

Burden of Non-Cancer Health Outcomes due to Bidi Consumption in India:

A Comprehensive Analysis from various Indian States





School of Public Health AIIMS Jodhpur

How to cite :

Burden of Non-Cancer Health Outcomes due to Bidi Consumption in India: A Comprehensive Analysis from various Indian States. School of Public Health, AIIMS Jodhpur and Vital Strategies; 2025 January. Available from: <http://treesphaiimsjdjdh.org/reports>

Footnote: AIIMS Jodhpur acknowledges that this document has been produced with the help of a grant managed by the Vital Strategies and funded by Bloomberg Initiative to Reduce Tobacco Use. The content of this document is the sole responsibility of the authors and can under no circumstances be regarded as reflecting the position of Vital Strategies or the Bloomberg Philanthropies.

School of Public Health,

All India Institute of Medical Sciences (AIIMS) Jodhpur

School of Public Health at AIIMS Jodhpur is established to address public health issues and offer highest standard of care to community. Since inception, we have taken many initiatives for tobacco sensitization in community through screening camps, awareness sessions and IEC development. Tobacco control has been a major component of the flagship School Health Promotion Program of SPH since 2019. Faculty members including the PI are designated Nodal persons for Scientific Group, National Tobacco Testing Laboratory (NTTL) under the MoHFW since Sep 2020.

In the past few years, we have worked to quantify the holistic burden due bidi by generating national and state estimates of environmental, health and economic burden due to bidi smoking. By partnering with other partners of Vital Strategies and The Union, SPH AIIMS Jodhpur has developed 4 major national reports with corresponding state factsheets for states/UTs. “Environmental Burden due to Tobacco Consumption in India” enumerated the indiscriminate amount of waste disposed in the environment by bidi and other tobacco products. “The Lifecycle Approach to Bidi Trade in India” deciphered the fragmented data on bidi lifecycle which today, serves as a comprehensive document on every aspect of bidi lifecycle from raw material to labour statistics, working conditions and even an estimation of annual production. “Tax and Regulatory Implications of Bidi Industry” was a novel document which projects implications of increased taxation and regulation of bidi with increase in government revenue and decrease health burden. Due to the strong government liaisons, these reports were disseminated amongst the top-ranking governmental stakeholders across all relevant ministries in the country.

Vital Strategies, India

Vital Strategies is a global public health and scientific organization supporting Data for health, Partnership for healthy city, control of lead poisoning, civil registration and vital statistics (CRVS), tobacco control and environmental health/ climate change. Vital Strategies India is a social enterprise with office in New Delhi and serves as regional hub for Southeast Asian countries viz. India, Bangladesh, Maldives, Bhutan, Nepal and Sri Lanka. Vital Strategies India office has a potential to reach 2 billion low and middle- income population in South Asian countries. Tobacco Control Division, Vital Strategies is working closely with its partners and state governments in adopting digital means to monitor and report Cigarettes and Other Tobacco Products Act, 2003 or COTPA, 2003 and Tobacco Free Educational Institutions (ToFEI) compliance.

School of Public Health, All India Institute of Medical Sciences, Jodhpur

Dr. Pankaj Bhardwaj

Dr. Manoj Kumar Gupta

Dr. Akhil Dhanesh Goel

Dr. Nitin Kumar Joshi

Dr. Yogesh Kumar Jain

Ms. Yashika Bhati

Mr. Satish Kumar Trivedi

Vital Strategies

Dr. Rana J Singh

Dr. Shivam Kapoor



Dr. Goverdhan Dutt Puri

Executive Director

All India Institute of Medical Sciences

Basni Phase – II, Jodhpur

Rajasthan - 342005

I am happy to present this report, "Burden of Non-Cancer Health Outcomes due to Bidi Consumption in India: A Comprehensive Analysis from various Indian States." This crucial document marks a significant step forward in understanding and addressing the profound health burden associated with bidi consumption in India.

Bidi smoking, a culturally and economically entrenched practice, remains one of the most pressing public health challenges facing our nation. This report offers a comprehensive and evidence-based account of the health impacts caused by bidi consumption, highlighting its contribution to the burden of diseases. Alarmingly, bidi smoking is responsible for over 7 lakh annual deaths in India, including over 3 lakh deaths among women. Furthermore, this practice disproportionately affects vulnerable populations, resulting in the loss of over 7 thousand young lives each year.

Drawing on a combination of meta-analysis, stakeholder consultations, and hospital-based primary data collection, this report provides both national and subnational estimates of the morbidity, mortality, and disability attributable to bidi smoking. The findings underscore the particularly debilitating impact of bidi consumption on marginalized groups, emphasizing the urgent need for targeted interventions.

The findings of this report are a stark reminder of the need for coordinated and urgent action. The policy recommendations outlined—ranging from reconsidering the regulatory status of the bidi industry to increasing taxation and expanding public awareness initiatives—are evidence-based, actionable, and critical for mitigating the devastating health impacts of bidi use. The report also emphasizes the role of academia, civil society, and government in collaboratively shaping a future free from the burden of bidi-related diseases.



Dr Shalini Singh

Director

ICMR-National Institute of
Cancer Prevention and Research

This report provides critical insights into the far-reaching health impacts of bidi consumption, particularly its role in cardiovascular and respiratory health outcomes. Addressing such disproportionate impacts of bidi smoking especially on vulnerable populations, such as women and youth, requires gender- and age-responsive strategies that prioritize health while promoting inclusive cessation support strategies. Youth is heavily impacted by bidi smoking, often initiated at an early age due to social, cultural, and economic influences, and this early exposure invariably pushes them on a path of illness and associated expenses, further perpetuating cycles of poverty and poor health outcomes.

The morbidity and mortality associated with bidi smoking underscore the need for robust public health measures. This report strongly advocates for the development and integration of non-cancer disease registries, as a tool to systematically document and monitor the health consequences of bidi consumption. Such registries are essential for capturing the full spectrum of bidi-related diseases and strengthening the evidence base for effective policymaking.

This report serves as a powerful call to action for policymakers, public health practitioners, and civil society. Together, we must address the systemic factors driving bidi consumption and work toward a future where all individuals, especially the most vulnerable, are protected from its harmful effects.



Dr Prakash C Gupta

Director,
Healis-Sekhsaria Institute for Public Health

Bidi is the most used single tobacco product in India. It has been clearly shown that bidi smoking causes excess all-cause mortality. Among diseases caused by bidi smoking, there is a reasonable understanding about cancer. But our current understanding of the non-cancer health burden attributable to bidi consumption remains incomplete. This lacuna becomes even more important when we realize that the prevalence of bidi smoking is much higher in underprivileged sections of the society

In this regard, this document represents a pivotal contribution to our collective understanding of the significant and often overlooked non-cancer health outcomes associated with bidi smoking in India. This document provides estimated number of cases of various diseases due to bidi smoking that are critical to our understanding of the extent of bidi epidemic. A surprising finding is the contribution of bidi smoking to tuberculosis. Tuberculosis has been conquered in industrialized countries but it still presents a serious public health problem in India. Bidi smoking continues to exact a heavy toll on public health, particularly among economically disadvantaged and socially vulnerable populations. This report underscores the urgent need to address this data gap by establishing hospital-based non-cancer registries to capture the influence of bidi smoking on the health outcomes. Additionally, it emphasizes the importance of scaling up state-level studies to facilitate a nuanced and accurate subnational analysis of bidi's health impacts. Without these critical steps, the true magnitude of the non-cancer health burden attributable to bidi consumption will remain underestimated, hindering effective policymaking and intervention.

The recommendations put forth in this report provide a clear roadmap for advancing our efforts to mitigate the harm caused by bidi smoking. Enhanced data collection, coupled with targeted policy interventions and public health campaigns, will be instrumental in addressing the vast health inequities posed by this harmful practice. Collaboration among stakeholders—including academia, public health professionals, and government agencies—will be key to translating these recommendations into meaningful change.

It is my hope that this report serves as a catalyst for renewed commitment and coordinated action to tackle the non-cancer health burden of bidi consumption. Let us work together to ensure that no community is left behind in the pursuit of a healthier, tobacco-free future for India.



Gan Quan

Senior Vice President, Tobacco Control
Vital Strategies
New York, United States



Ashish Pandey

Director (Tobacco Control)
South East Asia and Eastern Mediterranean Regions
Vital Strategies, New York, United States

Bidi smoking continues to be one of India's most critical public health concerns, with far-reaching consequences for the nation's health and socio-economic progress. The report, "Burden of Non-Cancer Health Outcomes due to Bidi Consumption in India: A Comprehensive Analysis from Various Indian States," offers an in-depth examination of the devastating health impacts of bidi consumption across the country. It underscores the urgent need to address this issue, given its disproportionate impact on vulnerable populations, including women, youth, and economically disadvantaged communities.

