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# Reversal in declining trend of adult mortality in many states of India, 1970-2001: Is it due to AIDS?

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# Reversal in declining trend of adult mortality in many states of India, 1970-2001: Is it due to AIDS?

Abhaya Indrayan and Ajay Kumar Bansal

**Abstract**

Objectives: To investigate the reversal in adult mortality trend from declining to rising in some segments of population in India, and to use an indirect demographic method to examine if this increase could be due to AIDS mortality. Also, to estimate the total excess deaths.

Design: Cross-sectional data on age-specific death rate in 5-year age-intervals from 25 to 44 years for the years 1970 to 1998 for rural/urban and male/female segments for each of 16 major states of India obtained from the government reports, and their projections till the year 2001.

Methods: In view of reversal of trend in some areas, we tried to fit a parabola to the observed rates in each segment. A statistically significant fit in some segments revealed the year with least mortality rate when the reversal started. Another fit was obtained by projection of the previously declining trend. Excess deaths were estimated by applying the excess death rate to the population of the segment where reversal in trend was significant.

Results: Reversal in declining mortality trend was detected in 65 of a total 256 age-sex-area (urban/rural) segments that we examined. Fourteen of the 16 States revealed reversal in at least one segment. The year of reversal in most segments coincides fairly well with the anticipated year of start of substantial AIDS mortality. At the national level, a total of at least 214,390 deaths till 2001 were revealed as excess by this method. This number is quite low relative to the deaths otherwise attributed to AIDS in the country. Contrary to belief, increase in mortality due to

AIDS was seen more commonly in rural areas than in urban areas, and more in females than in males.

Conclusions: The indirect demographic method of estimating AIDS deaths in India yields an apparently low number of deaths, and does not confirm the belief that AIDS in India is spreading from urban to rural, and from male to female populations.

Keywords: AIDS deaths, Mortality trend reversal, States of India, Age-specific death rates, Demographic method

## Introduction

Seventeen years down the epidemic in India since 1986, the focus in 2003 naturally shifted to AIDS mortality. The World Health Organization[1] estimated that approximately 350,000 people died in the country due to AIDS till the year 2000 in 15-49 years age group, and the number projected for the year 2005 was close to 500,000. Schwartlander et al.[2] estimated 350,000 AIDS deaths in India by the year 1997 including children. UNAIDS[3] estimated 310,000 deaths for the year 1999 alone. Their recent estimates are not available. No such estimates are available from the National AIDS Control Organization (NACO), which is the official agency for this purpose in India.

With more than a million HIV cases estimated in early nineties in India by GPA/WHO[4] and the survival duration surmised to range from 7 to 13 years in the absence of therapy[5], the projection of more than a million deaths cumulatively since the onset of epidemic till the year 2001 may not be far too off from reality. But there is no evidence yet that so many deaths have actually occurred. NACO has documented only 1759 AIDS deaths till December 2000[6]. Since then 2931 more deaths have been documented by the year 2003, according to the Health Minister of India[7]. A large number escape attention or defy cause attribution due to inadequate system of certification of cause of deaths.

The basic difficulty in assessing AIDS mortality in India is the cause attribution. For many causes such as pneumonia and tuberculosis, at least some information is available by way Survey of Causes of Death of the Registrar General of India, which attributes causes from a non-medical list after verbal autopsy[8]. Although substantial AIDS deaths were expected 17 years after the detection of first case but this survey has still not geared itself to attribute AIDS as a cause of death. These deaths can be easily counted for the opportunistic infections such as tuberculosis. Civil registration of deaths in India that assigns cause of death is deficient to an extent of 54 percent[9], and is completely inadequate to give any indication of the mortality attributable to AIDS.

In the absence of feasibility of any direct method, it is natural to investigate indirect methods. While preparing database on HIV seroepidemiology for India on behalf of South Asia Inter-country Programme of UNAIDS, we noted that mortality rates in some adult age groups in some states have shown upswing against a secular decline over the previous 20 odd years. This was surprising since nothing was known to cause such increase in deaths. It started in early nineties in many cases that coincided with the feared time of occurrence of AIDS deaths. This prompted us to examine this feature in more detail. The present communication reports findings about such reversal and estimates the excess deaths that could be possibly assigned to AIDS epidemic in different major states of India.

