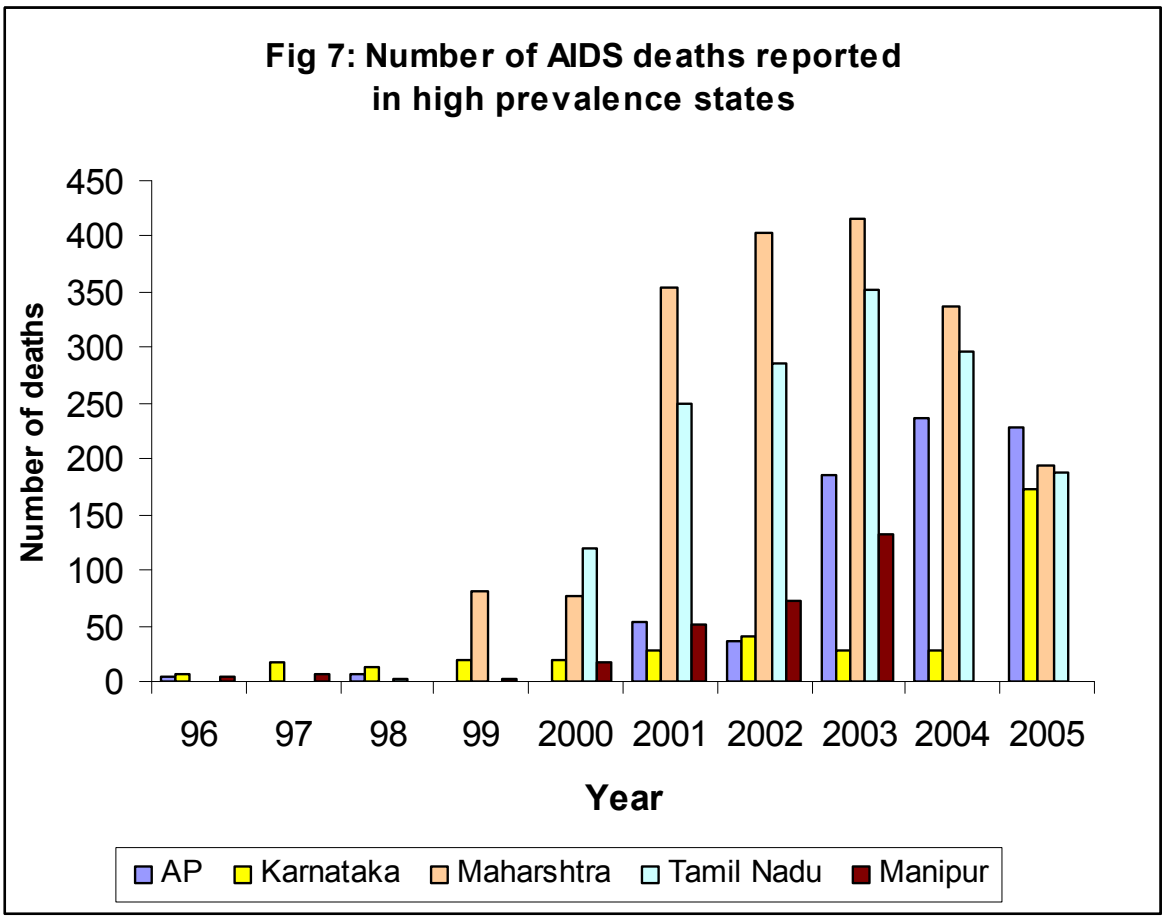


Fig 6: Number of AIDS cases reported in high prevalence states
Number of cases in '000
18
16
14
12
10
8
6
4
2
0
2000
2001
2002
2003
2004
2005
Year
AP
Karnataka
Maharshtra
Tamil Nadu
Manipur



What are the excess deaths due to?

In the absence of actual data, indirect estimates may be used to analyze the situation. As of 1998, only 14.9% of all registered and 41.3% of unregistered deaths were covered by MCCD.[10] Medically certified deaths comprise of not more than 16% of the total registered deaths since 1984 and it ranges from 5.4% in Andhra Pradesh to 33.7% in Maharashtra.[18] Analysis of various causes predict that cardiovascular causes, cancers and maternal deaths may not be the major contributors to the excess deaths. Injuries may contribute to a proportion of excess deaths but the rising trend of AIDS deaths explains it could be playing a major role.