Particularly alarming is the pervasive impact of bidi smoking on women and youth. Women who are frequently exposed to bidi smoke due to socio-economic circumstances or engaged in bidi manufacturing, face compounded health risks, including occupational hazards. Similarly, the increasing prevalence of bidi use among youth poses a grave concern, as early initiation into smoking perpetuates cycles of addiction and long-term health complications. These trends not only exacerbate health inequities but also impede India's efforts toward sustainable development.

This report stands as a clarion call for evidence-based, multi-sectoral interventions to mitigate the burden of bidi consumption. It highlights the necessity of implementing stringent regulations, increasing taxes on bidis, and expanding access to cessation services. Importantly, the report advocates for gender-sensitive policies and youth-centric campaigns to raise awareness and foster behavior change in at-risk populations.

The findings of this report emphasize the collective responsibility of government bodies, civil society, and academic institutions in combating the health and socio-economic toll of bidi smoking. By adopting a holistic approach and translating evidence into action, India can make significant strides toward protecting public health and advancing tobacco control goals.



Dr Rana Jugdeep Singh

Director (Tobacco Control) - Southeast Asia

Vital Strategies

New Delhi

Bidi consumption continues to pose a severe and escalating public health crisis in India, with approximately 72 million bidi smokers, making it the most widely used tobacco product in the country. Alarmingly, bidi smoking is responsible for over 7 lakh annual deaths in India. Furthermore, this practice disproportionately affects vulnerable populations, resulting in the loss of over 7 thousand young lives each year. The widespread use of bidis, particularly among lower-income communities, underscores the urgent need for comprehensive interventions. This report highlights the necessity of establishing hospital-based registries to enhance surveillance of tobacco-related diseases, complementing existing cancer registries to provide a more complete picture of the health impact. Additionally, significant regional disparities in bidi use and its associated health consequences call for tailored, region-specific strategies that address the unique socio-economic and cultural challenges of different states. Strengthening regulatory frameworks, ensuring stricter enforcement, and implementing sustained public health education campaigns are essential to curb bidi consumption and mitigate its devastating impact on health, productivity, and the economy. A multi-sectoral approach involving policymakers, healthcare professionals, and community organizations is crucial to effectively reduce bidi use and protect public health.



Prof Pankaj Bhardwaj

Academic Head, School of Public Health

All India Institute of Medical Sciences, Jodhpur

We are delighted to present this report, "Burden of Non-Cancer Health Outcomes due to Bidi Consumption in India: A Comprehensive Analysis from various Indian States." This document represents a significant milestone in our collective efforts to understand and address the widespread impact of bidi smoking on public health in India.

Bidi smoking, often perceived as a traditional and less harmful form of tobacco consumption, poses a severe threat to the health and well-being of millions. This report sheds light on the extensive burden of diseases linked to bidi smoking, ranging from respiratory illnesses to cardiovascular conditions, while also highlighting its far-reaching social and economic implications.

This document is the culmination of a rigorous research process, including systematic reviews, stakeholder consultations, and hospital-based primary data collection across multiple states. It highlights the widespread consequences of bidi smoking, which disproportionately affects vulnerable groups, including women and youth. The early age of initiation and the compounded risks faced by women engaged in bidi production and consumption emphasize the urgency of targeted interventions.

By documenting the morbidity, mortality, and socio-economic consequences of bidi consumption, this report aims to provide policymakers, public health professionals, and civil society with evidence-based insights to shape effective strategies. Recommendations in the report focus on stricter regulations, enhanced taxation, expanded cessation services, and the need for gender-sensitive and youth-focused campaigns.

We hope that this report serves as a catalyst for transformative action. Stricter regulations on the bidi industry, increased taxation, expanded cessation services, and targeted awareness campaigns are among the critical steps outlined to mitigate the devastating consequences of bidi use.

I congratulate the whole team involved in this project for successfully completing this report. Their work on this report is not only a testament to their dedication to addressing tobacco use but also a call to action for all stakeholders to prioritize bidi control in the broader agenda of public health improvement.

Table of Contents

S. No	Section	Page No.
01	Executive Summary	01
02	Background	03
03	Methodology	04
04	Results	05
05	Discussion	21
06	Conclusion & Recommendations	22
07	References	24
08	List of Partner Institutions	26

Burden of Non-Cancer Health Outcomes due to Bidi Consumption in India: A Comprehensive Analysis from various Indian States

Executive Summary

Bidi smoking is a major public health threat in the country. Being the second most common form of consumed tobacco, it contributes to a significant threat to health and productivity of the nation. Bidi is the most commonly smoked tobacco product in India, with an estimated 72 million adult users—nearly double the number of cigarette smokers. India and similar low- and middle-income countries, are most severely impacted with such a high prevalence of bidi smoking, contributing to a range of cancers, cardiovascular and respiratory diseases.

While the burden due to cancer related health outcomes can now be estimated through Population-Based and Hospital-Based Cancer Registries, the non-cancer health outcomes due to diseases such as Chronic Obstructive Pulmonary Disease (COPD), Ischemic Heart Disease (IHD), Cardiovascular Disorders (CVD), Tuberculosis (TB) relies on secondary sources and is largely fragmented. This report assesses the true health burden of non-cancer health outcomes due to bidi consumption through primary data collection from healthcare facilities of selected states in a selected time frame, to provide nationally representative estimates of death and disability.

The data collected across 21 healthcare facilities in 11 states revealed a high prevalence of bidi smoking among diseased individuals with 23.27% bidi smokers amongst COPD patients, 9.18% bidi smokers amongst CVD patients, 22.42% bidi smokers amongst IHD patients, and 34.94% bidi smokers amongst TB patients. This primary data resulted in an estimated 7,57,590 annual deaths and 2,01,68,490 annual DALYs due to four major non-cancer diseases caused by bidi consumption, namely, TB, CVD, COPD, and IHD.

This study provides evidence of the significant health impact of bidi smoking in India, emphasizing the urgent need for targeted public health interventions. Moreover, the study highlights need for more primary data points through hospital based non-cancer registries for smoking prevalence, and scaled up state-level studies for robust sub-national analysis, to obtain the true estimates of bidi related health burden in the country.

The report proposes recommendations to the various involved Ministries, academic institutions and civil society organizations. The Ministry of Commerce and Industry along with the Ministry of Micro, Small and Medium Enterprises should reconsider the status of bidi industry as a cottage industry, and the implementation of tobacco vendor licensing including bidi sale at every stage of bidi



manufacturing, thus restricting loose sale and sale to minors. Ministry of Finance should increase the taxes on bidis to discourage smoking. The generated revenue from increased taxes could be further allocated to fund and increase the outreach of tobacco control programs and public health initiatives. The Ministry of Youth Affairs and Sports should launch comprehensive, youth-targeted tobacco awareness campaigns in educational institutions and community centres, highlighting the severe health risks of bidi and other tobacco use, with a focus on preventing 'early initiation' and 'tobacco free generation'. The Ministry of Women and Child Development should expand the existing cessation services for bidi use control to the vulnerable sects of the society, namely women and children and should promote women's socio-economic empowerment through initiatives that reduces the financial and social stressors driving tobacco use. It is recommended that the academia and researchers engage with the civil society organizations for establishing non-cancer registries for tobacco related health outcomes, and engage in wider sensitisation campaigns, cessation efforts backed with operational & exploratory research in various domains related to bidi use control.

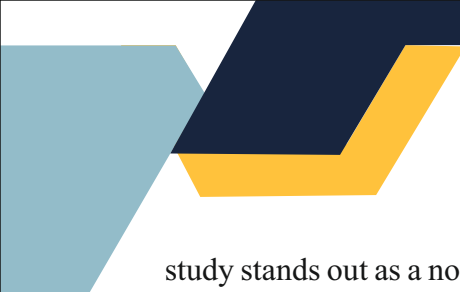
Background

Tobacco consumption is the leading cause of preventable death globally, posing a significant public health challenge and resulting in substantial social and economic costs. The World Health Organization (WHO) reports that over 8 million people die each year due to tobacco use, with more than 7 million deaths attributed to direct tobacco use and around 1.3 million to second-hand smoking. Approximately 80% of the 1.3 billion tobacco users globally reside in low- and middle-income countries, where the impact of tobacco-related illnesses and deaths is most severe (1).