## Methods

Widely used methods such as life expectancy at birth, crude death rate, infant mortality rate and child mortality rate[10] are not appropriate for India at the current stage of the epidemic since the affected were only around 0.4 percent of the total population[4]. Perinatal transmission is not large yet[11] to cause any significant increase in infant or child mortality. AIDS deaths in India are still concentrated in the adult age groups. This communication reports findings for the age-group 25-44 years broken into four 5-year intervals.

Sample Registration System (SRS) is a scheme of the Registrar General of India that was set up in late sixties for providing reliable estimates of fertility and mortality in different major states[12]. The number of sampling areas exceeds 6500 units in the year 1998 . The estimates of death rate provided by SRS have been found to be within 3 percent of the actuals[12]. This is just about the best source available in India for this purpose, and is widely believed to be correct.

Besides HIV database, we are also building up another database of more than 30 health indicators. These include age-specific death rates from SRS reports. These rates are available for urban and rural areas separately for males and females since the year 1970. Thus the data required for this work were readily available with us. With segments such as urban-male, urban-female, rural-male and rural-female and four age groups in each segment, we had 16 segments to examine for each state. The data were available for 16 major states, so that a total of 16×16 = 256 segments were examined for trend in mortality.

The secular trend in the age-specific death rate for each segment of each state was obtained for two scenarios. One was fitting a parabola to the observed rates wherever such a fit was statistically significant ($P<0.10$) (Examples in Figure 1 and 2). Level of significance of 0.10 instead of conventional 0.05 allowed us to detect minor reversals also that might be in the making. Parabolic fit has some very desirable feature: if reversal in mortality occurred, it is automatically revealed by the rise in the curve after a secular decline. If there is no reversal, the parabola generally will not be a good fit. The point of the minimum mortality in the trend was identified in each case by the change in sign of $\boldsymbol{dy/dx}$ from negative to positive wherever the parabolic fit was significant. The fit assumes that there was a gradual decline in the mortality, a leveling off, and then a gradual rise, and there is no sudden upswing. Such an observed trend is shown by solid curve for Andhra Pradesh as illustration in Figures 1 and 2.

The second fit was done assuming continuation of the previous declining trend. The average of the rates of decline seen in three years prior to the minimum was assumed to continue for the subsequent period. This gave us the projected trend had the earlier secular decline continued. In Figures 1 and 2 this is shown by broken line. The data were available for the years 1970 to 1998 and the same trend was extrapolated to the year 2001 for both the fits.

The difference between the observed trend and the projection of the previous declining trend is the excess death rate. This gap is shown by shaded areas in Figures 1 and 2. The excess death rate was applied to the estimated population for each segment in each year to get an estimate of the volume of excess deaths. For estimation of year-wise population, we used the simple geometric progression method based on census data for the year 1991[13] and for the year 2001[14]. The estimates of percentage population in different age groups were obtained from SRS reports. The latest SRS report available at the time of starting this work was for the year 1998 and our calculations for the years 1999, 2000 and 2001 assume same rates and proportions as in the year 1998. The year to year differences are minimal and this approximation is not likely to result in any big error.

**Results**

Table 1 shows the year of reversal of mortality from declining to rising wherever parabolic fit was found significant. Out of 256 segments we examined, such reversal occurred in 65 segments. Of these, 9 are for urban-males, 21 for urban-females, 18 for rural-males and 17 for rural-females. Out of 16 states, 14 states showed reversal in at least one segment. The salient observations are as follows:

1. The states of Bihar and Haryana showed no reversal in any segment and Uttar Pradesh showed reversal in only one segment. These states are known for low prevalence of HIV[6].
2. The reversal in five or more segments occurred in six states, namely, Andhra Pradesh (AP), Assam (AS), Maharashtra (MH), Orissa (OR), and Tamil Nadu (TN). Except OR and AS, these are the states which are categorized by NACO as high-prevalence states[6]. Orissa is a stranger in this group considering extremely low prevalence obtained by HIV sentinel surveillence in this state[6].
3. The year of reversal is between 1993 and 1997 in 41 segments. This is consistent with the expected time of substantial AIDS deaths considering the onset of epidemic in 1986. In other segments, reversal occurred quite early — even in late eighties. If this is to be believed, this raises the hypothesis that HIV was probably present before 1986 in some areas. We discuss this possibility later in this communication.