Although the levels of HIV/ AIDS infection prevalence are not markedly increasing now, yet the states are witnessing the increase in the number of HIV/AIDS deaths as a result of infections that affected 10 years ago. In a study carried out in Mumbai, from an estimated 85,200 HIV infected individuals in 1997, at least 4120 excess deaths attributed to AIDS occurred among 15-54 year olds.[7]

Commercial sex workers(along with injecting drug use in Tamil Nadu) serve as the major driver of the epidemic. HIV surveillance in 2003 found 14% of the commercial sex workers (CSW) in Karnataka and 19% in Andhra Pradesh was infected with HIV. The recent finding that 26% of CSW in Mysore (Karnataka) were HIV + is not surprising given that just 14% of the women used condoms consistently with clients and that 91% of them never used condoms during sex with their regular partners.[19] Available data suggest that efforts to promote condom use during commercial sex has not been effective in Mumbai as HIV prevalence among female sex workers has not fallen below 52% since 2000.[20]

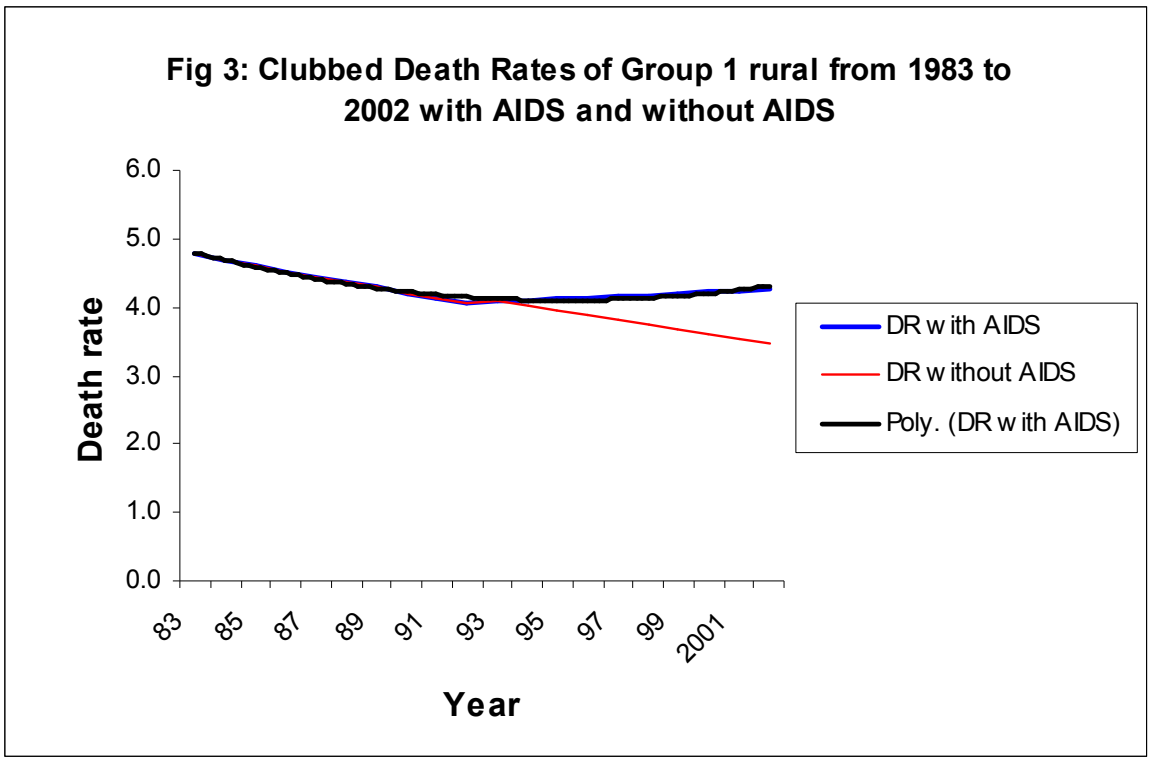
Yet another indirect evidence is that of ill-defined illness that has shown an increase in Karnataka and Maharashtra.[13] Emergence of multidrug resistant tuberculosis in new TB cases could be another finding. Its prevalence in fact has shown an increase from 1.4% in 1985-89 to 3% in 1999-2000 in studies conducted in diverse locations in these four states.[21] A resurgence of TB has occurred in Mumbai since 1990, characterized by a 70-140% increase in the rate of TB related deaths among adults aged 25-44 years. A recent review of autopsy reports from Mumbai showed that 59% of adult patients with AIDS were diagnosed with pulmonary TB. The city has reported a high prevalence of multidrug resistant tuberculosis; 11% in 1991-95 to 58% in 1994-5 in two reference mycobacterial laboratories in private hospitals.[22] Increase in the prevalence, incidence and mortality due to tuberculosis is not evident due to the ongoing Revised National Tuberculosis Control Programme (RNTCP).[23] However, a modest decline in life expectancy has been seen in Andhra Pradesh between 1995-99 and 1996-2001 among males and females.[24]