In 2022, approximately 253 million people aged 15 years and older in India, accounting for 28.6% of the country's adult population, were tobacco users. This makes India the second-largest tobacco-consuming nation globally and the largest in the WHO South-East Asia Region. In 2021, tobacco was identified as the fifth leading risk factor contributing to the highest number of deaths and disabilities combined in the country (2).

A distinctive feature of India's tobacco market is the widespread use of traditional products like chewing tobacco and bidis. Bidis are the most commonly smoked tobacco product in India, with an estimated 72 million adult users—nearly double the number of cigarette smokers (3). However, there is a misconception in India and many other countries that bidis are less harmful than cigarettes. Scientific evidence explicitly disproves this belief (4) as bidis deliver higher levels of nicotine and carcinogens compared to manufactured cigarettes, making them a major risk factor for tobacco-related diseases in India. Bidi smoking has been linked to severe health conditions, including lung and oral cancers, respiratory diseases, heart attacks, and tuberculosis. Toxic chemicals released from bidi smoking significantly reduce life expectancy and lead to serious health complications. Moreover, a high prevalence of bidi use, coupled with a low median age of onset at 10.5 years, poses a long-term threat to the Indian population, as the health effects of tobacco use often manifest after 2–3 decades of usage (5–7).

Despite significant health burden associated with bidi consumption, much of the existing data relies on secondary sources and data modelling estimates which are highly fragmented and presented in form of risk and odds of disease occurrence. Moreover, while the burden due to cancer related health outcomes can now be estimated through Population-Based and Hospital-Based Cancer Registries, the non-cancer health outcomes due to diseases such as Chronic Obstructive Pulmonary Disease (COPD), Ischemic Heart Disease (IHD), Cardiovascular Disorders (CVD), Tuberculosis (TB) relies on secondary sources. This creates a critical need for novel research based on primary data. This



study stands out as a novel effort by assessing true health burden of non-cancer health outcomes due to bidi consumption through primary surveys conducted from healthcare facilities of selected states in a selected time frame, to provide nationally representative estimates of death and disability due to major non-cancer bidi-related diseases, namely, Chronic Obstructive Pulmonary Disease (COPD), Ischemic Heart Disease (IHD), Cardiovascular Disorders (CVD) and Tuberculosis (TB). By building robust evidence on the health impacts of bidi consumption, the report aims to provide evidence-based insights for targeted policies and improve public awareness.

Methodology

To document the nationally representative morbidity and mortality data on health harms of bidi smoking, a three-fold methodology was adopted. In the first phase, a scoping review of all available literature was conducted followed by a meta-analysis to estimate the bidi attributable death, disability and prematurely lost life years. Following the secondary estimations, consultation exercises were conducted with stakeholders, namely researchers and academicians, civil society organisations and developmental agencies as well as government officials. Following the consultations, a line-listing of healthcare institutions across the country was prepared which may aid in gathering hospital-based data on bidi exposure amongst diseased individuals. Lastly, primary data on bidi exposure amongst the diseased was gathered and analysed to come up with true bidi related morbidity and mortality in the country and sub-national regions.

Phase I – Meta-Analysis and Global Burden of Disease (GBD) Estimation

A scoping review and meta-analysis was conducted to account the data from all published studies concerning with disease occurrence as a result of tobacco consumption. To estimate the proportion of health burden due to the risk factor of bidi consumption, pooled odds ratio (OR) was calculated to determine population attributable fraction (PAF) using published case-control studies, which contained individual data of odds of disease occurrence due to bidi smoking. Those studies which contained generalised results due to “smoking” or “tobacco” were excluded.

The obtained PAF values were applied to the total number of deaths, DALY, and YLL, as obtained from the Global Burden of Disease (GBD) data for India, to obtain the estimates of morbidity and mortality specifically attributable to bidi.

Phase II – Stakeholder Consultations

Numerous telephonic and virtual consultations were conducted to create a line list of healthcare institutions across the country, who may support the data collection on proportion of diseases individuals exposed to bidi. The targeted stakeholders included representatives from healthcare institutions of national importance, researchers, civil society organisations and developmental agencies.

Phase III – Country-wide Cross-sectional Primary Survey

A country-wide cross-sectional primary survey was conducted in the line-listed healthcare facilities. A convenience sampling strategy was employed, wherein all the consenting patients visiting the hospital OPDs were recruited over a period of 2 months, and were enquired about their bidi consumption history at the time of diagnosis. Using the data from secondary analysis, all the patients suffering from Chronic Obstructive Pulmonary Disease (COPD), Ischemic Heart Disease (IHD), Cardiovascular Disorders (CVD) and Tuberculosis (TB) were included in the primary survey.

Results

Phase I: Meta-Analysis and Global Burden of Disease (GBD) Estimation

The meta-analysis of the secondary data yielded a Population Attributable Fraction (PAF) for development of TB, CVD, COPD, and IHD, as a result of bidi smoking. Applying this PAF to the Global Burden of Disease (GBD) database, we estimated that 5,68,453 deaths were attributable annually to bidi smoking in the year 2021. Simultaneously, bidi was found to be responsible for a loss of 1,48,44,253 Disability Adjusted Life Years due to TB, CVD, COPD and IHD. (Table 1)

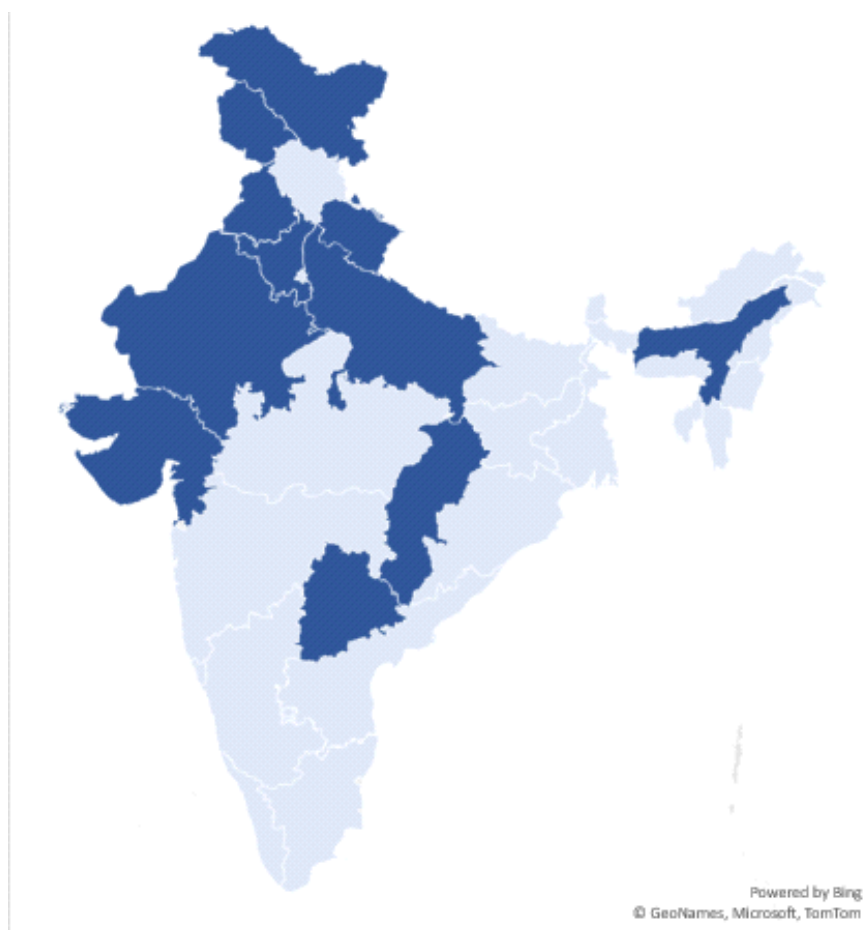
Table 1: Pooled odds ratio and population attributable fraction for bidi smoking obtained by meta-analysis

Disease attributable to Bidi	Pooled Odds Ratio	95% Confidence Interval	Population Attributable Fraction
Tuberculosis	3.63	3.17-4.15	0.21
IHD	2.68	2.11-3.40	0.17
COPD	2.58	2.00-3.33	0.19
CVD	1.24	1.07-1.52	0.03

Phase II – Stakeholder Consultations

Stakeholders representing 14 medical institutions and civil society organizations from 11 states/UTs of the country were engaged in stakeholder consultations. The stakeholders highlighted the consistency of observed mortality trends with those obtained from the secondary analysis, and for reinforcing the reliability of the findings, provided their consent to support primary hospital-based data collection aimed at gathering the proportion of bidi users among diseased individuals. These 11 states spanned all the major physiographic divisions of the country, ensuring diverse geographical representation. (Figure 1)

Figure 1: Representation of stakeholders from various Indian states and UTs for hospital-based data collection



Phase III – Primary Data Collection and Validation

Primary data collection was conducted across 21 healthcare facilities of 11 states/Union Territories of India with a total of 1012 study participants. The sample revealed that 23.27% of COPD patients, 9.18% of CVD patients 22.42% of IHD patients and 34.94% of TB patients were bidi smokers during the time of their diagnosis.

