

The Burden of HIV/AIDS in India and its Northeastern States

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The HIV/AIDS epidemic is a major global public health threat and development challenges. According to the World Health Organization's Global Health Estimates, HIV/AIDS has remained one of the leading causes of death among the productive age group (30 to 49 years) in India from 2000 to 2019. It affected the working-age population extensively at their productive ages, thus affecting the economy. This paper aims to quantify the burden of HIV/AIDS in India using the Disability-Adjusted Life Years (DALYs) metrics. The study is based on secondary data from different sources. Results indicate that the DALYs lost due to HIV/AIDS for different age groups was 102.54 million DALYs. Of which the 15-49 age groups accounted for 85 per cent. During 2000-2019, the average HIV/AIDS burden in India accounted for Rs 27098 crores (5.47 billion USD) per year. During 2007-19, the Northeast states accounted for an average of 4.76 per cent of the national burden. However, in 2017, it had rapidly increased to 12 per cent. Manipur, Nagaland, and Mizoram have a higher HIV/AIDS burden share on the economy than the national average of 0.14 per cent in 2017 and 2019. The study concludes that there is an urgent need to provide equitable, affordable, and quality healthcare delivery for HIV/AIDS services in these vulnerable states.

Keywords: HIV/AIDS, disability-adjusted life years, working-age group, premature death, northeast states, economic burden, public health

Introduction

Ever since the first reported cases in 1981, the HIV/AIDS epidemic has become a major global public health threat and development challenge. Since the beginning of the HIV epidemic, the number of people infected globally stands at approximately 75.7 million, out of which 32.7 million have died as of 2020 (UNAIDS, 2020a). The number of people living with HIV (PLHIV) has increased by about 58 per cent since 2000, when there were approximately 24 million PLHIV, reaching around 38 million in 2020 (UNAIDS, 2020b). According to WHO, HIV/AIDS became the eighth leading

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cause of death globally in 2000 and the nineteenth in 2019. Despite the significant fall in HIV/AIDS deaths during the last two decades, it still remains one of the leading causes of death in lower-income countries. The Global Burden of Disease 2017, Causes of Death Collaborators (2018) reveals that 15 to 49 years and under-five years are the most at risk.

India is the third-largest country with an HIV epidemic globally in 2017, with 2.1 million people living with HIV, after South Africa with 7.5 million and Mozambique with 2.2 million (UNAIDS, 2018; UNAIDS, 2020b; CIA, 2021). Due to its enormous population of 1.3 billion people, India has an adult HIV prevalence of 0.2 per cent, which is below the global threshold of 0.8 per cent. However, two-fifths of the Indian states have an adult HIV prevalence higher than the national threshold as of 2019 (See Table 1). Since 2007, HIV/AIDS has been an alarming issue in North East India. Since 2017, three states have recorded the highest prevalence rates, which are higher than the national average: Mizoram (2.04%), Manipur (1.43%), and Nagaland (1.15%). The National AIDS Control Organisation (NACO) estimates indicate about 190 new HIV infections per day in 2019. In 2007, approximately 148,310 people died due to AIDS-related diseases, which fell to 69,220 in 2019. Since 2007, the estimated number of people living with HIV has increased by 6 per cent by 2019. According to the Global Health Estimates (WHO, 2020), HIV/AIDS remains one of the leading causes of death among the productive age group (30 to 49 years) from 2000 to 2019 in India. Hence, it has extensively affected the working-age population during their productive years due to its marked impact on mortality and morbidity. As a result, a comprehensive study on the burden of HIV/AIDS on the economy is essential.

Generally, poor health status reduces economic productivity, adversely impacting economic growth (WHO, 2001; Bloom et al., 2004). The HIV/AIDS epidemic has enormously affected the economically active population, shredding the breadwinner of the family. It results in low factor productivity due to the loss of skilled and unskilled labour and a decline in savings due to increased medical consumption (Ojha et al., 2006). HIV/AIDS impact on demographics and health is addressed by mortality and morbidity outcomes, particularly life expectancy and disability-adjusted life years (DALYs). The WHO Global health estimates show that in 2000, nine-tenths of the HIV/AIDS deaths were among the working-age group (15-49 years). Studies during 2001-2015 estimated that HIV/AIDS-infected patients have more than 38 years less than the standard life expectancy at the age of 20 (Mohammadi-Moein et al., 2013; Yaghoobi & Ahmadiania, 2017). Studies have also found that HIV-positive life expectancy has increased during the past decade in both high and middle-income countries and low-income countries after initiating Antiretroviral treatment. However, HIV-positive life expectancy was not yet close to the standard life expectancy due to antiretroviral's initial start (Wandeler et al., 2016).

Murray and Lopez (2013) reviewed the epidemiological transition between 1990 and 2010, highlighting that HIV/AIDS became the top five global causes of DALYs in 2010. The DALYs lost due to HIV/AIDS increased from 18,118 thousand DALYs in 1990 to 81,549 thousand DALYs in 2010. Ortblad et al. (2013) calculated the burden of HIV/AIDS using DALYs at the global and country levels. They estimate

that HIV accounts for 2.8 per cent of global deaths and 3.3 per cent of the global DALY during 2010. Regardless of the decrease in HIV/AIDS mortality, they found that it continues to be the top cause of mortality and burden globally and ranked the most common DALY cause for both sexes for the 30–44 age groups. WHO (2013) estimated 91.9 million DALYs were lost due to HIV/AIDS globally in 2012: Africa (73%), South-East Asia (13%), Europe (5%), Eastern Mediterranean (2%), Western Pacific (4%), and the Americas (4%). Since 2000, DALYs lost due to HIV/AIDS have decreased by 19.2 per cent, mainly due to a decline in AIDS-related deaths (Wang et al., 2016). However, morbidity has been reduced by only 9.6 per cent, while mortality has declined by 18 per cent (UNAIDS, 2016). In 2017, an estimate of the healthy life lost in India showed that HIV/AIDS is not one of the top fifteen mortality and disability conditions causing most DALYs in the country (Menon et al., 2019). Other studies showed that in 2010, India comprised 11.4 per cent of global HIV/AIDS DALYs while it shares 1.8 per cent of its country's total burden (Ortblad et al., 2013). Therefore, HIV/AIDS presents a relatively small fraction of the country's total disease burden; however, it shares a massive part of the global HIV/AIDS burden. Likewise, HIV/AIDS can be associated with any disease where the common HIV co-infection is tuberculosis, hepatitis B, hepatitis C, and cancer. People living with HIV (PLHIV) are 21 times at an increased risk of developing tuberculosis; it comprises 25 per cent of PLHIV deaths in the country during 2017-18 to 2019-20. (NACO, 2020a; NACO, 2020b).

The high prevalence and incidence of HIV/AIDS among the working-age population suggest a systematic analysis to understand the disease burden at the national and regional levels. Existing studies have mainly focused on the clinical and medical aspects and some on the household and social perspectives. Given the country's size, diversity, and variations across HIV/AIDS services, the current HIV/AIDS achievement is still distinct from the target goal. Hence, it is crucial to study the mortality and morbidity outcomes of HIV/AIDS in India to tackle them further. The objective of the study attempts to quantify the burden of HIV/AIDS in India and Northeast states using the Disability-Adjusted Life Years (DALYs) metrics. It aimed to determine the repercussions on individual health conditions at the population level, comparably and consistently. Using the health gap measures, we identified the epidemic burden and enhanced how the epidemic affects the economy through the indirect productivity loss of income among the working-age groups. Since 2007, the Northeast states have higher HIV adult prevalence than the national average. As a result, the study reveals the extent of the HIV/AIDS burden distinctly among these hardest-hit regions. The study expanded an improved perception of the significant relationship between health and human capital.