The number of AIDS cases and deaths are highly underreported due to the stigma associated with it. Numbers reported may represent only the tip of the iceberg. AIDS deaths as reported to the Government of India in the state of Maharashtra was 257 till 2000. But in an independent study conducted in Sangli, a high prevalence district, the number of AIDS deaths was 257.[25] Maharashtra had a toll of around 915 which is more than 3.5 times the number reported. Mumbai and Sangli district accounted for more than half the total deaths occurring in the state. Migrants constitute about 50% of the total growth of population in Mumbai and majority are from other states or other parts of Maharashtra.[26] Higher proportion of male migrants return back to their place of origin after diagnosis thus decreasing the figures even further.[25]

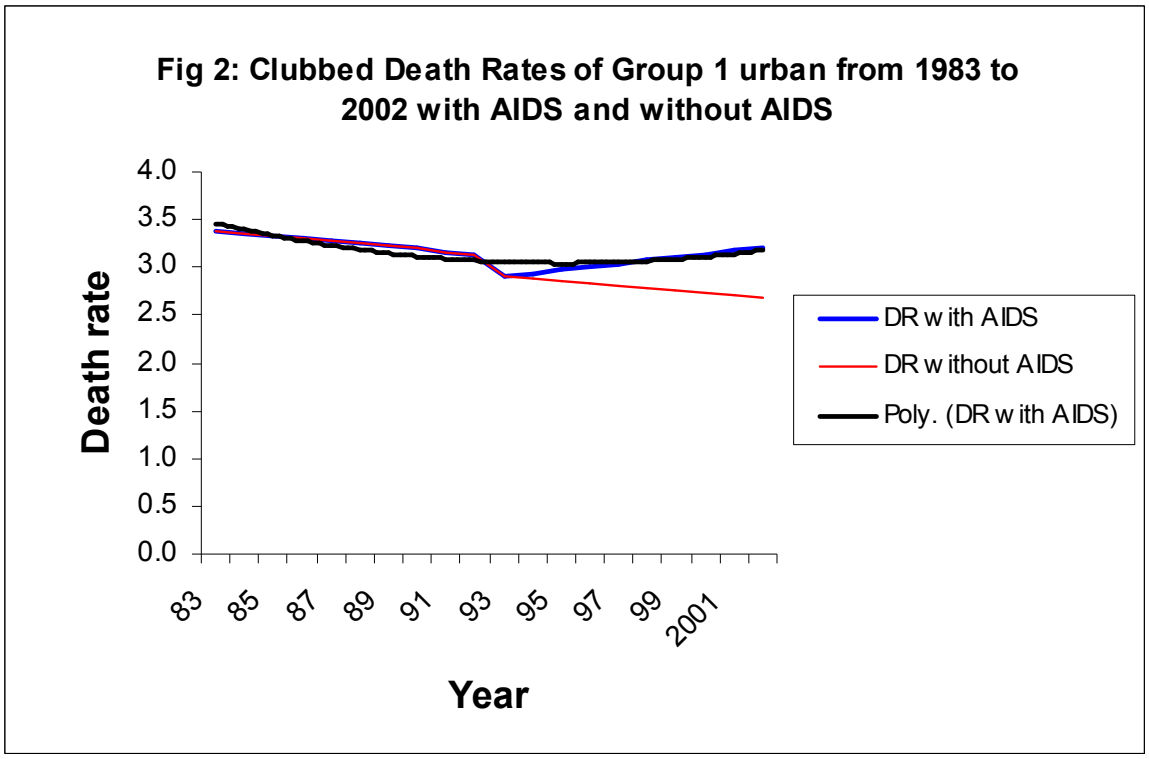
To conclude, a large proportion of excess deaths could be due to AIDS even though other factors could be playing some role. This goes quite well with the estimated deaths of more than 4000 on 1997 alone.[7]