Table 2: Proportion of bidi smokers amongst diseased individuals as obtained from the country-wide primary hospital based survey

India	Bidi Smokers	Non-Bidi Smokers	Total Patients	Percentage of smokers amongst diseased
Tuberculosis	112	209	321	34.94
IHD	45	154	199	22.42
COPD	59	195	254	23.27
CVD	22	216	238	9.18

Overall Findings

The study findings demonstrated strong concordance between secondary data estimates and primary data analysis. The meta-analysis of secondary data estimated an overall burden of 5,68,453.33 annual deaths and 1,48,44,253.33 annual Disability-Adjusted Life Years (DALYs) attributable to bidi smoking due to COPD, TB, IHD, and CVD. In context to the primary data, the analysis revealed a higher burden, with 7,57,590.32 annual deaths and 2,01,68,489.73 annual DALYs. (Tables 2–4, Figures 2 & 3)

These results underscore the significant public health burden posed by bidi smoking across all genders and age groups. Particularly for females, the secondary data estimated 2,33,996.39 annual deaths and 58,26,649.19 annual DALYs, while the primary data analysis estimated 3,12,379.48 deaths and 79,33,498.27 DALYs. Similarly, for youth aged between 10–24 years, the secondary data estimated 4,806.82 annual deaths and 4,07,021.94 DALYs, while the primary data analysis revealed higher estimates of 7,507.71 deaths and 6,33,458.23 DALYs. (Tables 5–6, Figures 4–7)

Regional differences were also evident, with higher mortality rates observed in Uttar Pradesh, Maharashtra, Tamil Nadu, Gujarat, and West Bengal. These five states accounted for nearly half (48.42%) of the national disease burden due to bidi smoking.

Table 3: Annual deaths and DALYs due to bidi consumption as obtained through secondary analysis and primary hospital-based survey

Total Annual Deaths in India due to bidi smoking		
	Secondary Data	Primary Data
TB	83,799.23	1,39,665.388
COPD	2,02,574.44	2,45,221.687
CVD	4,489.75	13,469.24
IHD	2,77,589.91	3,59,234.00
Total	5,68,453.33	7,57,590.32
Total Annual DALYs in India due to bidi smoking		
TB	31,62,138.16	52,70,230.26
COPD	45,63,492.26	55,24,227.47
CVD	94,787.58	2,84,362.753
IHD	70,23,835.33	90,89,669.25
Total	1,48,44,253.33	2,01,68,489.7
Total Annual Deaths amongst females in India due to bidi smoking		
TB	32,123.14	53,538.57
COPD	93,187.87	1,12,806.37
CVD	3,155.48	9,466.44
IHD	1,05,529.90	1,36,568.11
Total	2,33,996.39	3,12,379.48
Total Annual DALYs amongst females in India due to bidi smoking		
TB	12,20,483.97	20,34,139.95
COPD	20,46,495.88	24,77,337.12
CVD	64,194.31	1,92,582.92
IHD	24,95475.03	32,29,438.28
Total	58,26,649.19	79,33,498.27
Total Annual Deaths amongst youth in India due to bidi smoking		
TB	3,460.67	5,767.78
COPD	121.54	147.13
CVD	4.69	14.07
IHD	1,219.92	1,578.72
Total	4,806.82	7,507.71
Total Annual DALYs amongst youth in India due to bidi smoking		
TB	2,91,641.30	4,86,068.90
COPD	30,137.41	36,482.13
CVD	347.32	1,041.96
IHD	84,895.87	1,09,865.24
Total	4,07,021.90	6,33,458.23

Table 4: States/UTs-wise annual deaths due to bidi consumption

States/UTs	Secondary Data	Primary data	% of National Burden
India	5,68,453.33	7,57,590.32	
Andhra Pradesh	22,374.70	29,623.25	3.91
Arunachal Pradesh	273.89	381.42	0.05
Assam	9,286.59	12,810.70	1.69
Bihar	36,677.96	49,110.73	6.48
Chhattisgarh	10,955.00	15,067.14	1.99
Delhi	6,050.21	7,998.49	1.06
Goa	626.27	826.06	0.11
Gujarat	38,214.11	51,040.47	6.74
Haryana	11,377.23	14,976.36	1.98
Himachal Pradesh	3,906.08	5,088.70	0.67
Jammu & Kashmir	5,445.46	7,060.09	0.93
Jharkhand	8,754.14	11,992.65	1.58
Karnataka	31,434.62	41,127.70	5.43
Kerala	17,600.74	22,971.88	3.03
Madhya Pradesh	34,249.75	45,792.62	6.04
Maharashtra	52,894.61	70,029.50	9.24
Manipur	881.25	1,222.79	0.16
Meghalaya	615.83	885.52	0.12
Mizoram	271.46	357.99	0.05
Nagaland	350.81	486.31	0.06
Odisha	12,814.45	18,454.11	2.44
Punjab	15,873.28	20,984.46	2.77
Rajasthan	35,467.68	46,951.06	6.20
Sikkim	173.07	232.67	0.03
Tamil Nadu	39,305.47	52,181.92	6.89
Telangana	17,550.01	23,104.73	3.05
Tripura	1,321.42	1,727.79	0.23
Uttar Pradesh	1,08,716.88	1,45,865.80	19.25
Uttarakhand	7,164.15	9,517.77	1.26
West Bengal	36,669.52	48,168.88	6.36
Other UTs	1,156.69	1,550.74	0.20



Figure 2



Table 5: States/UTs-wise annual DALYs due to bidi consumption

States/UTs	Secondary Data	Primary data	% of National Burden
India	1,48,44,253.33	2,01,68,489.73	
Andhra Pradesh	5,50,923.75	7,35,152.57	3.65
Arunachal Pradesh	7,949.51	11,335.51	0.06
Assam	2,69,819.38	3,82,815.67	1.90
Bihar	9,31,691.64	12,71,667.83	6.31
Chhattisgarh	3,17,967.01	4,44,936.84	2.21
Delhi	1,59,106.34	2,13,481.99	1.06
Goa	13,726.90	18,181.05	0.09
Gujarat	10,07,728.55	13,73,272.37	6.81
Haryana	3,03,073.53	4,04,790.04	2.01
Himachal Pradesh	92,067.27	1,21,697.11	0.60
Jammu & Kashmir	1,30,226.32	1,70,782.60	0.85
Jharkhand	2,45,034.81	3,41,988.30	1.70
Karnataka	7,89,844.09	10,47,611.58	5.19
Kerela	3,88,529.15	5,07,924.44	2.52
Madhya Pradesh	9,31,057.57	12,72,233.71	6.31
Maharashtra	13,15,807.84	17,69,709.71	8.77
Manipur	23,705.01	33,368.48	0.17
Meghalaya	18,553.32	27,255.01	0.14
Mizoram	6,758.87	9,128.59	0.05
Nagaland	9,057.53	12,794.00	0.06
Odisha	3,73,226.98	5,45,384.73	2.70
Punjab	4,07,904.67	5,42,351.06	2.69
Rajasthan	9,44,651.86	12,91,224.40	6.40
Sikkim	4,468.68	6,126.34	0.03
Tamil Nadu	10,22,142.26	13,64,811.92	6.77
Telangana	4,45,389.43	5,91,483.37	2.93
Tripura	32,412.14	42,904.13	0.21
Uttar Pradesh	29,71,442.20	41,06,264.47	20.36
Uttarakhand	1,96,111.76	2,65,295.00	1.32
West Bengal	9,03,187.20	12,00,916.66	5.95
Other UTs	30,687.74	41,600.25	0.21

Figure 3: State/UTs-wise annual DALYs due to bidi consumption (in lakhs)

