

# **Burden of Diseases due to Air Pollution in Urban India**

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# Motivation

- Despite having high rate of economic growth air-pollution in India particularly in the urban areas has been alarmingly increasing since recent past. Air quality has failed to meet the health-based standards in many of the Indian cities raising a question to the sustainability of urban areas
- No universal agreement on how to define “urban” and “city”. Characteristics vary based on density of a settlement, economic activity and the border between city and villages
- We relied on definition by Census, 2011
- How is labour productivity (indicated by wages or income) affected by diseases that are caused by air pollution?
- What is the economic burden of diseases caused by air pollution in Urban India?

# Indicators

- Self-reported health status
- Diseases caused by air pollution are identified based on the list by National Institute of Environmental and Health Sciences
- Direct economic burden of – % share of health expenditure to total household expenditure (a proxy for income)
- Indirect economic burden - % share of income loss due to ailment to total household income (proxied by expenditure) – an indicator for loss of labour productivity (Leibenstein, 1957), loss of well-being as it reduces the capability of an individual and leaves her/him with limited array of opportunities (limited freedom of choice, Sen, 1987)

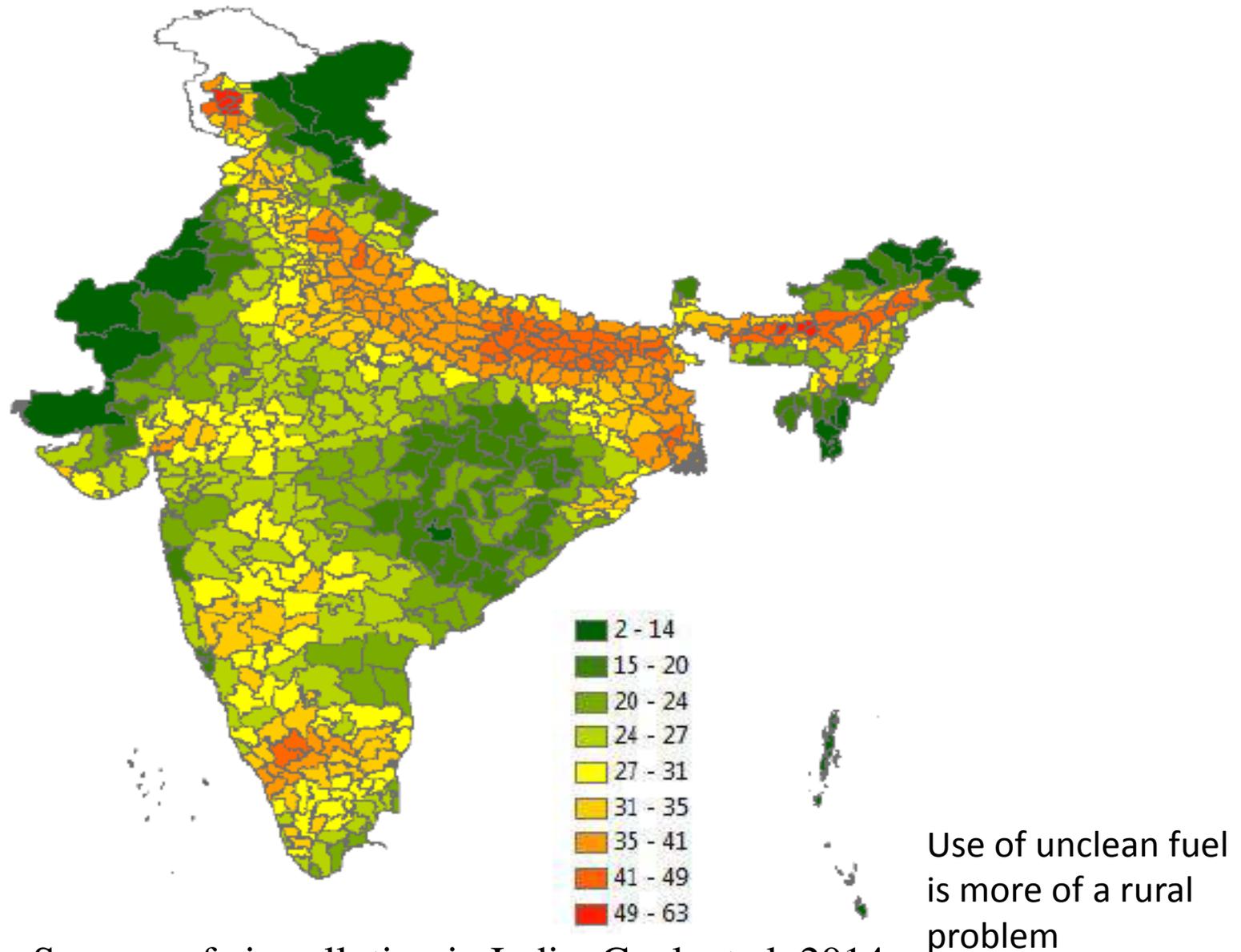
# Sources of Data

- The data on air-quality index from 52 monitoring stations  
<http://aqicn.org/map/india/#@g/19.4387/62.9589/7z>
- ASI and Census, various rounds
- Unit level data from National Sample Survey (NSS) of 60<sup>th</sup> round (2004) and 71<sup>st</sup> round (2014) on Health and Morbidity, schedule no. 25.0.

Table 1. Number of monitoring stations/cities by average quality of air based on air quality index collected from 52 monitoring stations in various States

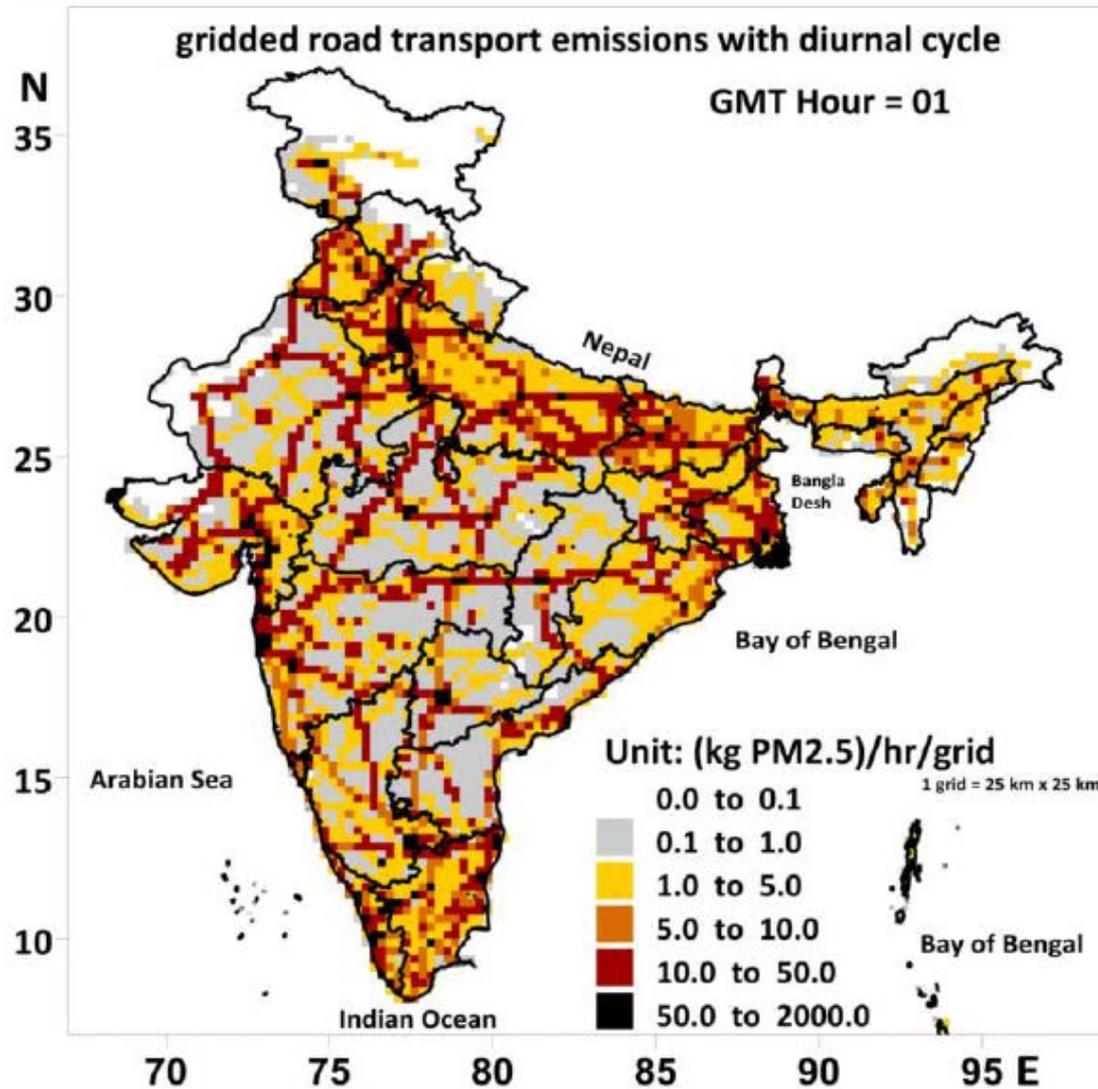
States	Number of monitoring stations/cities by quality of air					
	Hazardous	Very unhealthy	Unhealthy	Unhealthy for sensitive people	Moderate	Good
Andhra Pradesh					2	
Telangana			1			
Bihar				2		
Delhi	1	1	7		1	
Haryana			1		1	
Karnataka			1	1	3	
Maharashtra		1	4	4	5	
Rajasthan			2		1	
Tamil Nadu			1	1		2
Uttar Pradesh	3	1	2	1		
West Bengal				1		1