For brevity, we are not giving figures for each state. Illustrations in Figures 1 and 2 are for Andhra Pradesh — a state severely affected by HIV in India. Excess deaths obtained for each segment are given in Table 2 for different states. At the national level, a total of 214,390 deaths were revealed as excess by this method. This is cumulative till the year 2001. Small number of deaths may have occurred in other segments in some states that have not caused sufficient dent in the age-specific death rate for reversal to be statistically significant. Also, there were 19 other smaller states and Union Territories that are not covered in the present exercise due to lack of SRS data for these areas. However, their population together is only 9.4 percent of India's total population. Sixteen major states in our exercise cover the remaining 90.6 percent population.

**Discussion**

Various attempts have been made in the past in different areas to study AIDS mortality from secondary sources. Timaeus[16] examined trend in probability of dying between ages 15 and 50 year in four endemic and one nonendemic country in Africa, and observed upswing similar to the one observed by us for India. No attempt was made to transform this to the actual number of deaths attributable to AIDS. Garenne et al.[17] did almost exactly same exercise as ours for mortality in Abidjan. They noted marked increase in death rates starting 1986 — the date of the first diagnosed AIDS case in the city, particularly among male adults, and assumed that the excess mortality is attributable to AIDS. Their exercise ignored the consideration of incubation or the latent period that would cause lag in mortality.

Bangkok's Institute of Population Studies carried out a very comprehensive study[18] on mortality as a proxy for the impact of AIDS epidemic on Thai population. They studied all the age-groups beginning 0 to 70+, and projected excess deaths from 1989 to 2000. They considered average mortality in the years 1987 and 1988 as baseline, and excess was obtained as simple subtraction of baseline from the observed rate. No trends were fitted. This excess was divided in to an

increase due to external causes of death and an increase attributable to AIDS. External causes comprise accidents, homicides, suicides and poisoning. They also applied the excess death rate to the estimated age-specific population for each year just as we are doing in this communication.

Stover and Way[10] studied impact of AIDS on mortality by estimating the effect on life expectancy in countries of Africa. Conti et al.[19] measured premature mortality due to AIDS by potential years of life lost (PYLL) for Italy between 1984 and 1993. Heath et al.[20] analyzed demographic data of 11 selected industrialized nations with highly developed AIDS registration system, and obtained PYLL and standardized mortality ratio. Data limitation prevented us from using any of these methodologies.

There are limitations of our results. First, the reversal in adult mortality in some segments occurred before nineties. It is difficult to accept this as occurring due to AIDS in the wake of first case detected in the year 1986 in India. Note however that not only HIV but also AIDS case was detected in that year. There is anecdotal evidence that HIV was present in some pockets in India in the early eighties[21, 22]. Thus the possibility of reversal of trend in adult mortality in some areas in late eighties is not altogether implausible. Our analysis reveals that reversal occurred in 12 segments before the year 1990. Perhaps a closer look is needed to examine why such a trend emerged in those areas. We leave this aspect for future endeavours.

Second, the excess deaths revealed by this methodology are much less than otherwise apprehended considering the estimated infection levels in previous years. Deaths may be occurring in other segments also but not substantial to cause significant dent in the mortality trend. In addition, as already mentioned, smaller states and Union Territories are not included in the present estimate.

Third, reversal of trend is seen more commonly in rural areas than in urban areas, and more commonly in females than in males. Both these contradict the NACO assumption that the infection is spreading from urban to rural, and from males to females[6]. Their assumption looks rational but lacks evidence. Either their assumption needs reexamination or the reversal we observe is attributable to causes other than AIDS. The following strengthen the belief that this increase in mortality is indeed mostly due to AIDS.

1. Primary risk group for HIV/AIDS in India are the patients attending STD clinics[6]. Recent Behaviour Surveillance Survey[23] reports that genital discharge and/or genital ulcer/sore are more common in rural areas than urban areas in several states. Also females are more commonly affected than males in almost all the states. Thus a higher prevalence of HIV and consequent deaths in these groups is not entirely inconsistent, at least for some states.
2. Hira et al.[24] also report for Mumbai municipal area that excess mortality in adult age-groups is most likely due to AIDS in the absence of any other plausible cause. We examined the death rates by external causes such as accidents and suicides as reported by the Survey of Causes of Death and noted that these are rising linearly over the years without any special upswing to reverse the earlier decline trend in mortality. Some of the excess deaths might be due to these external causes but the data suggest that this could be minor.