This paper is divided into five sections: Introduction, Materials and Methods, Results, Discussion, and Conclusions. The Introduction provides an overview of HIV/AIDS as a global health issue, with a specific focus on the challenges faced by India, particularly in its Northeast states. The Materials and Methods section details the data sources utilised, the calculation of Disability-Adjusted Life Years (DALYs), and the assessment of the economic burden associated with HIV/AIDS. The Results chapter

includes the overall burden of HIV/AIDS in India, a gender-wise breakdown of the burden, and an analysis of the burden in the Northeast Indian states. The Discussion interprets the findings, compares them with existing studies, and explores their policy implications. Finally, the Conclusions summarise the key findings and emphasise the necessity for continued research and effective interventions to address the ongoing challenges posed by HIV/AIDS.

Materials and Methods

The burden of disease defines the total, cumulative impact of a particular disease or a range of both fatal and nonfatal diseases in terms of disabilities within society. The outcomes consider health and social aspects, along with their associated costs to society. The burden of disease (BOD) reflects the various dimensions of a disease's consequences on health outcomes at the country, regional, or individual level. Its purpose is to evaluate the economic burden a disease or illness imposes on society (Jo, C., 2014). As Jefferson et al. (2000) explained, "The aim is descriptive: to itemise, value, and sum the costs of a particular problem with the aim of giving an idea of its economic burden."

The burden of disease is assessed by applying the WHO methodology for measuring the global burden of disease (GBD), which uses Disability-Adjusted Life Years (DALYs). This approach combines losses from premature death (years of life lost or YLL) and from disability (years of life lived with disability or YLD). In this study, the burden of HIV/AIDS is calculated using the DALY approach to identify health gaps. The methodology for estimating Disability-Adjusted Life Years (DALYs), including Years of Life Lost (YLL) and Years Lived with Disability (YLD), is guided by standards provided in the WHO Global Health Estimates (Department of Data and Analytics, 2020). Therefore, "one DALY" signifies the loss of one year of life lived in full health, represented by the following standard formula:

$$\text{DALY} = \text{YLL} + \text{YLD}$$

YLL = years of life lost due to premature death; YLD = years of life lost due to disability

The year of life lost due to premature death (YLL) metric is represented by multiplying the total number of deaths from a disease or illness by the standard life expectancy at the age of death (represented in years). The basic formula for calculating YLL is as follows;

$$\text{YLL} = \text{N} \times \text{L}$$

N = total number of deaths; L = Life expectancy at the time of death

The years of life lost due to disability (YLD) metrics measure the total time lived with a disability using two methods: prevalence and incidence measure of disability. The former is computed by multiplying the number of prevalent cases by the disability weight factor. The latter is computed by multiplying the number of new incident cases by the average duration of disability and the disability weight factor. The formulae for calculating YLD are:

$$YLD=P \times DW$$

P= number of prevalent cases
DW= disability weights

$$YLD=IDWL$$

I=number of new incident cases
L=average duration of disability (in years)

The disability weight stipulates the severity of the disease on a scale from 0 (perfect health) to 1 (equivalent to death). In the study, the prevalence measure of disability is used for computing YLD. The monetary value of HIV/AIDS is calculated in the study by using the Human Capital Approach (HCA). HCA is applied to measure the monetary value of loss of health due to work absence due to illness, diseases, injury, and other risk factors. HCA calculates the potential value of productivity loss due to mortality or morbidity. The value of human capital is calculated by the value of the average future earnings (Clabaugh & Ward, 2008; Grosse, 2009; Klarman, 1963; Rice, 1967; Weisbrod, 1961). Therefore, work absenteeism due to illness is considered and valued by the achievable gross income. It can be calculated using wages as a measure of output.

In the study, the burden of HIV/AIDS was calculated for aggregate India. The DALYs were calculated for all HIV-infected age groups, and the burden was calculated for the working-age groups, 15-49 years. It distinctly calculates the burden of HIV/AIDS during 2007-2019 for the working-age groups (15-49 years) in eight states of Northeast India, namely Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, and Tripura. In the various steps to calculate the health gaps (DALY) in India, the following secondary data are used:

- 1) The life expectancy at the time of death was collected from the Sample Registration System (SRS)-Abridged life tables (2000-18) provided by the Office of the Registrar General & Census Commissioner, India (ORGI).
- 2) The total number of deaths due to HIV/AIDS in India was extracted from the Institute of Health Metrics and Evaluation.
- 3) HIV/AIDS disability weight was taken from the Global Burden of Disease Study.
- 4) The total number of HIV/AIDS prevalent cases in India was collected from the Institute of Health Metrics and Evaluation.

In the various steps to calculate the health gaps (DALY) in Northeast states of India, the following secondary data are used:

- 1) The life expectancy at the time of death was collected from the Sample Registration System (SRS)-Abridged life tables (2005-18) provided by the Office of the Registrar General & Census Commissioner, India (ORGI).
- 2) The total number of deaths due to HIV/AIDS in India was collected from the National AIDS Control Organisation.
- 3) HIV/AIDS disability weight was taken from the Global Burden of Disease Study.
- 4) The total number of HIV/AIDS prevalent cases in eight different northeast states was taken from the National AIDS Control Organisation.

These data were used to calculate the years of life lost due to premature death and the years of life lived with disability. After calculating DALY, the burden of HIV/AIDS

is calculated in monetary terms using India's Gross Domestic Product per capita for different years at constant prices, i.e., Total DALYs multiplied by GDP per capita. The nation's gross domestic product per capita at constant prices during 2000-19 was used for India. The respective state gross domestic product per capita at constant prices during 2007-19 was used for the Northeast states. Here, the data on the GDP per capita of India was collected from the World Bank database (World Bank Group, n.d.). The GDP per capita at constant local currency units and constant 2010 USD was used for the calculation. The Gross State Domestic Product (GSDP) per capita at constant prices was computed using the statewise GDP data collected from the Ministry of Statistics and Programme Implementation (MoSPI) and the statewise population data from the 2011 Census (Office of the Registrar General & Census Commissioner, India, 2011). The calculations were performed using MS Excel 2019, employing descriptive statistics to analyse the data. This study only includes the working-age group between the ages of 15 and 49, as there were no published data on gender and age groups in the Northeast states during the period. Additionally, it is important to note that 2018 data were unavailable during the study period and thus excluded from the analysis.

Results

The Burden of HIV/AIDS in India

Year of Life Lost due to Premature Death (YLL)

The total YLL due to HIV/AIDS premature death in India from 2000 to 2019 is based on the average life expectancy. Table 2 demonstrates a fall in the number of years lost due to premature death for age groups under 5 and 15-49 years. It is observed that since 2007, the YLL due to HIV/AIDS premature death started to show a decreasing trend.

Years of Life Lived with Disability (YLD)

Table 3 portrays concentrated years of life living with HIV/AIDS disability in India from 2000 to 2019. Since its peak in 2003, the YLD has shown a steady decline during the last two decades. Moreover, it shows that the number of YLD has decreased for the age groups under 5 and 15-17 years. On the contrary, the YLD has been increasingly high over the period for the remaining age groups.

Disability Adjusted Life Years (DALYs)

Table 4 gives the total DALYs lost due to HIV/AIDS in India. Over the decades, the DALY lost by the age group under five has declined, while the 50-above age groups showed a rising trend, indicating higher DALYs among the elder age groups. It is observed that the DALYs lost due to HIV/AIDS have reduced by 2264814 DALYs (51%) from 2000 to 2019. The highest DALYs lost during the two decades due to HIV/AIDS was 7580845 DALYs in 2006; the lowest was 2333702 DALYs in 2019. It is revealed that four-fifths of the total DALYs lost fall under the 15-49 age groups, indicating an absence of a very healthy workforce.