Map 2. Share of households' fuel consumption to outdoor PM2.5 pollution



Source: Sources of air pollution in India, Goel, et al. 2014

# Map 1. Road Transport Emissions



Vehicular emission is a major problem in cities

Source: Sources of air pollution in India, Goel, et al. 2014

Table2. Trend of Urbanisation in India (1901 to 2011 Census)

Census Year	Total Population	Urban Population	Percentage of Urban Population to Total Population	Decadal Urban Growth Rate
1901	238396327	25854967	10.85	NA
1911	252093390	25948431	10.29	0.36
1921	251321213	28091299	11.18	8.26
1931	278977238	33462539	11.99	19.12
1941	318660580	44162191	13.86	31.98
1951	361088090	62443709	17.29	41.40
1961	439234771	78936603	17.97	26.41
1971	548159652	109113977	19.91	38.23
1981	683329097	159462547	23.34	46.14
1991	846302688	217611012	25.71	36.47
2001	1028610328	286119689	27.82	31.48
2011	1210569573	377106125	31.15	31.80

The proportion of population residing in urban areas has increased from 11% in 1901 to over 31% in 2011

**Table3. Number of towns in different classes in India from 1901 to 2011**

Year	Class/Category of Cities/Towns						
	All Classes	Class-I (100000 & above)	Class-II (50000-99999)	Class-III (20000-49999)	Class-IV (1000-19999)	Class-V (5000-9999)	Class-VI (Less than 5000)
1901	1917	25	44	144	427	771	503
1911	1909	26	38	158	388	750	546
1921	2047	29	49	172	395	773	626
1931	2219	31	59	218	479	849	580
1941	2424	49	88	273	554	979	478
1951	3060	76	111	374	675	1195	629
1961	2700	107	139	518	820	848	268
1971	3126	151	219	652	988	820	296
1981*	3949	226	325	883	1247	920	348
1991**	4615	322	421	1161	1451	973	287
2001	5161	441	496	1388	1561	1041	234
2011	7935	503	607	1892	2232	2190	511