Our findings regarding excess deaths due to AIDS in India can not be said unequivocal. The total excess deaths revealed by this method are much less than otherwise suspected. Nevertheless, this paper communicates that at least an attempt has been made to estimate the excess deaths using demographic method and it does not firmly confirm the pattern of AIDS deaths that is believed to be occurring in India.

**Key Messages**

- Substantial AIDS deaths are expected 17 years after the detection of first case.
- Basic difficulty in assessing AIDS mortality in India is the cause attribution.
- Civil registration of deaths in India that assigns cause of deaths is deficient to an extent of 54 percent and is completely inadequate to give any indication of the mortality attributable to AIDS.
- Reversal in mortality trend from declining to rising is detected in 14 states out of 16 major states of India in at least one segment of population (male/female – rural/urban).
- An indirect demographic method has been investigated for estimating excess deaths due to AIDS, and a total of at least 214,390 deaths till 2001 are revealed as excess by this method. This is low relative to those otherwise projected.

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**Table 1 : Year of age-specific mortality trend reversal in major States of India for different areas (rural, urban) and age-categories (25 to 44) in males and females -- 1971 to 2001**

| Segment | AP | AS | BH | HN | HP | GJ | KA | KL | MP | MR | OR | PJ | RJ | TN | UP | WB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| U-M,25-29 | ↑ 1994 | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ↑ 1987 | ☆ | ☆ |
| U-M,30-34 | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ↑ 1989 | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ |
| U-M,35-39 | ↑ 1994 | ☆ | ☆ | ☆ | ☆ | ↑ 1990 | ☆ | ☆ | ☆ | ☆ | ↑ 1989 | ☆ | ☆ | ☆ | ☆ | ↑ 1993 |
| U-M,40-44 | ☆ | ↑ 1995 | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ↑ 1989 | ☆ | ☆ | ☆ | ☆ | ☆ |
| | | | | | | | | | | | | | | | | |
| U-F,25-29 | ☆ | ↑ 1990 | ☆ | ☆ | ☆ | ☆ | ↑ 1990 | ☆ | ☆ | ↑ 1992 | ↑ 1998 | ↑ 1987 | | ↑ 1990 | ☆ | ☆ |
| U-F,30-34 | ☆ | ↑ 1991 | ☆ | ☆ | ☆ | ↑ 1995 | ☆ | ☆ | ☆ | ↑ 1995 | ↑ 1997 | ↑ 1995 | ☆ | ☆ | ↑ 1988 | ☆ |
| U-F,35-39 | ↑ 1988 | ↑ 1997 | ☆ | ☆ | ↑ 1994 | ☆ | ↑ 1993 | ☆ | ☆ | ↑ 1994 | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ |
| U-F,40-44 | ↑ 1988 | ☆ | ☆ | ☆ | ☆ | ↑ 1998 | ↑ 1999 | ☆ | ☆ | ☆ | ☆ | ↑ 1999 | ☆ | ☆ | ☆ | ☆ |
| | | | | | | | | | | | | | | | | |
| R-M,25-29 | ↑ 1990 | ☆ | ☆ | ☆ | ↑ 1986 | ☆ | ↑ 1989 | ☆ | ↑ 1996 | ↑ 1987 | ☆ | ☆ | ↑ 1997 | ↑ 1993 | ☆ | ☆ |
| R-M,30-34 | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ↑ 1992 | ↑ 1993 | ↑ 1984 | ☆ | ☆ | ☆ | ☆ |
| R-M,35-39 | ↑ 1998 | ☆ | ☆ | ☆ | ↑ 1993 | ☆ | ☆ | ☆ | ☆ | ☆ | ↑ 1996 | ☆ | ☆ | ↑ 1994 | ☆ | ☆ |
| R-M,40-44 | ↑ 1991 | ☆ | ☆ | ☆ | ☆ | ☆ | ↑ 1990 | ☆ | ☆ | ☆ | ↑ 1995 | ☆ | ☆ | ☆ | ☆ | ↑ 1997 |
| | | | | | | | | | | | | | | | | |
| R-F,25-29 | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ |
| R-F,30-34 | ↑ 1995 | ↑ 1994 | ☆ | ☆ | ☆ | ☆ | ↑ 1996 | ↑ 1993 | ↑ 1999 | ↑ 1991 | ☆ | ☆ | ↑ 1999 | ↑ 1995 | ☆ | ☆ |
| R-F,35-39 | ↑ 1995 | ☆ | ☆ | ☆ | ↑ 1994 | ☆ | ↑ 1996 | ↑ 1994 | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ |
| R-F,40-44 | ↑ 1996 | ☆ | ☆ | ☆ | ☆ | ☆ | ☆ | ↑ 1995 | ↑ 1992 | ☆ | ↑ 1996 | ☆ | ☆ | ☆ | ☆ | ↑ 1994 |