Economic Burden of Disease

Table 5 shows the economic burden due to the HIV/AIDS epidemic in India. It demonstrates the productivity lost in monetary terms. It was noted that the burden had been dramatically increasing from 2000 to 2007. The burden share of HIV/AIDS in the national GDP accounts for the highest in 2005, i.e., 0.56 per cent. The share of the burden has decreased from 0.37 per cent to 0.14 per cent over the past two decades (2000 to 2019).

Gender-wise Burden of HIV/AIDS in India*Gender-wise Years of Life Lost due to Premature Death (YLL)*

Table 6 demonstrates the gender-wise years of life lost due to premature death of HIV/AIDS in India based on the average male and female life expectancy. It was observed that more than half of the years of life lost due to premature death of HIV/AIDS were among males. The 15-49 age group accounts for more than four-fifths of YLL among males and females. The YLL of females under the 70 above age group has been declining since 2015.

Gender-wise Years of Life Lived with Disability (YLD)

Table 7 portrays the gender-wise years of life lived with disability due to HIV/AIDS in India. It shows that more than three-fifths of the years of life lived with a disability of HIV/AIDS are among males. More than three-quarters of the YLD was among the 15-49 age group for males and females.

Gender-wise Disability-Adjusted Life Years (DALYs)

Data from Table 8 shows that more than half of the DALYs lost due to HIV/AIDS are among males. More than four-fifths of the DALYs lost were accounted by the 15-49 age group for both males and females. More than four-fifths of the DALYs lost fall under the 15-49 age group for both males and females. The DALYs lost due to HIV/AIDS increased for the age groups 5-14 years till 2009, 50-69 years, and 70 above years till 2006 for male and female populations during 2000-2019.

Gender-wise Economic Burden of Disease

Data from Table 9 shows that the burden of HIV/AIDS has affected both the male and female working population. It is observed that the male population was more affected by the burden compared to the female population over the period. During 2018 and 2019, the HIV/AIDS burden's share in the economy declines to 0.07 per cent for both genders. The percentage share of the HIV/AIDS burden in the economy is below 0.3 per cent during the two decades, which is comparatively low compared to other countries or regions.

Burden of HIV/AIDS in the Northeast Indian States*Years of Life Lost due to Premature Death (YLL)*

The years of life lost due to HIV/AIDS premature deaths is measured by multiplying the estimated number of AIDS-related deaths and the life expectancy. Table 10 shows

the YLL due to HIV/AIDS premature deaths in different Northeast states. It is seen that Manipur and Nagaland have the highest YLL compared to the other states from 2007-2019. It is noticed that the YLL fluctuated, and the total YLL slightly declined during 2013-16.

Years of Life Lived with Disability (YLD)

The year of life lived with disability of HIV/AIDS for the Northeast states was measured by multiplying the estimated number of HIV prevalent cases and the HIV/AIDS disability weight. Table 11 shows the YLD due to HIV/AIDS in eight Northeast states. It is revealed that almost two-fifths of the total YLD is borne by Manipur, followed by Mizoram and Nagaland. The YLD due to HIV/AIDS is relatively low compared to YLL due to HIV/AIDS premature death.

Disability Adjusted Life Years (DALYs)

The disability-adjusted life years lost in India due to HIV/AIDS are calculated by taking the sum of premature death and loss of healthy life of the HIV/AIDS epidemic. Table 12 shows that Manipur and Nagaland have the highest DALYs lost due to HIV/AIDS over the decade. The DALY lost due to HIV/AIDS has been increasingly high in 2017 for Manipur, Mizoram, Nagaland, and Assam. Sikkim and Arunachal Pradesh have the least DALY lost due to HIV/AIDS among the states. Assam has the third-highest DALYs lost during the decade, followed by Mizoram and Tripura. It indicates that despite the fewer losses of healthy life due to disability in Assam, the high losses of premature deaths due to HIV/AIDS contribute to the DALYs losses.

Economic Burden of HIV/AIDS for 15-49 Age Groups in the Northeast states

Table 13 shows the burden of HIV/AIDS in the Northeast states during 2007-19. It is noticed that Manipur and Nagaland have the utmost burden of HIV during the decade. Arunachal Pradesh has the lowest burden of HIV/AIDS, followed by Sikkim and Meghalaya. The highest burden lost due to HIV/AIDS during the decade was Rs 38943.31 lakhs in 2017, borne by Manipur. It is revealed an increasing trend of HIV/AIDS in the Northeast state, where the burden was relatively rising during 2017 and 2019.

Table 14 shows the HIV/AIDS burden share in the GSDP during 2007-19. It is seen that Manipur and Nagaland have more than one per cent share of the burden in their state economy during the period, followed by Mizoram from 2017. Table 5 shows India's HIV/AIDS burden share in the economy, where the average share during 2000-19 was 0.37 per cent, and 2007-19 was 0.31 per cent. The Northeast state's average HIV/AIDS burden share in the economy can be calculated from Table 14. During 2007-2019, Manipur had an average burden share of 1.83%, followed by Nagaland at 0.98% and Mizoram at 0.72%. Notably, this burden share in the economy is higher than the national average of 0.31% during the same period. This highlights that the HIV/AIDS epidemic is a significant issue that has profoundly impacted the Northeast states.

The Burden of HIV/AIDS in India vs. Northeast States for the 15-49 Age Groups

The burden of HIV/AIDS in India compared to the Northeast states for the 15-49 age group is illustrated in Table 15. The analysis reveals that the Northeast states account for an average of 4.76% of the national burden of HIV/AIDS within this age group. Notably, this contribution increased significantly, reaching 12.38% in 2017 and 10.11% in 2019. Consequently, the burden of HIV/AIDS poses an alarming threat to individuals aged 15-49, significantly impacting the smaller states of the Northeast.

Discussion

This study calculates the burden of HIV/AIDS primarily for the working-age population 15-49 years, which accounts for approximately 85% of the total burden (see Table 4). While the burden on children and older adults may appear numerically smaller, it could be more complex due to their care needs and the indirect effects of the high burden on the working-age population. Additionally, the monetary burden of HIV/AIDS is calculated for India overall and the Northeast states specifically. This focus is justified by the fact that the Northeast has consistently had the highest HIV prevalence rates, surpassing the national average since 2007, in contrast to the West, East, South, North, and Central regions (National AIDS Control Organization (NACO) & ICMR-National Institute of Medical Statistics, 2015, 2018, 2020; see Table 1).

The analysis shows that HIV/AIDS contributed more to mortality losses than to healthy life losses due to disability in India. It was found that YLL due to HIV/AIDS premature death accounted for more than four-fifths of the DALYs lost. However, the YLD of HIV/AIDS under the 70 above age group has increased over the decades. For the above 70 age group, seven-tenths of the DALYs lost due to HIV/AIDS was caused by disability in 2019. It indicated that elderly HIV/AIDS people faced more disability than premature death due to HIV/AIDS. The expansion of free Antiretroviral Therapy (ART) treatment to PLHIV has saved and prolonged life. In 2015, NACO reported that the annual deaths due to HIV/AIDS had fallen by 54 per cent, consistent with the rapid increase in Antiretroviral Therapy (ART) access to people living with HIV (PLHIV). Since the free ART services were introduced in 2004, around 4.5 lakhs of lives were saved during 2004-14 in the country (National AIDS Control Organization & ICMR-National Institute of Medical Statistics, 2015). Therefore, in India, HIV/AIDS causes more losses due to premature death than disability. According to the IHME-GBD India profile, HIV/AIDS ranked 78th among the conditions causing premature death in 1990, which rose to the 12th rank (2.3%) in 2010.