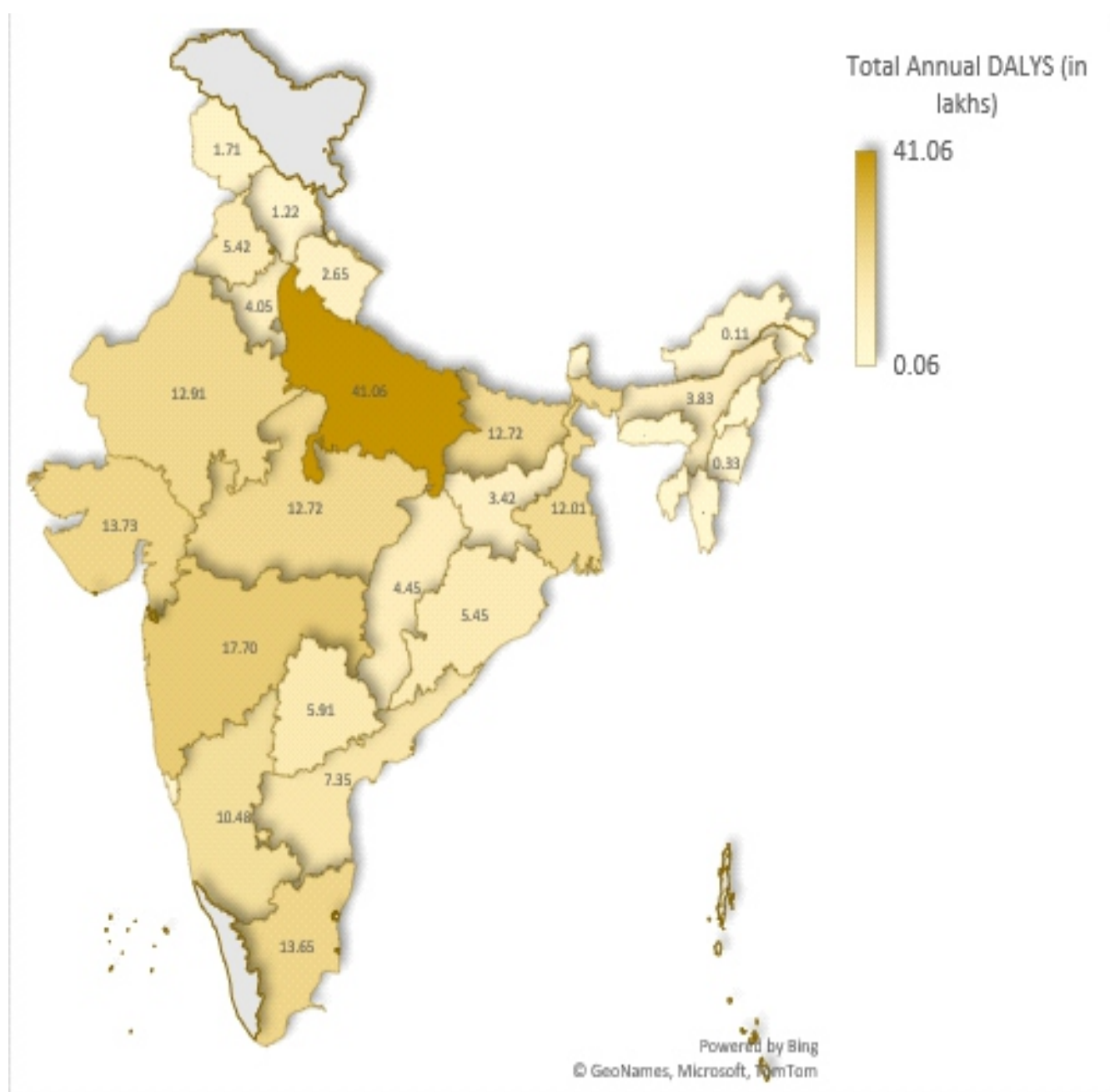


Table 6: States/UTs-wise annual deaths of females due to bidi consumption

States/UTs	Secondary Data	Primary data	% of National Burden
India	2,33,996.39	3,12,379.48	
Andhra Pradesh	9,736.56	12,972.59	4.15
Arunachal Pradesh	101.23	143.74	0.05
Assam	3,839.13	5,281.23	1.69
Bihar	15,588.97	20,828.08	6.67
Chhattisgarh	4,203.71	5,798.69	1.86
Delhi	2,470.87	3,260.53	1.04
Goa	277.55	366.35	0.12
Gujarat	15,886.03	21,250.30	6.80
Haryana	4,364.45	5,769.07	1.85
Himachal Pradesh	1,391.76	1,808.32	0.58
Jammu & Kashmir	2,206.57	2,886.75	0.92
Jharkhand	4,454.73	6,000.08	1.92
Karnataka	13,667.37	17,883.54	5.72
Kerela	7,546.58	9,912.90	3.17
Madhya Pradesh	12,961.79	17,362.64	5.56
Maharashtra	23,160.11	30,726.56	9.84
Manipur	421.05	587.30	0.19
Meghalaya	262.02	378.83	0.12
Mizoram	125.54	166.20	0.05
Nagaland	150.99	207.01	0.07
Odisha	4,823.28	6,939.51	2.22
Punjab	6,177.14	8,206.37	2.63
Rajasthan	13,503.23	17,854.50	5.72
Sikkim	65.74	88.58	0.03
Tamil Nadu	14,854.82	19,708.06	6.31
Telangana	7,257.38	9,588.69	3.07
Tripura	531.04	694.85	0.22
Uttar Pradesh	45,344.52	61,252.25	19.61
Uttarakhand	2,672.26	3,532.82	1.13
West Bengal	15,507.91	20,328.93	6.51
Other UTs	442.06	594.19	0.19