↑ - Reversal in trend; ☆- No reversal in trend

R - Rural; U - Urban; M - Male; F - Female

AP-Andhra Pradesh; AS-Assam; BH-Bihar; HN-Haryana; HP-Himachal Pradesh; GJ-Gujarat; KA-Karnataka; KL-Kerala; MP-Madhya Pradesh; MR-Maharashtra; OR-Orissa; PJ-Punjab; RJ-Rajasthan; TN-Tamil Nadu; UP-Uttar Pradesh; WB-West Bengal

**Table 2 : Estimated excess deaths in different States - 1991 to 2001**

| Segment | AP | AS | BH | GJ | HN | HP | KA | KL | MP | MR | OR | PJ | RJ | TN | UP | WB | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | |
| **U-M,25-29** | 736 | | | | | | | | | | | | | 10971 | | | **11707** |
| **U-M,30-34** | | | | | | | | | | 11132 | | | | | | | **11132** |
| **U-M,35-39** | 1299 | | | 5477 | | | | | | | 1673 | | | | | 1595 | **10044** |
| **U-M,40-44** | | 102 | | | | | | | | | 3029 | | | | | | **3131** |
| ***U-M,25-44*** | ***2035*** | ***102*** | | ***5477*** | | | | | | ***11132*** | ***4702*** | | | ***10971*** | | ***1595*** | ***36014*** |
| | | | | | | | | | | | | | | | | | |
| **U-F,25-29** | | 737 | | | | | 3868 | | | 4732 | 24 | 2998 | | 4585 | | | **16944** |
| **U-F,30-34** | | 627 | | 364 | | | | | | 774 | 46 | 146 | | | 11287 | | **13244** |
| **U-F,35-39** | 8669 | 74 | | | | 51 | 994 | | | 2300 | | | | | | | **12088** |
| **U-F,40-44** | 5508 | | | 73 | | | 32 | | | | | 10 | | | | | **5623** |
| ***U-F,25-44*** | ***14177*** | ***1438*** | | ***437*** | | ***51*** | ***4894*** | | | ***7806*** | ***70*** | ***3154*** | | ***4585*** | ***11287*** | | ***47899*** |
| | | | | | | | | | | | | | | | | | |
| **U-P,25-29** | 736 | 737 | | | | | 3868 | | | 4732 | 24 | 2998 | | 15556 | | | **28651** |
| **U-P,30-34** | | 627 | | 364 | | | | | | 11906 | 46 | 146 | | | 11287 | | **24376** |
| **U-P,35-39** | 9968 | 74 | | 5477 | | 51 | 994 | | | 2300 | 1673 | | | | | 1595 | **22132** |
| **U-P,40-44** | 5508 | 102 | | 73 | | | 32 | | | | 3029 | 10 | | | | | **8754** |
| ***U-P,25-44*** | ***16212*** | ***1540*** | | ***5914*** | | ***51*** | ***4894*** | | | ***18938*** | ***4772*** | ***3154*** | | ***15556*** | ***11287*** | ***1595*** | ***83913*** |
| | | | | | | | | | | | | | | | | | |
| **R-M,25-29** | 21072 | | | | | 5884 | 7023 | | 1055 | 14413 | | | 321 | 2124 | | | **51892** |
| **R-M,30-34** | | | | | | | | | | 3595 | 3525 | 9449 | | | | | **16569** |
| **R-M,35-39** | 371 | | | | | 556 | | | | | 1204 | | | 1005 | | | **3136** |
| **R-M,40-44** | 17111 | | | | | | 5228 | | | | 1574 | | | | | 1838 | **25751** |
| ***R-M,25-44*** | ***38554*** | | | | | ***6440*** | ***12251*** | | ***1055*** | ***18008*** | ***6303*** | ***9449*** | ***321*** | ***3129*** | | ***1838*** | ***97348*** |
| | | | | | | | | | | | | | | | | | |
| **R-F,25-29** | | | | | | | | | | | | | | | | | |
| **R-F,30-34** | 2325 | 3028 | | | | | 1021 | 1934 | 133 | 6803 | | | 98 | 2404 | | | **17746** |