From 2000 to 2019, the total Disability-Adjusted Life Years (DALYs) lost due to HIV/AIDS across different age groups for both males and females amounted to 102.54 million DALYs. Of these, 85 per cent were from the productive age group of 15 to 49 years. The average annual DALYs lost accounted for approximately 5.13 million. The DALYs lost due to HIV/AIDS in India peaked between 2007 and 2011, representing 29 per cent of the total DALYs lost over the two decades. Specifically, from 2000 to 2019, males accounted for 55.8 million DALYs lost, while females accounted for 46.43 million DALYs lost. This indicates that 55 per cent of the total DALYs lost were among males, while 45 per cent were among females. Within the

15 to 49 age group, 47 per cent of the DALYs lost were males, and 38 per cent were females. The working-age group of males was more significantly affected by DALYs lost, while the under-five age group accounted for 4 per cent of the DALYs lost for both genders.

The analysis further shows that the HIV/AIDS burden has enormously affected its working-age population, leading to premature death and disabilities. It portrays a concentrated burden of the epidemic on the economy. The economic burden of HIV/AIDS was measured as the productivity loss. During 2000-2019, the total economic burden of HIV/AIDS was Rs.541953.92 crores (109.39 billion USD). The average burden accounted for Rs 27098 crores (5.47 billion USD) per year. It was found that the burden of HIV/AIDS has been rapidly increasing from 2000 to 2007. During 2000-2010, the burden accounted for 109.7 billion USD (at constant prices, 2010) and showed an overall increase of 20 per cent. However, the average burden from 2015 to 2019 was Rs 20,740 crore per year (\$4186 million). The male population was affected by 54 per cent higher than the female population over the period. The average burden of HIV/AIDS is Rs 14703 crores (\$2970 million) for males and Rs 12309 crores (\$2485 million) for females per year. The estimates show that the burden share of HIV/AIDS in the national GDP accounts was the highest in 2005, i.e., 0.56 per cent. The burden share had declined from 0.37 per cent to 0.14 per cent from 2000 to 2019. The average share of the HIV/AIDS burden in the economy is 0.37 per cent during the period. These findings underscore the need for sustained public health interventions and economic support systems to address the critical issue of HIV/AIDS, particularly given its significant and fluctuating burden on the economy, which peaked in 2005 at 0.56% of GDP before declining to 0.14% by 2019.

During 2007-2019, the Northeast states economic burden of HIV/AIDS accounted for Rs 6230 crore, with an average burden of Rs 527 crore per year. Northeast states accounted for an average of 4.76 per cent of the national burden of HIV/AIDS from 2007 to 2016. In 2017, it had rapidly increased to 12.38 per cent. Manipur, Nagaland, and Mizoram states have the HIV/AIDS burden share on the economy more than the national average of 0.14 per cent in 2017 and 2019. Since the peak in 2007, the burden of HIV/AIDS has steadily declined. However, these underdeveloped states are bearing the most burden of the epidemic. In India, the percentage share of the burden in the GDP is low, but it is enormous in absolute number. Enhanced public health strategies, increased funding, and community-based programmes are essential to address the specific needs of these states, ensuring that the fight against HIV/AIDS is inclusive and effective for all regions.

Conclusions

It can be concluded that the expansion of HIV/AIDS services, such as providing ART drugs and early HIV detection, has enormously influenced the burden of HIV/AIDS over the decades. Since the peak in 2007, HIV/AIDS deaths have declined by 54 per cent for all age groups. The introduction of prevention of mother-to-child transmission (PMTCT) programmes provides a range of services for women's health and prevents their infants from acquiring HIV. The achievement showed that the

years of life lost due to premature death have declined by 73 per cent for the under-five age group. It is seen that HIV/AIDS contributes more to mortality losses than to healthy life losses due to disability. The years of life lost due to premature death comprise more than four-fifths of the DALYs lost. However, the years of life lived with a disability under the 70 years and above age group have increased over the decades. In 2019, seven-tenths of the DALYs lost due to HIV/AIDS was caused by disability among the 70 and above age group. It indicates that elderly HIV/AIDS people face more disability than premature deaths due to HIV/AIDS. The expansion of free antiretroviral treatment to PLHIV has saved and prolonged life.

The analysis further shows that the HIV/AIDS burden has enormously affected the Indian working-age population, leading to premature deaths and disabilities. It portrays a concentrated burden on the economy. Since the peak in 2007, the burden of HIV/AIDS is steadily decreasing. The Northeast states comprised an average of 4.76 per cent of the national burden of HIV/AIDS during 2007-2019. This burden share had increased to 12.38 per cent in 2017 and 10.11 in 2019. In 2017 and 2019, Manipur, Nagaland, and Mizoram states have a higher HIV/AIDS burden on the economy than the national average. These states required specific attention where their ongoing HIV prevention and treatment services urgently need expeditious action. There has been a rapid increase in the NACO estimates from 2017. In this round, NACO improved the State/UT models' data inputs by updating the sex/age pattern of incidence from the National Family Health Survey (3rd and 4th round). The HIV estimates from 2017 are more robust and improved, and it replaces all previous estimates.

Despite the declining HIV mortality during 2000-2019, HIV/AIDS prevalent cases kept increasing. This implies that the resource needs for prevention and treatment services are still not up to the requirements. The government needs to strengthen the services by expanding the Antiretroviral Therapy Centres (ARTC), Integrated Counselling and Testing Centres (ICTC), Blood Bank services, and Opioid Substitution Therapy centres (OST) in all districts of India, with a special focus on the high-burden states, to effectively reduce the prevalence and incidence rates of HIV. The study provides insight into the economic burden of HIV/AIDS and highlights the urgent need for quality, equitable, and affordable healthcare delivery for HIV/AIDS in Northeast India. We suggest that Mizoram, Manipur, and Nagaland require immediate attention. The ongoing HIV prevention and treatment services should be accelerated to reduce the burden further. In conclusion, a collaborative and urgent approach involving government, NGOs, and community organisations is essential to enhance HIV prevention and treatment services in high-burden states like Mizoram, Manipur, and Nagaland while also addressing stigma and ensuring sustainable funding for long-term impact.

“AIDS is not just a serious threat to our social and economic development; it is a real threat to our very existence, and every effort must be made to bring the problem under control.”

—Daniel Arap Moi (1924-2020), Former President of Kenya

Acknowledgement: The authors would like to thank Ms. Shrishti Chamola, formerly an MPhil Scholar at the School of Economics, University of Hyderabad, Gachibowli, Hyderabad, Telangana, India, and currently a PhD Scholar in the Department of Educational Finance, National Institute of Educational Planning and Administration, New Delhi, India, for her valuable insights and suggestions.