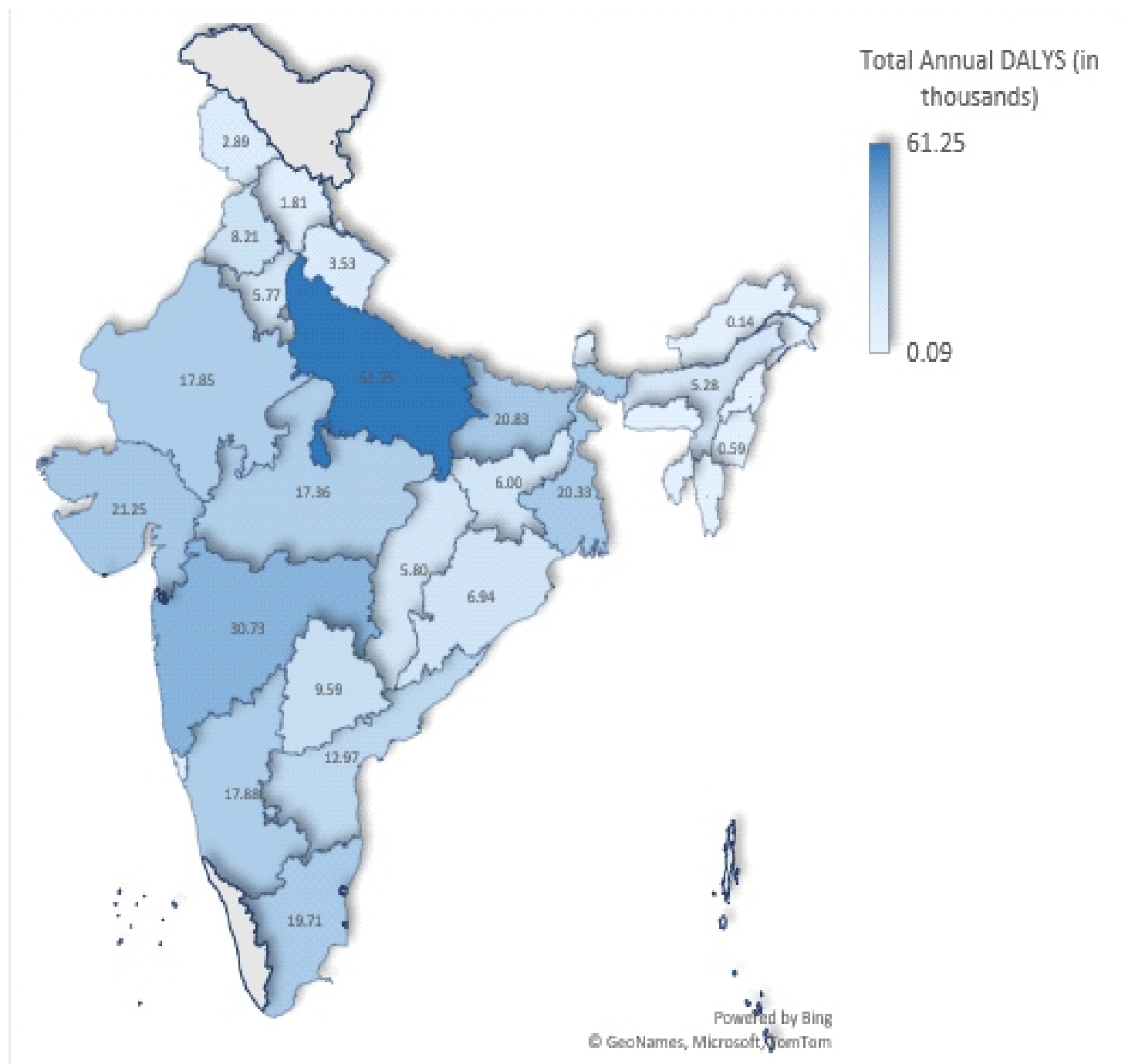
Figure 4: State



Table 7: States/UTs-wise annual DALYs of females due to bidi consumption

DALY	Secondary Data	Primary data	% of National Burden
India	58,26,649.19	79,33,498.27	
Andhra Pradesh	2,29,168.89	12,972.59	0.16
Arunachal Pradesh	3,015.51	143.74	0.00
Assam	1,07,180.38	5,281.23	0.07
Bihar	3,92,896.29	20,828.08	0.26
Chhattisgarh	1,17,647.24	5,798.69	0.07
Delhi	60,763.81	3,260.53	0.04
Goa	5,836.92	366.35	0.00
Gujarat	3,86,093.57	21,250.30	0.27
Haryana	1,09,311.02	5,769.07	0.07
Himachal Pradesh	30,398.48	1,808.32	0.02
Jammu & Kashmir	51,935.69	2,886.75	0.04
Jharkhand	1,21,482.96	6,000.08	0.08
Karnataka	3,20,590.84	17,883.54	0.23
Kerela	1,52,250.73	9,912.90	0.12
Madhya Pradesh	3,26,273.14	17,362.64	0.22
Maharashtra	5,47,332.61	30,726.56	0.39
Manipur	11,226.53	587.30	0.01
Meghalaya	7,866.90	378.83	0.00
Mizoram	3,031.77	166.20	0.00
Nagaland	3,752.97	207.01	0.00
Odisha	1,40,502.55	6,939.51	0.09
Punjab	1,53,298.06	8,206.37	0.10
Rajasthan	3,35,333.04	17,854.50	0.23
Sikkim	1,646.57	88.58	0.00
Tamil Nadu	3,62,211.54	19,708.06	0.25
Telangana	1,75,314.41	9,588.69	0.12
Tripura	12,298.77	694.85	0.01
Uttar Pradesh	12,07,866.94	61,252.25	0.77
Uttarakhand	67,586.40	3,532.82	0.04
West Bengal	3,71,322.99	20,328.93	0.26
Other UTs	11,211.68	15,217.73	0.19

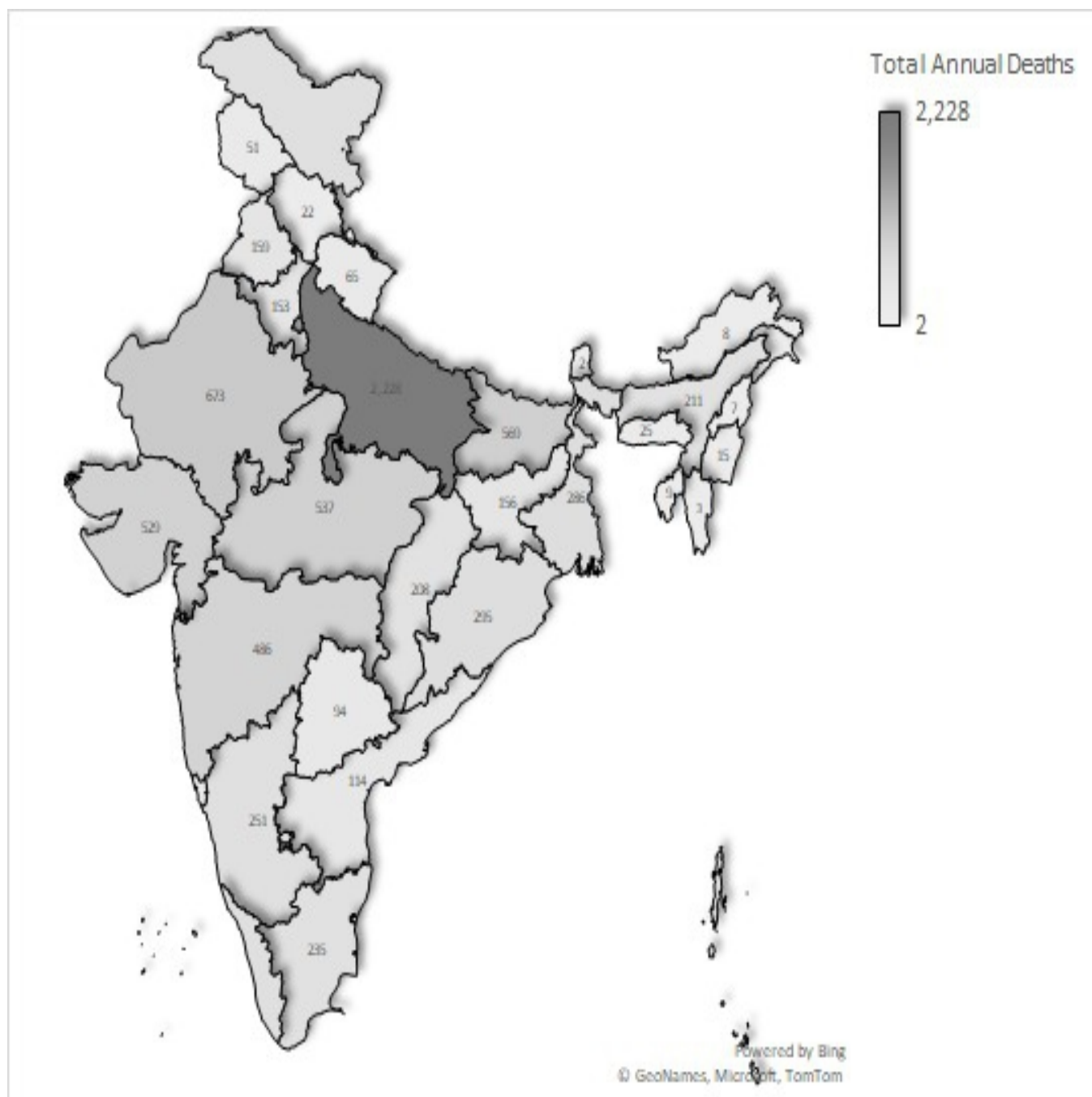
Figure 5: State/UTs-wise annual DALYs of females due to bidi consumption (in thousands)



**Table 8: States/UTs-wise annual deaths of youth (10-24 yrs)
due to bidi consumption**

States/UTs	Secondary Data	Primary data	% of National Burden
India	4,806.82	7,507.71	
Andhra Pradesh	76.64	113.62	1.51
Arunachal Pradesh	4.8	7.75	0.10
Assam	131.5	211.24	2.81
Bihar	365.53	569.06	7.58
Chhattisgarh	131.54	208.23	2.77
Delhi	42.15	64.01	0.85
Goa	1.54	2.26	0.03
Gujarat	339.7	529.44	7.05
Haryana	102.04	153.41	2.04
Himachal Pradesh	14.26	21.80	0.29
Jammu & Kashmir	34.05	50.56	0.67
Jharkhand	98.25	155.99	2.08
Karnataka	167.88	250.74	3.34
Kerela	28.56	40.53	0.54
Madhya Pradesh	346.65	537.24	7.16
Maharashtra	314.06	485.74	6.47
Manipur	9.18	14.66	0.20
Meghalaya	15.17	24.70	0.33
Mizoram	1.92	3.11	0.04
Nagaland	4.58	7.30	0.10
Odisha	181.74	294.66	3.92
Punjab	113.82	159.07	2.12
Rajasthan	420.91	672.65	8.96
Sikkim	1.41	2.21	0.03
Tamil Nadu	160.38	235.46	3.14
Telangana	63.56	93.69	1.25
Tripura	5.7	8.63	0.11
Uttar Pradesh	1,392.47	2,227.67	29.67
Uttarakhand	42.14	65.14	0.87
West Bengal	187.63	286.39	3.81
Other UTs	7.06	10.77	0.14