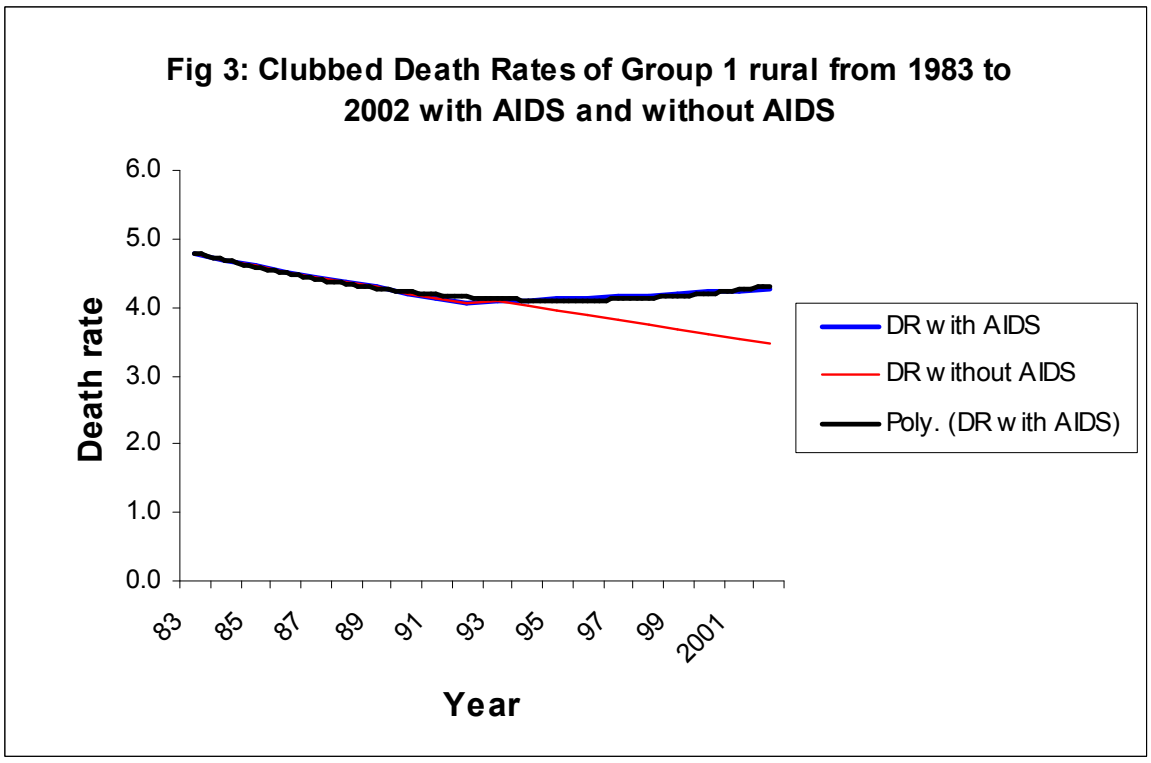
References

1. Srinivasa Rao ASR. Mathematical modeling of AIDS epidemic in India. Current Science 2003;84:1192-97.
2. Gabriel P, Sophie LC, Pierre M, Nicolas B, Mare L. Contribution of AIDS to the general mortality in Central Africa: evidence from a morgue based study in Brazzaville, Congo. AIDS 1998; 12:2217-2223.
3. De Cock KM, Barrere B, Diaby L. AIDS: the leading cause of adult death in the West African city of Abidjan, Cote d'Ivoire. Science 1990; 249:793-796.
4. Timaeus IM. Impact of the HIV epidemic on mortality in sub Saharan Africa: evidence from national surveys and censuses. AIDS 1998; 12:S15-27.



Residence wise analysis showed that there were more than 3 lakhs deaths in excess analysisresidence and sex wise was done.





Residence wise analysis showed that there were more than 3 lakhs deaths in excess