References

- Bloom, D. E., Canning, D., & Sevilla, J. (2004). The effect of health on economic growth: a production function approach. *World development*, 32(1), 1-13.
- Central Intelligence Agency (2021). HIV/AIDS-people living with HIV/AIDS. The World Factbook. Available from <https://www.cia.gov/the-world-factbook/field/hiv-aids-people-living-with-hiv-aids/country-comparison>. Accessed on 20 March 2021.
- Chatterjee, S., Levin, C., & Laxminarayan, R. (2013). Unit cost of medical services at different hospitals in India. *Plos one*, 8(7), e69728.
- Clabaugh, G., & Ward, M. M. (2008). Cost-of-illness studies in the United States: a systematic review of methodologies used for direct cost. *Value in Health*, 11(1), 13-21.
- Department of Data and Analytics, Division of Data, Analytics and Delivery for Impact, World Health Organization. (2020). *WHO methods and data sources for global burden of disease estimates 2000-2019* (Global Health Estimates Technical Paper No. WHO/DDI/DNA/GHE/2020.3). World Health Organization. https://cdn.who.int/media/docs/default-source/gho-documents/global-health-estimates/ghes2019_daly-methods.pdf?sfvrsn=31b25009_7
- GBD 2017 Causes of Death Collaborators. (2018). Global, regional, and national age-sex-specific mortality for 282 causes of death in 195 countries and territories, 1980–2017: A systematic analysis for the Global Burden of Disease Study 2017. *The Lancet*, 392(10159), 1736-1788. [https://doi.org/10.1016/S0140-6736\(18\)32203-7](https://doi.org/10.1016/S0140-6736(18)32203-7)
- Global Burden of Disease Collaborative Network. (2012). *Global Burden of Disease Study 2010 (GBD 2010) Disability Weights*. Seattle, United States: Institute for Health Metrics and Evaluation (IHME). <https://doi.org/10.6069/WPCK-H173>
- Global Burden of Disease Collaborative Network. (2016). *Global Burden of Disease Study 2015 (GBD 2015) Disability Weights*. Seattle, United States: Institute for Health Metrics and Evaluation (IHME).
- Global Burden of Disease Collaborative Network. (2017). *Global Burden of Disease Study 2016 (GBD 2016) Disability Weights*. Seattle, United States: Institute for Health Metrics and Evaluation (IHME).
- Global Burden of Disease Collaborative Network. (2018). *Global Burden of Disease Study 2017 (GBD 2017) Disability Weights*. Seattle, United States: Institute for Health Metrics and Evaluation (IHME).
- Global Burden of Disease Collaborative Network. (2019). *Global Burden of Disease Study 2019 (GBD 2019) Results*. Seattle, United States: Institute for Health Metrics and Evaluation (IHME), 2020. Retrieved from: <http://ghdx.healthdata.org/gbd-results-tool>

- Global Burden of Disease Collaborative Network. (2020). *Global Burden of Disease Study 2019 (GBD 2019) Disability Weights*. Seattle, United States: Institute for Health Metrics and Evaluation (IHME). <https://doi.org/10.6069/1W19-VX76>
- Grosse, S. (2009). Human capital approach. In M. W. Kattan (Ed.), *Encyclopedia of medical decision making* (pp. 603-603). SAGE Publications, Inc., <https://www.doi.org/10.4135/9781412971980.n181>
- Institute for Health Metrics and Evaluation (2020). Global Burden of Disease Study 2019 (GBD 2019) Results. Seattle, United States. Available from <http://ghdx.healthdata.org/gbd-results-tool>
- Institute for Health Metrics and Evaluation. (n.d.). *IHME GDx*. Retrieved from <http://ghdx.healthdata.org>
- Jefferson, T., Demichelli, V., & Mugford, M. (2000). *Elementary economic evaluation in health care*. BMJ Publications.
- Jo, C. (2014). Cost-of-illness studies: concepts, scopes, and methods. *Clinical and molecular hepatology*, 20(4), 327.
- Klarman, H. E. (1963). Measuring the benefits of a health program—The control of syphilis. *Measuring Benefits of Government Investments*. Brookings Institution, Washington, DC.
- Klarman, H. E. (1963). Measuring the benefits of a health program—The control of syphilis. *Measuring Benefits of Government Investments*. Brookings Institution, Washington, DC.
- Menon, G. R., Singh, L., Sharma, P., Yadav, P., Sharma, S., Kalaskar, S., ... & Jha, P. (2019). National burden estimates of healthy life lost in India, 2017: an analysis using direct mortality data and indirect disability data. *The Lancet Global Health*, 7(12), e1675-e1684.
- Mohammadi-Moein, H. R., Maracy, M. R., & Tayeri, K. (2013). Life expectancy after HIV diagnosis based on data from the counseling center for behavioral diseases. *Journal of research in medical sciences: the official journal of Isfahan University of Medical Sciences*, 18(12), 1040.
- Murray, C. J., & Lopez, A. D. (2013). Measuring the global burden of disease. *New England Journal of Medicine*, 369(5), 448-457.
- National AIDS Control Organisation. (n.d.). *Annual reports: 2008-09; 2009-10; 2010-2011; 2011; 2011-12; 2012-13; 2013-14; 2014-15; 2015-16; 2016-17; 2017-18; 2018-19; 2019-20*. New Delhi: NACO, Ministry of Health and Family Welfare, Government of India. Available from <http://naco.gov.in/>
- National AIDS Control Organization & ICMR-National Institute of Medical Statistics. (2015). *India HIV estimations 2015 technical report*. New Delhi: NACO, Ministry of Health and Family Welfare, Government of India.
- National AIDS Control Organization & ICMR-National Institute of Medical Statistics. (2018). *HIV estimations 2017: Technical report*. New Delhi: NACO, Ministry of Health and Family Welfare, Government of India.
- National AIDS Control Organization & ICMR-National Institute of Medical Statistics. (2020). *India HIV estimates 2019 technical Report*. New Delhi: NACO, Ministry of Health and Family Welfare, Government of India.

- National AIDS Control Organization (2020b). *Sankalak: Status of National AIDS Response (Second edition, 2020)*. New Delhi: NACO, Ministry of Health and Family Welfare, Government of India.
- National AIDS Control Organization. (2020a). *Annual Reports*, New Delhi: NACO, Ministry of Health and Family Welfare, Government of India. Available from <http://www.naco.gov.in/documents/annual-reports>. Accessed on 3 November 2020 Nov.
- National AIDS Control Organization. (2020a). *Annual reports*. New Delhi: NACO, Ministry of Health and Family Welfare, Government of India. Available from <http://www.naco.gov.in/documents/annual-reports>. Accessed on November 3, 2020.
- National AIDS Control Organization. (2020b). *Sankalak: Status of national AIDS response (Second edition, 2020)*. New Delhi: NACO, Ministry of Health and Family Welfare, Government of India.
- Office of the Registrar General & Census Commissioner, India. (2011). *Primary census abstracts*. Ministry of Home Affairs, Government of India. Retrieved from <http://www.censusindia.gov.in/>
- Office of the Registrar General & Census Commissioner, India. (2000-2018). *SRS-abridged life tables*. Various annual publications. Retrieved from <https://censusindia.gov.in/census.website/data/SRSALT>
- Ojha, V. P., & Pradhan, B. K. (2006). *The macro-economic and sectoral impacts of HIV and AIDS in India: A CGE analysis*. United Nations Development Programme.
- Ortblad, K. F., Lozano, R., & Murray, C. J. (2013). The burden of HIV: insights from the Global Burden of Disease Study 2010. *AIDS (London, England)*, 27(13), 2003.
- Rice, D. P. (1967). Estimating the cost of illness. *American Journal of Public Health and the Nations Health*, 57(3), 424-440.
- UNAIDS (2016). , *Global AIDS Update 2016*. Joint United Nations Programme on HIV/AIDS, Available from <https://www.unaids.org/en/resources/documents/2016/Global-AIDS-update-2016>. Accessed on 23 February 2021.
- UNAIDS (2018). *Joint United Nations Programme on HIV/AIDS, Geneva. UNAIDS Data 2018 Reference*. Available from https://www.unaids.org/sites/default/files/media_asset/unaid-data-2018_en.pdf. Accessed on 3 November 2020.
- UNAIDS (2020a). *Data 2020*. Joint United Nations Programme on HIV/AIDS, Available from <https://www.unaids.org/en/resources/documents/2020/unaid-data>. Accessed on 22 February 2021.
- UNAIDS (2020b). *Global HIV & AIDS statistics — Fact sheet*, Available from https://www.unaids.org/sites/default/files/media_asset/UNAIDS_FactSheet_en.pdf.
- Wandeler, G., Johnson, L. F., & Egger, M. (2016). Trends in life expectancy of HIV-positive adults on ART across the globe: comparisons with general population. *Current Opinion in HIV and AIDS*, 11(5), 492.
- Wang, H., Naghavi, M., Allen, C., Barber, R. M., Bhutta, Z. A., Carter, A., ... & Bell, M. L. (2016). Global, regional, and national life expectancy, all-cause mortality, and cause-specific mortality for 249 causes of death, 1980–2015: a systematic