| **R-F,35-39** | 2714 | | | | | 566 | 855 | 1384 | | | | | | | | | **5519** |
| **R-F,40-44** | 1716 | | | | | | | 79 | 809 | | 683 | | | | | 6577 | **9864** |
| ***R-F,25-44*** | ***6755*** | ***3028*** | | | | ***566*** | ***1876*** | ***3397*** | ***942*** | ***6803*** | ***683*** | | ***98*** | ***2404*** | | ***6577*** | ***33129*** |
| | | | | | | | | | | | | | | | | | |
| **R-P,25-29** | 21072 | | | | | 5884 | 7023 | | 1055 | 14413 | | | 321 | 2124 | | | **51892** |
| **R-P,30-34** | 2325 | 3028 | | | | | 1021 | 1934 | 133 | 10398 | 3525 | 9449 | 98 | 2404 | | | **34315** |
| **R-P,35-39** | 3085 | | | | | 1122 | 855 | 1384 | | | 1204 | | | 1005 | | | **8655** |
| **R-P,40-44** | 18827 | | | | | | 5228 | 79 | 809 | | 2257 | | | | | 8415 | **35615** |
| ***R-P,25-44*** | ***45309*** | ***3028*** | | | | ***7006*** | ***14127*** | ***3397*** | ***1997*** | ***24811*** | ***6986*** | ***9449*** | ***419*** | ***5533*** | | ***8415*** | ***130477*** |
| | | | | | | | | | | | | | | | | | |
| **C-M,25-29** | 21808 | | | | | 5884 | 7023 | | 1055 | 14413 | | | 321 | 13095 | | | **63599** |
| **C-M,30-34** | | | | | | | | | | 14727 | 3525 | 9449 | | | | | **27701** |
| **C-M,35-39** | 1670 | | | 5477 | | 556 | | | | | 2877 | | | 1005 | | 1595 | **13180** |
| **C-M,40-44** | 17111 | 102 | | | | | 5228 | | | | 4603 | | | | | 1838 | **28882** |
| ***C-M,25-44*** | ***40589*** | ***102*** | | ***5477*** | | ***6440*** | ***12251*** | | ***1055*** | ***29140*** | ***11005*** | ***9449*** | ***321*** | ***14100*** | | ***3433*** | ***133362*** |
| | | | | | | | | | | | | | | | | | |
| **C-F,25-29** | | 737 | | | | | 3868 | | | 4732 | 24 | 2998 | | 4585 | | | **16944** |
| **C-F,30-34** | 2325 | 3655 | | 364 | | | 1021 | 1934 | 133 | 7577 | 46 | 146 | 98 | 2404 | 11287 | | **30990** |
| **C-F,35-39** | 11383 | 74 | | | | 617 | 1849 | 1384 | | 2300 | | | | | | | **17607** |
| **C-F,40-44** | 7224 | | | 73 | | | 32 | 79 | 809 | | 683 | 10 | | | | 6577 | **15487** |
| ***C-F,25-44*** | ***20932*** | ***4466*** | | ***437*** | | ***617*** | ***6770*** | ***3397*** | ***942*** | ***14609*** | ***753*** | ***3154*** | ***98*** | ***6989*** | ***11287*** | ***6577*** | ***81028*** |
| | | | | | | | | | | | | | | | | | |
| **C-P,25-29** | 21808 | 737 | | | | 5884 | 10891 | | 1055 | 19145 | 24 | 2998 | 321 | 17680 | | | **80543** |
| **C-P,30-34** | 2325 | 3655 | | 364 | | | 1021 | 1934 | 133 | 22304 | 3571 | 9595 | 98 | 2404 | 11287 | | **58691** |
| **C-P,35-39** | 13053 | 74 | | 5477 | | 1173 | 1849 | 1384 | | 2300 | 2877 | | | 1005 | | 1595 | **30787** |
| **C-P,40-44** | 24335 | 102 | | 73 | | | 5260 | 79 | 809 | | 5286 | 10 | | | | 8415 | **44369** |
| ***C-P,25-44*** | ***61521*** | ***4568*** | | ***5914*** | | ***7057*** | ***19021*** | ***3397*** | ***1997*** | ***43749*** | ***11758*** | ***12603*** | ***419*** | ***21089*** | ***11287*** | ***10010*** | ***214390*** |