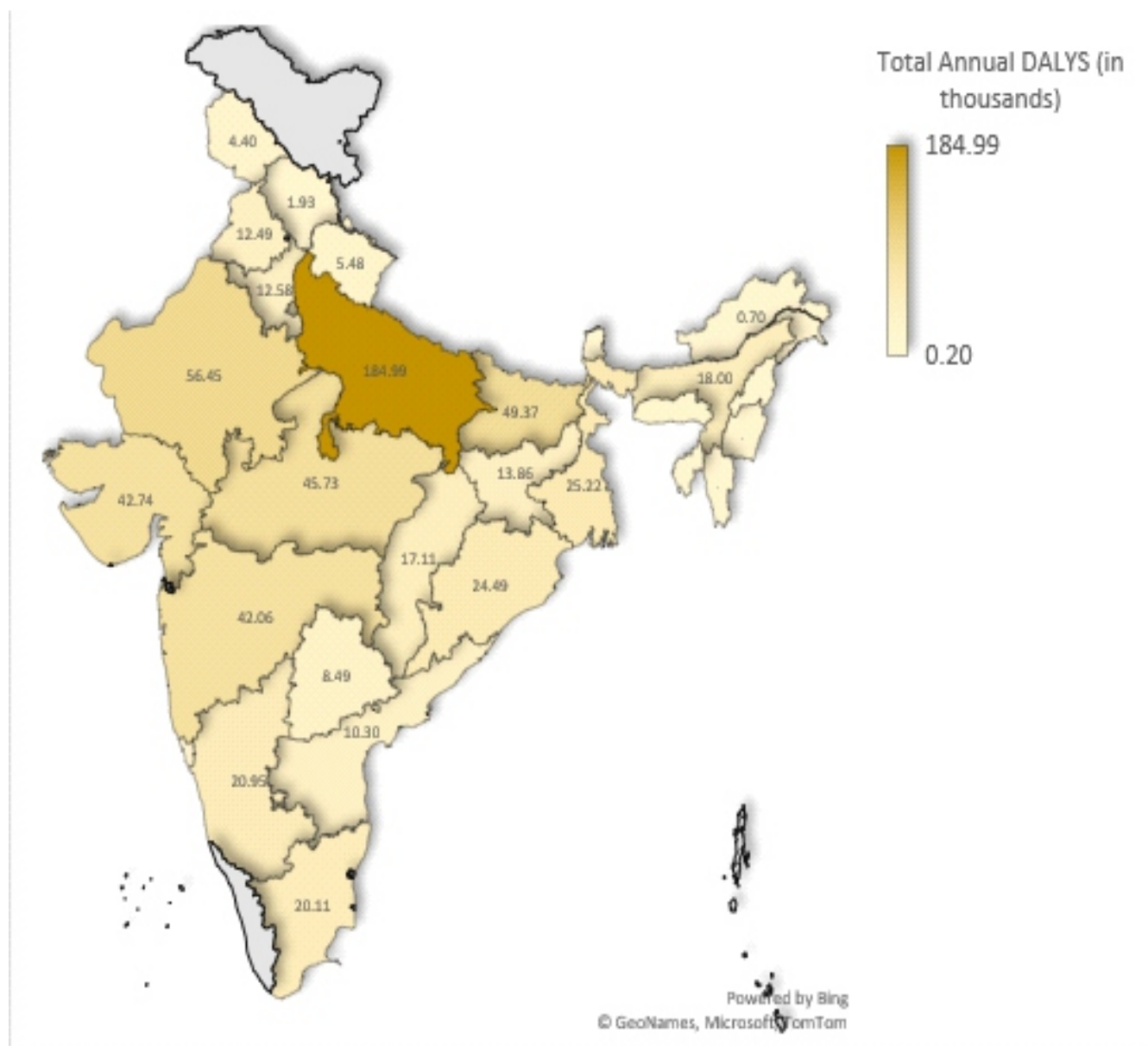
**Figure 6: States/UTs-wise annual deaths of youth (10-24 yrs)
due to bidi consumption**



**Table 9: States/UTs-wise annual DALYs of youth (10-24 yrs)
due to bidi consumption**

States/UTs	Secondary Data	Primary data	% of National Burden
India	4,07,021.94	6,33,458.23	
Andhra Pradesh	6,959.59	10,302.32	1.63
Arunachal Pradesh	438.12	699.14	0.11
Assam	11,284.89	18,000.69	2.84
Bihar	31,898.95	49,374.14	7.79
Chhattisgarh	10,857.55	17,113.81	2.70
Delhi	3,922.81	5,952.70	0.94
Goa	136.61	200.14	0.03
Gujarat	27,451.16	42,738.00	6.75
Haryana	8,377.43	12,582.20	1.99
Himachal Pradesh	1,266.81	1,925.52	0.30
Jammu & Kashmir	2,973.29	4,397.29	0.69
Jharkhand	8,801.50	13,858.18	2.19
Karnataka	14,006.29	20,954.29	3.31
Kerela	2,581.47	3,652.36	0.58
Madhya Pradesh	29,527.68	45,728.00	7.22
Maharashtra	27,277.17	42,055.12	6.64
Manipur	816.99	1,292.84	0.20
Meghalaya	1,272.40	2,052.52	0.32
Mizoram	185.9	293.66	0.05
Nagaland	404.11	638.22	0.10
Odisha	15,195.54	24,491.52	3.87
Punjab	8,868.47	12,494.20	1.97
Rajasthan	35,489.39	56,446.97	8.91
Sikkim	128.32	199.98	0.03
Tamil Nadu	13,634.62	20,113.89	3.18
Telangana	5,746.42	8,485.08	1.34
Tripura	514.09	769.30	0.12
Uttar Pradesh	1,16,190.80	1,84,985.35	29.20
Uttarakhand	3,559.46	5,483.09	0.87
West Bengal	16,622.31	25,215.57	3.98
Other UTs	631.76	962.15	0.15

**Figure 7: States/UTs-wise annual DALYs of youth (10-24 yrs)
due to bidi consumption (in thousands)**



Discussion

The findings from this study highlight the substantial public health burden posed by bidi smoking in India. The present study followed an approach to determine the direct health burden that is attributable to bidi consumption in the general population through the calculation of PAF. Many researchers have proposed similar approaches as legitimate methodologies, including Mansournia and Altman, who describe PAF as a valid epidemiologic measure to evaluate the impact of exposures in populations; Lin and Chen, who claim it is an effective measure of disease burden attributable to specific risk factors and description of PAF by the WHO. Additionally, PAF has been used in some research, such as the CDC's calculation of smoking-attributable death in the US (7).

Previous research by Doung et al (2021) in the southeast Asian population has demonstrated a significantly increases the risk of respiratory [1.3% (0.8–2.2)] and cardiovascular diseases [5.1% (3.5–7.3)] as a result of bidi smoking (8), aligning with the high Population Attributable Fraction (PAF) values, associated mortality and Disability Adjusted Life Years (DALYs) identified in the current analysis.

According to available literature, bidi smokers proportion amongst COPD patients ranged from 22.6% to as high as 80% (9–11). Similarly, 32% of tuberculosis (TB) deaths are documented to be attributed to tobacco and bidi smoking (12,13). Furthermore, Jha et al. (2020) (14) reported that smoking among individuals aged 30 to 69 years accounts for approximately 1 in 20 deaths among women and 1 in 5 deaths among men. Our findings estimate that bidi smoking was responsible for 6,63,021 deaths due to four disease condition and correlate with the above available mortality estimates if the all-cause mortality were to be considered. This underscores the substantial mortality burden associated with bidi smoking.

Regional disparities in bidi consumption across India can be attributed to various factors, including population size, socio-economic conditions, cultural practices, and accessibility. According to the various rounds of Global Adult Tobacco Survey, states with larger populations, such as Uttar Pradesh, Bihar, and Madhya Pradesh, tend to report higher prevalence rates of bidi smoking due to the greater number of smokers in these regions. Additionally, socio-cultural factors, such as the deep-rooted tradition of bidi smoking in certain rural areas, contribute to regional disparities. Economic factors, including lower income levels in some states, also play a role, as bidi smoking is often perceived as a more affordable alternative to cigarettes. In our study the regional differences were observed, with Uttar Pradesh, Maharashtra, Tamil Nadu, Gujarat, and West Bengal accounting for nearly half of the bidi-related disease burden.