- analysis for the Global Burden of Disease Study 2015. *The Lancet*, 388(10053), 1459-1544.
- Weisbrod, B. A. (1961). The valuation of human capital. *Journal of political economy*, 69(5), 425-436.
- World Bank Group. (n.d.). *World Development Indicators*. Retrieved from <https://databank.worldbank.org/source/world-development-indicators>
- World Health Organization (2001). Macroeconomics and health: investing in health for economic development: report of the Commission on Macroeconomics and Health. In *Macroeconomics and health: investing in health for economic development: report of the commission on macroeconomics and health* (pp. 202-202).
- World Health Organization (2013). *WHO methods and data sources for global burden of disease estimates 2000-2011*. Global Health Estimates Technical Paper WHO/HIS/HSI/GHE/2013.4. Available at: http://www.who.int/healthinfo/mortality_data/en/index.html
- World Health Organization (2020). *Global Health Estimates 2019: Deaths by Cause, Age, Sex, by Country and by region, 2000-2019*. Geneva, Available from: <https://www.who.int/data/gho/data/themes/mortality-and-global-health-estimates/ghel-leading-causes-of-death>
- Yaghoobi, H., & Ahmadiania, H. (2017). Life expectancy and years of life lost in HIV patients under the care of Bandar Abbas Behavioral Disorders Counseling Center. *Nepal journal of epidemiology*, 7(4), 702.

Table 1: HIV Prevalence Among Adults (Aged 15-49 Years) by States and Union Territories in India (Percentage)

Regions	States/UTs	2007	2009	2011	2013	2015	2017	2019
North	Chandigarh	0.20	0.26	0.29	0.31	0.35	0.20	0.19
	Delhi	0.18	0.20	0.22	0.22	0.23	0.30	0.41
	Haryana	0.11	0.12	0.12	0.13	0.13	0.18	0.21
	Himachal Pradesh	0.14	0.13	0.13	0.12	0.12	0.05	0.12
	Jammu & Kashmir	0.03	0.04	0.04	0.04	0.03	0.03	0.06
	Punjab	0.15	0.16	0.17	0.19	0.19	0.18	0.27
	Rajasthan	0.22	0.24	0.24	0.23	0.23	0.10	0.11
	Uttarakhand	0.08	0.10	0.10	0.11	0.11	0.11	0.13
	Mean	0.14	0.16	0.16	0.17	0.17	0.14	0.19
Central	Chhattisgarh	0.22	0.19	0.18	0.18	0.19	0.13	0.20
	Madhya Pradesh	0.12	0.11	0.10	0.10	0.09	0.09	0.10
	Uttar Pradesh	0.13	0.12	0.12	0.12	0.12	0.09	0.10
	Mean	0.16	0.14	0.13	0.13	0.13	0.10	0.13
East	Bihar	0.26	0.27	0.27	0.26	0.25	0.16	0.18
	Jharkhand	0.13	0.16	0.17	0.17	0.17	0.14	0.09
	Odisha	0.30	0.30	0.29	0.27	0.25	0.13	0.14
	West Bengal	0.29	0.27	0.24	0.22	0.21	0.20	0.09
	Mean	0.25	0.25	0.24	0.23	0.22	0.16	0.13
Northeast	Mizoram	0.80	0.79	0.79	0.80	0.80	2.04	2.32
	Nagaland	0.98	0.92	0.87	0.82	0.78	1.15	1.45
	Manipur	1.94	1.76	1.55	1.34	1.15	1.43	1.18
	Meghalaya	0.06	0.06	0.06	0.06	0.06	0.11	0.54
	Tripura	0.15	0.18	0.21	0.26	0.31	0.09	0.10
	Assam	0.04	0.04	0.05	0.06	0.06	0.06	0.09
	Sikkim	0.10	0.12	0.15	0.19	0.23	0.05	0.07
	Arunachal Pradesh	0.06	0.07	0.07	0.07	0.07	0.06	0.06
	Mean	0.52	0.49	0.47	0.45	0.43	0.62	0.73
West	Dadra & Nagar	0.08	0.08	0.12	0.15	0.18	0.17	0.23
	Daman & Diu	0.06	0.08	0.09	0.12	0.14	0.17	0.17
	Goa	0.60	0.53	0.48	0.43	0.40	0.42	0.27
	Gujarat	0.41	0.40	0.40	0.41	0.42	0.19	0.20
	Maharashtra	0.60	0.51	0.44	0.40	0.37	0.33	0.36
	Mean	0.35	0.32	0.31	0.30	0.30	0.26	0.25
South	Andaman & Nicobar	0.11	0.10	0.08	0.08	0.07	0.14	0.14
	Andhra Pradesh	0.94	0.85	0.77	0.71	0.66	0.63	0.69
	Karnataka	0.68	0.59	0.53	0.49	0.45	0.47	0.47
	Kerala	0.15	0.13	0.12	0.11	0.11	0.08	0.08
	Puducherry	0.19	0.18	0.17	0.16	0.15	0.15	0.35

	Tamil Nadu	0.37	0.33	0.31	0.30	0.28	0.22	0.23
	Telangana	0.94	0.85	0.77	0.71	0.66	0.70	0.49
	Mean	0.48	0.43	0.39	0.37	0.34	0.34	0.35
	India	0.34	0.31	0.29	0.27	0.26	0.22	0.22

Source: Compiled from data provided by the National AIDS Control Organization (NACO) & ICMR-National Institute of Medical Statistics (NIMS) (2015, 2018, 2020).

Table 2: Years of Life Lost Due to Premature Death in India

Year	Under 5	5-14	15-49	50-69	70+	Total
		years	years	years	years	
2000	468797	26264	3433597	125729	1602	4055989
2001	524371	37302	4112862	161869	1919	4838323
2002	559252	50320	4730021	199263	2219	5541075
2003	569616	64357	5186901	237460	2470	6060804
2004	571167	79822	5678750	272217	2719	6604675
2005	569255	97256	5953252	301328	2820	6923911
2006	530270	113841	6046132	318064	2994	7011301
2007	482784	131677	5869169	320207	2973	6806810
2008	421371	139632	5575016	313237	2861	6452117
2009	367293	140702	5089904	298666	2641	5899206
2010	339134	133407	4589357	283566	2275	5347739
2011	276067	124127	4084151	263880	2057	4750282
2012	239605	118712	3620813	248372	1913	4229415
2013	226902	102500	3244655	239090	1839	3814986
2014	210420	92871	2754380	224763	1721	3284155
2015	193742	84148	2297569	204064	1537	2781060
2016	166874	73199	1957610	180700	1462	2379845
2017	150914	67361	1672658	161929	1423	2054285
2018	138283	61380	1561550	155268	1481	1917962
2019	128461	55883	1555419	159391	1673	1900827

Source: Author's calculations based on data from *Institute for Health Metrics and Evaluation* and *Office of the Registrar General & Census Commissioner, India* (2000-2018).