U - Urban; R - Rural; C - Rural and Urban combined
M - Male; F - Female; P - Person
AP-Andhra Pradesh; AS-Assam; BH-Bihar; HN-Haryana; HP-Himachal Pradesh; GJ-Gujarat; KA-Karnataka; KL-Kerala; MP-Madhya Pradesh; MR-Maharashtra; OR-Orissa; PJ-Punjab; RJ-Rajasthan; TN-Tamil Nadu; UP-Uttar Pradesh; WB-West Bengal

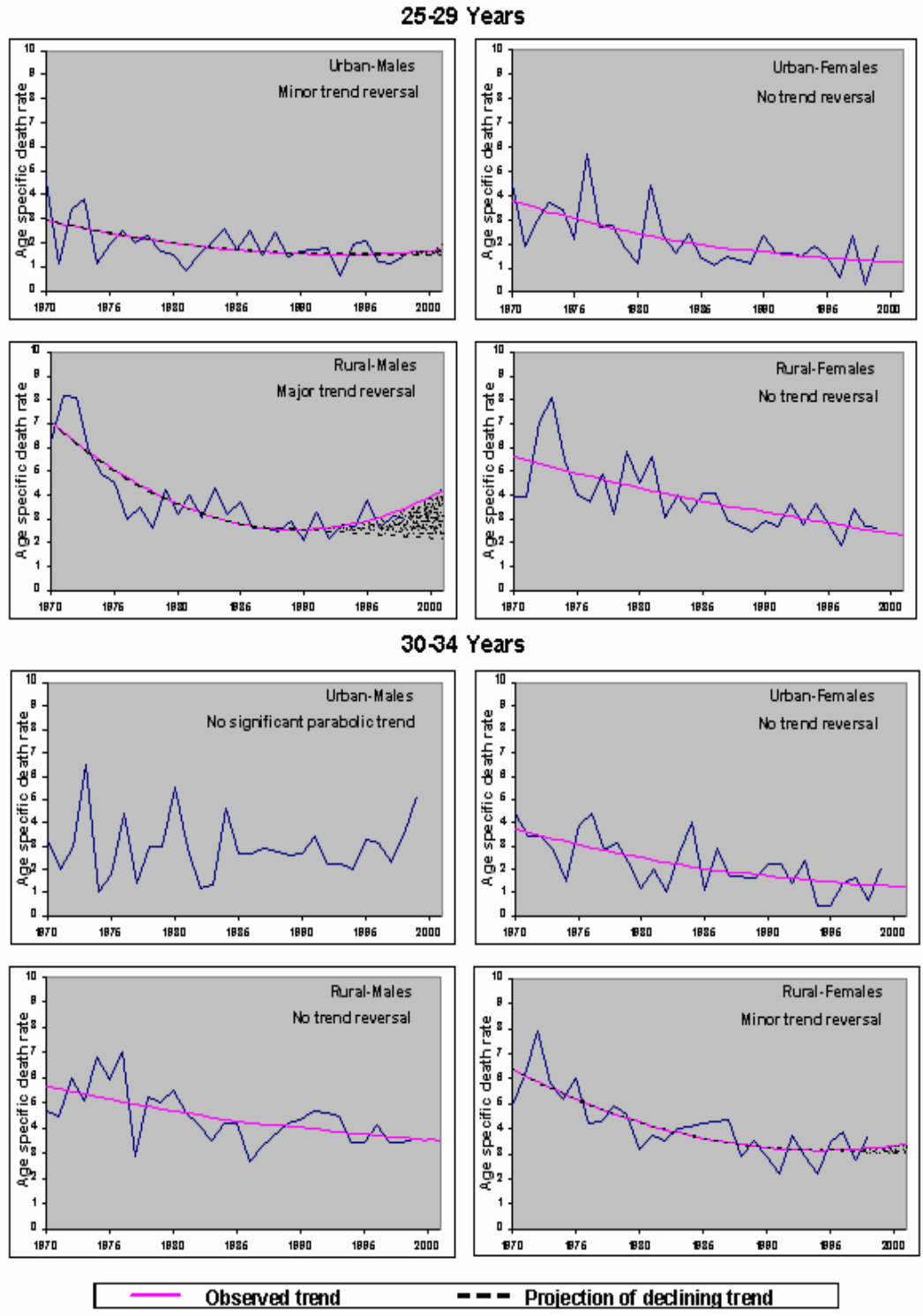


**Figure 1: Observed and projected trend in age-specific mortality in Andhra Pradesh in 25-29 and 30-34 years**

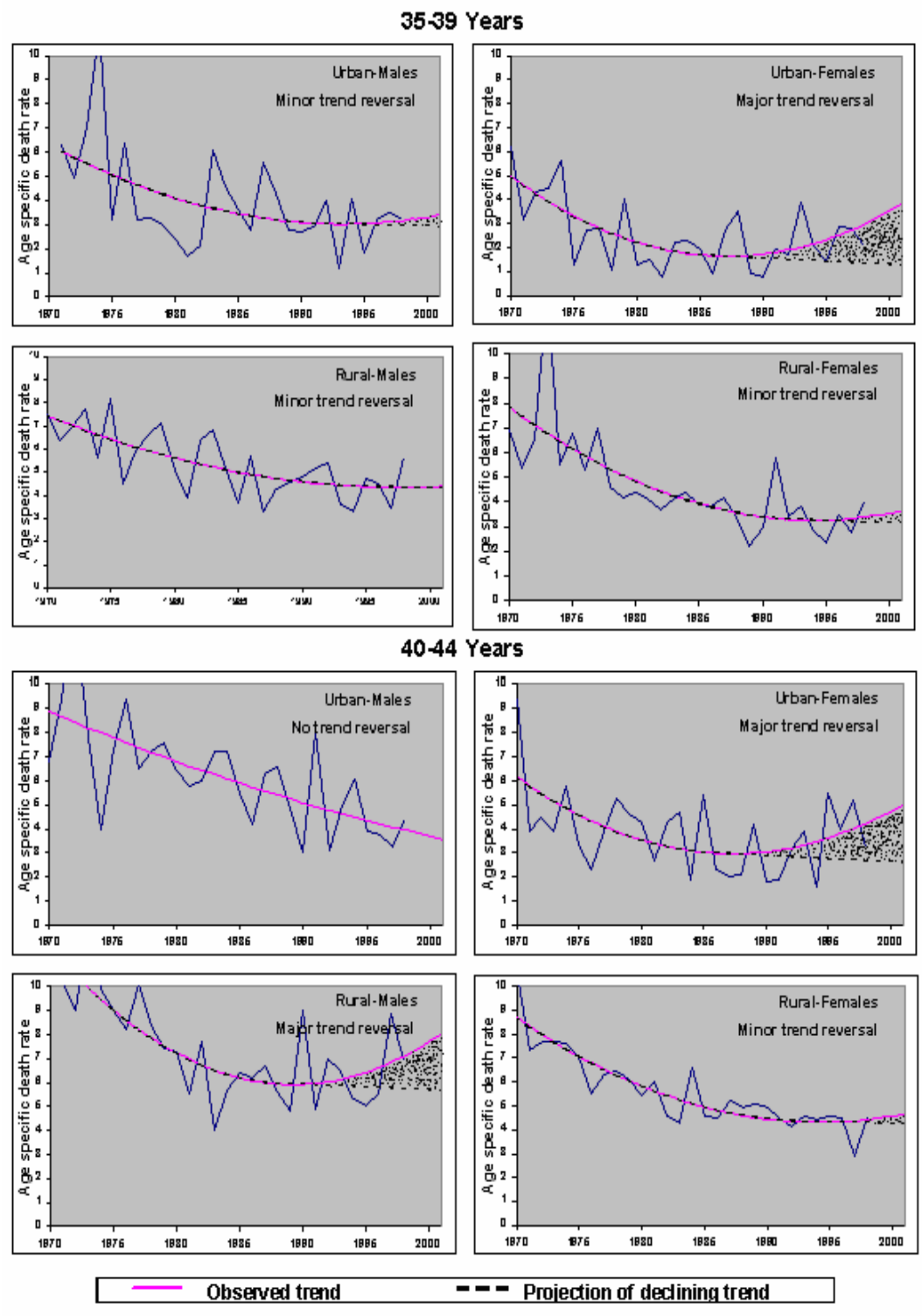


**Figure 2: Observed and projected trend in age-specific mortality in Andhra Pradesh in 35-39 and 40-44 years**