Strengths and Limitations

This study highlights the substantial health burden attributable to bidi smoking in India, validating findings from both national and global research. This study's methodological approach—integrating meta-analysis, stakeholder consultations, and primary data collection—proved robust in validating secondary data estimates. The findings emphasize the need for targeted tobacco control interventions, particularly in LMICs where the prevalence of bidi smoking is high and its health consequences are severe. Expanding this methodology to other regions and conducting longitudinal studies will provide further insights, enabling policymakers to design effective strategies to reduce bidi-related morbidity and mortality.

The study observed a relatively higher proportion of bidi users among diseased individuals in the conducted primary survey. Such findings may be a result of study's reliance largely on government hospitals. This overrepresentation of bidi users reflects the socio-economic profile of patients who predominantly use these healthcare facilities, as bidi smoking is more prevalent among lower-income groups. Nevertheless, certain studies conducted previously in various subsets of Indian population, and in similar socio-demographic profiles provide an even higher proportion of bidi users amongst diseased individuals, which further provide validity to the study findings.

Conclusion and Recommendations

This study provides evidence of the significant health impact of bidi smoking in India, emphasizing the urgent need for targeted public health interventions. Moreover, the study highlights need for more primary data points through hospital based non-cancer registries for smoking prevalence, and scaled up state-level studies for robust sub-national analysis, to obtain the true estimates of bidi related health burden in the country.

Recommendations for various Ministries

- The Ministry of Commerce and Industry along with the Ministry of Micro, Small and Medium Enterprises to reconsider the status of bidi industry as a cottage industry.
- Implementation of licensing at every stage of bidi manufacturing and selling by the vendors, to limit the sales to underage youth and better implementation of existing control policies.
- Ministry of Finance and the GST council to consider raising the taxes on bidis to discourage smoking and it should be ensured that an improved tax administration for limit tax avoidance and higher revenue collection is imposed at the earliest. The revenue generated from increased taxes could be allocated to fund tobacco control programs and public health initiatives.
- Ministry of Youth Affairs and Sports should launch comprehensive, youth-targeted tobacco awareness campaigns in educational institutions and community centres, highlighting the severe



health risks of bidi and other tobacco use, with a focus on preventing 'early initiation' and 'tobacco free generation'.

- Empowering the youth through peer-led interventions and mentorship programs that promote tobacco-free lifestyles, leveraging the influence of trusted young role models.
- Ministry of Women and Child Development should expand the existing cessation services for bidi use control to the vulnerable sects of the society, namely women and children and should promote women's socio-economic empowerment through initiatives that reduces the financial and social stressors driving tobacco use.
- Recommendations for the Civil Society Organisations
 - Wider and farther dissemination of the findings of such magnitude of health burden across the country to raise awareness about the health risks of bidi consumption. This can include organising awareness campaigns, providing information and engaging with the local rural and tribal communities to promote healthy livelihoods.

Recommendations for the Medical Institutions and Academia

- Establish an improved surveillance system in form of hospital based non-cancer registries for tobacco prevalence, at institutional levels, to monitor bidi related diseases. The surveillance initially involve limited departments such as general medicine, pulmonary medicine, and cardiology, and later scaled up to other concerned departments.
- State and district specific studies for sub-national estimations, in order to gather true burden and all-cause mortality/morbidity due to bidi consumption, along with intensive and targeted public awareness campaigns for health risks associated with bidi smoking.
- Academia may collaborate with government departments and civil society organizations to advocate for tobacco control policies and include the agenda of bidi control at the local, national, and international levels. This can include working with policymakers to conduct research, develop evidence-based policies, design interventions and providing expert testimony and consultations.

References:

1. World Health Organization. World No Tobacco Day 2020: Tobacco Fact Sheet [Internet]. Geneva: WHO; 2020 [cited 2025 Jan 13]. Available from: <https://www.who.int/docs/default-source/campaigns-and-initiatives/world-no-tobacco-day-2020/wntd-tobacco-fact-sheet.pdf>
2. Global Center for Good Governance in Tobacco Control. Tobacco Around the World: India [Internet]. [cited 2025 Jan 13]. Available from: <https://globalactiontoendsmoking.org/research/tobacco-around-the-world/india/>
3. World Health Organization. Bidi rolling is an occupational health hazard: WHO study [Internet]. Geneva: WHO; [cited 2025 Jan 13]. Available from: <https://www.who.int/india/news/feature-stories/detail/bidi-rolling-is-an-occupational-health-hazard--who-study>
4. Pednekar MS, Gupta PC, Yeole BB, Hébert JR. Association of tobacco habits, including bidi smoking, with overall and site-specific cancer incidence: Results from the Mumbai cohort study. *Cancer Causes and Control*. 2011 Jun;22(6):859–68.
5. Mbulo L, Palipudi KM, Smith T, Yin S, Munish VG, Sinha DN, et al. Patterns and related factors of bidi smoking in India. *Tob Prev Cessat*. 2020 May 1;6(May):1–10.
6. Ministry of Health and Family Welfare, Government of India. Global Youth Tobacco Survey (GYTS-4) India, 2019: Final Report [Internet]. New Delhi: MOHFW; 2019 [cited 2025 Jan 13]. Available from: <https://ntcp.mohfw.gov.in/assets/document/surveys-reports-publications/GYTS%204%20Final%20Report.pdf>
7. Jain YK, Bhardwaj P, Joshi NK, Gupta MK, Goel AD, Sharma PP. Death, Disability, and Premature Life Years Lost Due to Cigarettes, Bidis, and Smokeless Tobacco in India: A Comparative Assessment. *Addiction and Health*. 2023 Jan 29;15(1):53–62.
8. Duong ML, Rangarajan S, Zhang X, Killian K, Mony P, Swaminathan S, et al. Effects of bidi smoking on all-cause mortality and cardiorespiratory outcomes in men from south Asia: an observational community-based substudy of the Prospective Urban Rural Epidemiology Study (PURE). *Lancet Glob Health*. 2017 Feb 1;5(2):e168–76.
9. Sinha B, Vibha, Singla R, Chowdhury R. An epidemiological profile of chronic obstructive pulmonary disease: A community-based study in Delhi. *J Postgrad Med*. 2017 Jan 1;63(1):29–35.
10. Jindal S K. Tobacco Smoking and Chronic Obstructive Lung Disease- The Indian Evidence. NAMSCON [Internet]. (187-198–2008). Available from: https://nams-india.in/anams/2008/44_3_187-198.pdf
11. Khan MM, Tandon SN, Khan MT, Pandey S, Affiliations I, Disclaimer P, et al. A comparative study of effects of cigarette and bidi smoking on respiratory function tests [Internet].



Available from: <https://pubmed.ncbi.nlm.nih.gov/12617324/>

12. Gupta S, C RJ, Jain N, Z MA. Association between Tobacco and Tuberculosis: A short narrative review. Indian Journal of Forensic and Community Medicine [Internet]. 2021 Dec 15;8(4):202–6. Available from: <https://www.ijfcm.org/article-details/15449>
13. Pednekar MS, Gupta PC. Prospective study of smoking and tuberculosis in India. Prev Med (Baltim). 2007 Jun;44(6):496–8.
14. Jha P, Jacob B, Gajalakshmi V, Gupta PC, Dhingra N, Kumar R, et al. A Nationally Representative Case–Control Study of Smoking and Death in India. New England Journal of Medicine. 2008 Mar 13;358(11):1137–47.

List of Partner Institutions and Healthcare Facilities involved in Data Collection

1. Adesh Hospital, Bathinda, Punjab
2. AIIMS Bathinda, Punjab
3. AIIMS Bibinagar, Telangana
4. AIIMS Gorakhpur, Uttar Pradesh
5. AIIMS Jodhpur
6. Balajee Sewa Sansthan, Uttarakhand
7. Faith Foundation, Gujarat
8. Guwahati Medical College & Hospital, Assam
9. Maharishi Markandeshwar Institute of Medical Sciences and Research, Ambala, Haryana
10. MJPSJC, Amdebkar Nagar, UP
11. Pandit Deendayal Upadhyay Govt Hospital, Dehradun, Uttarakhand
12. SNM Hospital, Leh, UT of Ladakh
13. Uttar Pradesh Voluntary Health Association, Uttar Pradesh
14. Community Health Centers and UPHCs, Vadodara, Gujarat
15. District Hospital and SMHS, various centers in Srinagar, J&K
16. Various District Hospitals of Chhattisgarh