Table 3: Years of Life Lived with Disability Among Different Age Groups in India

Year	Under 5	5-14	15-49	50-69	70+	Total
		years	years	years	years	
2000	7875	2392	515236	16495	531	542529
2001	8683	3472	546737	19451	580	578923
2002	9196	4799	561127	22230	626	597978
2003	9440	6288	561029	24739	670	602166
2004	9468	7837	550201	26961	713	595180
2005	9467	9538	541283	29411	761	590460
2006	9116	10998	517729	30904	798	569545
2007	8662	12275	491222	32467	845	545471
2008	8180	13311	466052	34311	907	522761
2009	7758	14103	444331	36587	988	503767
2010	7251	14678	426507	39424	1087	488947
2011	5808	12984	357234	37020	1046	414092
2012	5465	13078	348885	40549	1182	409159
2013	5213	12947	342670	44646	1352	406828
2014	4998	12700	338355	49361	1570	406984
2015	4744	12418	336599	54726	1844	410331
2016	4487	12111	336318	60578	2182	415676
2017	4239	11746	336220	66998	2616	421819
2018	3977	11360	335716	73749	3149	427951
2019	3715	10964	333857	80553	3786	432875

Source: Author's calculations based on data from the *Institute for Health Metrics and Evaluation*, along with the extraction of disability weights from *GBD 2017 Causes of Death Collaborators* (2018) and *Global Burden of Disease Collaborative Network* (2012, 2016, 2017, 2018, 2020).

Table 4: Disability-Adjusted Life Years (DALYs) Lost Due to HIV/AIDS by Different Age Groups in India

Year	Under 5	5-14 years	15-49 years	50-69 years	70+ years	Total
2000	476672	28656	3948832	142223	2133	4598516
2001	533054	40773	4659600	181319	2499	5417245
2002	568449	55118	5291148	221494	2845	6139054
2003	579056	70645	5747931	262199	3140	6662971
2004	580634	87659	6228951	299179	3432	7199855
2005	578722	106794	6494535	330739	3581	7514371
2006	539386	124839	6563861	348968	3791	7580845
2007	491446	143952	6360391	352674	3819	7352282
2008	429551	152943	6041067	347547	3767	6974875
2009	375051	154805	5534235	335253	3629	6402973
2010	346384	148085	5015864	322990	3362	5836685
2011	281875	137111	4441384	300900	3103	5164373
2012	245070	131790	3969698	288921	3095	4638574
2013	232115	115447	3587325	283736	3191	4221814
2014	215419	105572	3092735	274124	3290	3691140
2015	198486	96565	2634169	258790	3380	3191390
2016	171361	85310	2293927	241277	3644	2795519
2017	155154	79106	2008878	228927	4039	2476104
2018	142260	72740	1897267	229018	4630	2345915
2019	132176	66847	1889275	239944	5460	2333702

Note: Results were obtained through the author's calculations based on the data presented in Tables 2 and 3 (DALY = YLL + YLD).

Table 5: Economic Burden of HIV/AIDS for Age Group 15-49 in India

Year	USD	Rupees	Share of Real GDP (In %)
2000	3264075257.64	161706894697.51	0.37
2001	3968192397.28	196589851482.32	0.43
2002	4599073237.50	227844578638.82	0.48
2003	5300557570.93	262597102488.25	0.52
2004	6099911083.46	302198203588.83	0.55
2005	6756344584.50	334718845623.73	0.57
2006	7265711535.73	359953603233.04	0.56
2007	7466305461.77	369891309417.62	0.54
2008	7204043726.43	356898492931.51	0.50
2009	7018789124.33	347720718502.42	0.45
2010	6809355151.00	337345063899.28	0.41
2011	6264245512.13	310339563102.35	0.36
2012	5832190822.27	288934964028.36	0.31
2013	5541051616.47	274511516902.14	0.28
2014	5072644308.57	251305957828.07	0.24
2015	4614179649.02	228592971584.48	0.20
2016	4302793557.21	213166465151.83	0.17
2017	3990902952.06	197714964416.40	0.15
2018	3958553405.68	196112322235.42	0.14
2019	4065202232.58	201395855628.38	0.14

Note: National GDP per capita (2000-2019) data sourced from the World Bank, using constant local currency units and constant 2010 USD for calculations.

Source: Author's calculations based on GDP per capita from World Bank Group (n.d.). World Development Indicators.

Table 6: Gender-Wise Years of Life Lost Due to Premature Death (YLL) Among Different Age Groups in India

Year	Male						Female					
	Under 5	5-14 years	15-49 years	50-69 years	70+ years	Total	Under 5	5-14 years	15-49 years	50-69 years	70+ years	Total
2000	234510	12859	2011858	71886	822	2331935	234648	13423	1398361	52460	769	1699661
2001	262737	18234	2374554	91398	949	2747872	262022	19094	1713339	68832	961	2064248
2002	280439	24811	2724565	111962	1084	3142861	279218	25533	1977280	85352	1125	2368508
2003	285450	31202	2968504	133277	1191	3419624	284585	33214	2189152	101879	1270	2610100
2004	286354	38734	3244557	153017	1279	3723941	285228	41159	2402641	116530	1433	2846991
2005	284690	47424	3349388	167439	1268	3850209	284685	50023	2570749	131068	1554	3038079
2006	265062	55200	3372160	174016	1294	3867732	265327	58884	2643046	141399	1707	3110363

2007	241203	64376	3242951	172427	1231	3722188	241694	67549	2598997	145448	1757	3055445
2008	210155	68850	3027709	165911	1147	3473772	211332	71010	2526288	145378	1731	2955739
2009	182883	70796	2708328	155083	1041	3118131	184526	70049	2367518	142102	1617	2765812
2010	168537	68517	2384634	145043	903	2767634	170942	64913	2196881	138313	1396	2572445
2011	136495	62433	2090174	133132	816	2423050	139888	61798	1989837	130771	1263	2323557
2012	117987	60323	1837527	124716	772	2141325	121917	58450	1780994	123748	1160	2086269
2013	111780	53163	1637623	120392	780	1923738	115402	49322	1605779	118747	1073	1890323
2014	103913	49785	1403662	114660	783	1672803	106755	42971	1348455	109973	945	1609099
2015	96468	45602	1185288	107092	764	1435214	97362	38409	1111015	96567	774	1344127
2016	83334	39911	1011305	96346	780	1231676	83606	33157	945138	83867	679	1146447
2017	75365	36872	873995	89441	822	1076495	75609	30363	797043	71792	594	975401
2018	69058	33361	813517	87521	888	1004345	69280	27914	746673	66931	583	911381
2019	64117	30167	803867	89518	1002	988671	64397	25631	750604	69063	660	910355

Source: Author's calculations based on data from the *Institute for Health Metrics and Evaluation* and *Office of the Registrar General & Census Commissioner, India* (2000-2018).

Table 7: Gender-Wise Years of Life Lived with Disability (YLD) Among Different Age Groups in India

Year	Male						Female					
	Under 5	5-14 years	15-49 years	50-69 years	70+ years	Total	Under 5	5-14 years	15-49 years	50-69 years	70+ years	Total
2000	4108	1252	307656	9651	234	322901	3767	1139	207580	6844	296	219626
2001	4531	1816	324222	11323	254	342146	4153	1655	222515	8127	325	236775
2002	4800	2509	330665	12911	272	351157	4397	2290	230462	9319	354	246822
2003	4929	3286	328694	14358	287	351554	4511	3002	232335	10381	383	250612
2004	4945	4095	320595	15657	300	345592	4523	3743	229606	11304	413	249589
2005	4945	4982	313735	17094	315	341071	4522	4557	227548	12317	446	249390
2006	4762	5742	298779	18011	329	327623	4354	5256	218950	12892	468	241920
2007	4524	6406	282454	19025	353	312762	4138	5869	208767	13442	492	232708

2008	4270	6941	267423	20272	390	299296	3910	6370	198628	14038	517	223463
2009	4046	7348	254908	21845	443	288590	3712	6755	189423	14743	545	215178
2010	3778	7641	244939	23757	518	280633	3473	7037	181568	15667	569	208314
2011	3024	6752	205329	22524	534	238163	2784	6232	151905	14496	512	175929
2012	2845	6796	200591	24920	639	235791	2620	6281	148294	15630	543	173368
2013	2714	6726	196989	27653	771	234853	2499	6221	145681	16993	582	171976
2014	2602	6596	194548	30714	938	235398	2396	6104	143807	18648	632	171587
2015	2470	6448	193637	34074	1149	237778	2273	5970	142963	20652	695	172553
2016	2337	6286	193470	37640	1406	241139	2149	5825	142848	22937	776	174535
2017	2209	6096	193265	41483	1724	244777	2030	5650	142955	25515	893	177043
2018	2073	5895	192671	45487	2097	248223	1905	5465	143045	28262	1051	179728
2019	1936	5689	191258	49516	2523	250922	1779	5274	142599	31036	1263	181951

Source: Author's calculations based on data from the *Institute for Health Metrics and Evaluation*, along with the extraction of disability weights from *GBD 2017 Causes of Death Collaborators* (2018) and *Global Burden of Disease Collaborative Network* (2012, 2016, 2017, 2018, 2020).

Table 8: Gender-Wise Disability-Adjusted Life Years (DALYs) Lost Due to HIV/AIDS by Different Age Groups in India

Year	Male						Female					
	Under 5	5-14 years	15-49 years	50-69 years	70+ years	Total	Under 5	5-14 years	15-49 years	50-69 years	70+ years	Total
2000	238618	14111	2319514	81537	1056	2654836	238416	14562	1605941	59304	1065	1919288
2001	267267	20050	2698776	102721	1203	3090017	266174	20749	1935854	76960	1286	2301023
2002	285239	27319	3055230	124873	1356	3494017	283614	27823	2207742	94671	1479	2615329
2003	290378	34488	3297198	147634	1478	3771176	289096	36216	2421487	112259	1653	2860711
2004	291299	42829	3565152	168674	1579	4069533	289751	44902	2632247	127834	1846	3096580
2005	289635	52406	3663122	184533	1583	4191279	289207	54580	2798297	143385	2000	3287469
2006	269824	60942	3670939	192027	1624	4195356	269681	64139	2861996	154292	2176	3352284
2007	245727	70782	3525405	191452	1584	4034950	245832	73418	2807764	158890	2248	3288152
2008	214425	75791	3295132	186184	1537	3773069	215242	77380	2724916	159416	2248	3179202
2009	186928	78144	2963236	176928	1484	3406720	188239	76805	2556941	156845	2163	2980993
2010	172314	76158	2629573	168800	1421	3048266	174415	71950	2378450	153980	1965	2780760
2011	139520	69186	2295503	155656	1350	2661215	142672	68030	2141741	145267	1775	2499485
2012	120832	67120	2038118	149636	1411	2377117	124537	64732	1929288	139378	1703	2259638
2013	114494	59889	1834611	148046	1550	2158590	117902	55544	1751460	135739	1654	2062299
2014	106515	56381	1598210	145373	1721	1908200	109151	49075	1492262	128621	1577	1780686

2015	98938	52050	1378925	141166	1912	1672991	99636	44378	1253978	117219	1469	1516680
2016	85672	46198	1204774	133987	2186	1472817	85756	38982	1087986	106804	1455	1320983
2017	77574	42967	1067260	130923	2545	1321269	77640	36012	939998	97307	1487	1152444
2018	71131	39257	1006188	133008	2986	1252570	71185	33378	889719	95193	1634	1091109
2019	66053	35856	995124	139034	3525	1239592	66176	30905	893202	100099	1923	1092305

Note: Results were obtained through the author's calculations based on the data presented in Tables 6 and 7 (DALY = YLL + YLD).

Table 9: Gender-Wise Burden of HIV/AIDS for Age Group 15-49 in India

Year	Male			Female		
	USD	Rupees	Share of Real GDP (In %)	USD	Rupees	Share of Real GDP (In %)
2000	1917293033.59	94985402668.34	0.22	1327458492.66	65764167105.40	0.15
2001	2298322113.68	113862121024.06	0.25	1648605268.34	81674231591.45	0.18
2002	2655610217.95	131562677933.71	0.28	1918972620.30	95068611764.28	0.20
2003	3040570525.98	150634154869.65	0.30	2233017530.55	110626839814.67	0.22
2004	3491295830.53	172963722544.06	0.32	2577716665.71	127703721427.87	0.23
2005	3810791096.90	188791968928.63	0.32	2911103102.80	144220156014.15	0.24
2006	4063459545.97	201309520474.44	0.31	3168018908.78	156948127614.99	0.25
2007	4138386355.54	205021500361.12	0.30	3295964936.59	163286754396.98	0.24
2008	3929483265.67	194672146473.74	0.27	3249494737.43	160984555149.43	0.23
2009	3758122172.13	186182676066.08	0.24	3242837974.58	160654769723.63	0.21
2010	3569813061.65	176853576981.36	0.21	3228896799.13	159964104217.25	0.19
2011	3237637643.09	160397137962.72	0.18	3020768383.73	149653128796.82	0.17
2012	2994357156.41	148344679322.17	0.16	2834466312.20	140423461253.95	0.15
2013	2833776228.69	140389273542.98	0.14	2705338652.09	134026294740.05	0.14
2014	2621353727.60	129865563057.25	0.12	2447579881.18	121256561466.73	0.12
2015	2415413073.53	119662972420.26	0.11	2196548614.58	108820118250.63	0.10
2016	2259834189.73	111955374955.52	0.09	2040770596.72	101102655403.96	0.08
2017	2120252976.26	105040324656.14	0.08	1867431193.82	92515176758.48	0.07
2018	2099361784.78	104005345547.53	0.07	1856353867.84	91966390396.66	0.07
2019	2141235251.70	106079816192.46	0.07	1921926688.20	95214960457.02	0.07

Note: National GDP per capita (2000-2019) data sourced from the World Bank, using constant local currency units and constant 2010 USD for calculations.

Source: Author's calculations based on GDP per capita from World Bank Group (n.d.). *World Development Indicators*.

Table 10: Years of Life Lost Due to Premature Death for Age Group 15-49 in the Northeast States

Year	Mizoram	Manipur	Nagaland	Assam	Tripura	Arunachal Pradesh	Sikkim	Meghalaya	Total
2007	10188	58220	28656	7850	5829	479	518	1787	113526
2008	10268	56080	27625	7652	6344	558	519	1787	110832
2009	9435	56991	26239	7771	6860	677	519	1628	110120
2010	8190	62217	23334	8394	7494	781	618	1477	112506
2011	6798	59762	19200	8067	8231	945	618	1232	104854
2012	5939	59435	16499	8763	8886	1109	741	1109	102482
2013	5407	55997	14657	9541	9746	1191	864	1028	98431
2014	3888	50994	12626	9882	10684	1271	1018	680	91043
2015	3297	48335	12077	9629	11190	1313	1102	553	87497
2016	3339	43186	11824	9840	11781	1039	575	743	82326
2017	19970	68385	22629	11190	2706	765	47	933	126626
2019	11781	41750	21068	21068	385	596	131	8827	105605

Source: Author's calculations based on data from the *National AIDS Control Organisation* (n.d.) and the *Office of the Registrar General & Census Commissioner, India* (2007-2018).