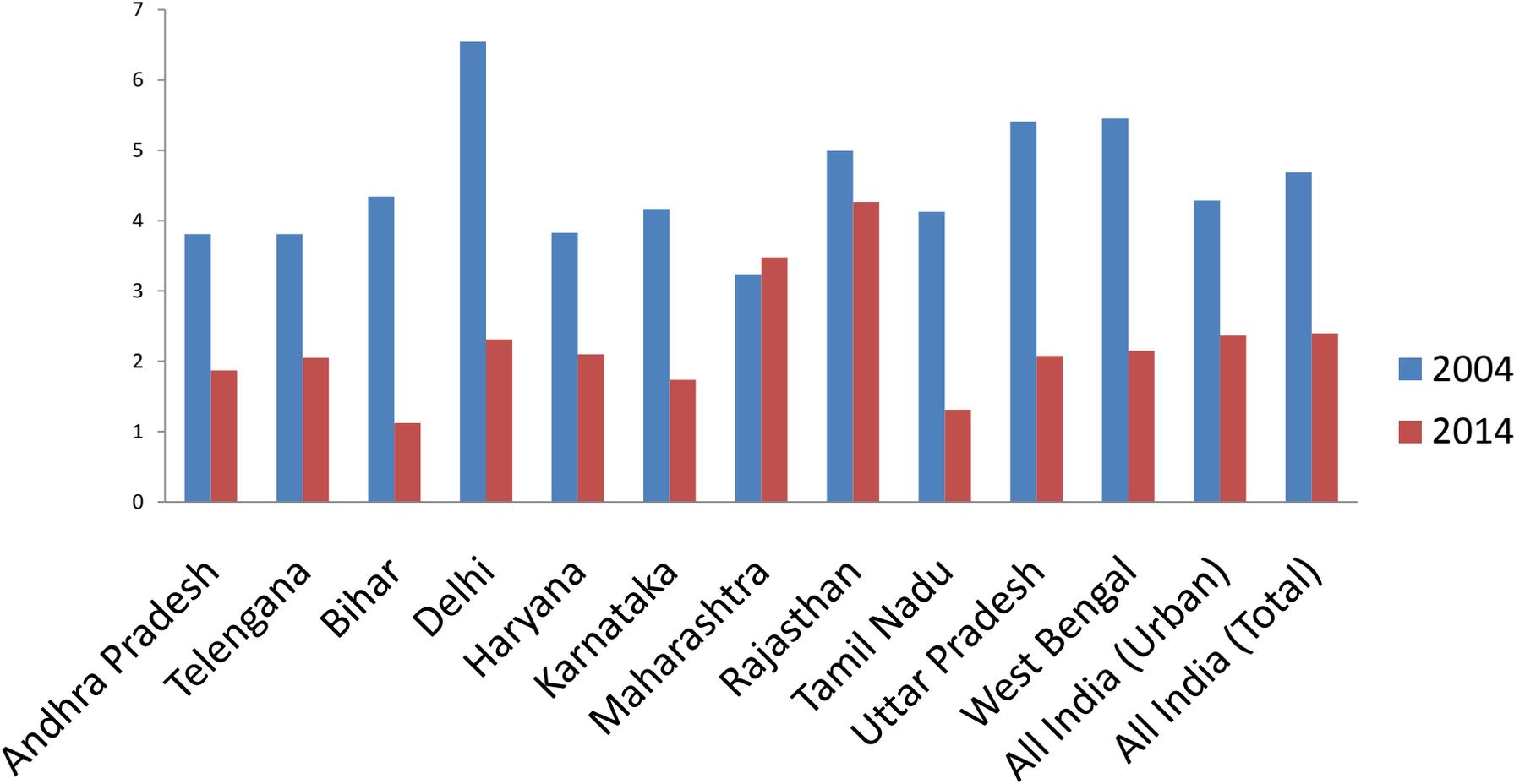
Although number of class 1 cities has increased from 25 in 1901 to 503 in 2011, it is the non-class I cities (all cities with less than 1, 00, 000 population) that have increased to a great extent during this same period. Particularly there are a large number of urban settlements that fall under the categories of class III, IV and V cities.

Table 6. Percentage of Ailing Persons suffering from air-pollution related diseases and percentage of people using clean sources of fuel for cooking purpose in selected urban areas of selected States and all India: NSS (2004) and NSS (2014)

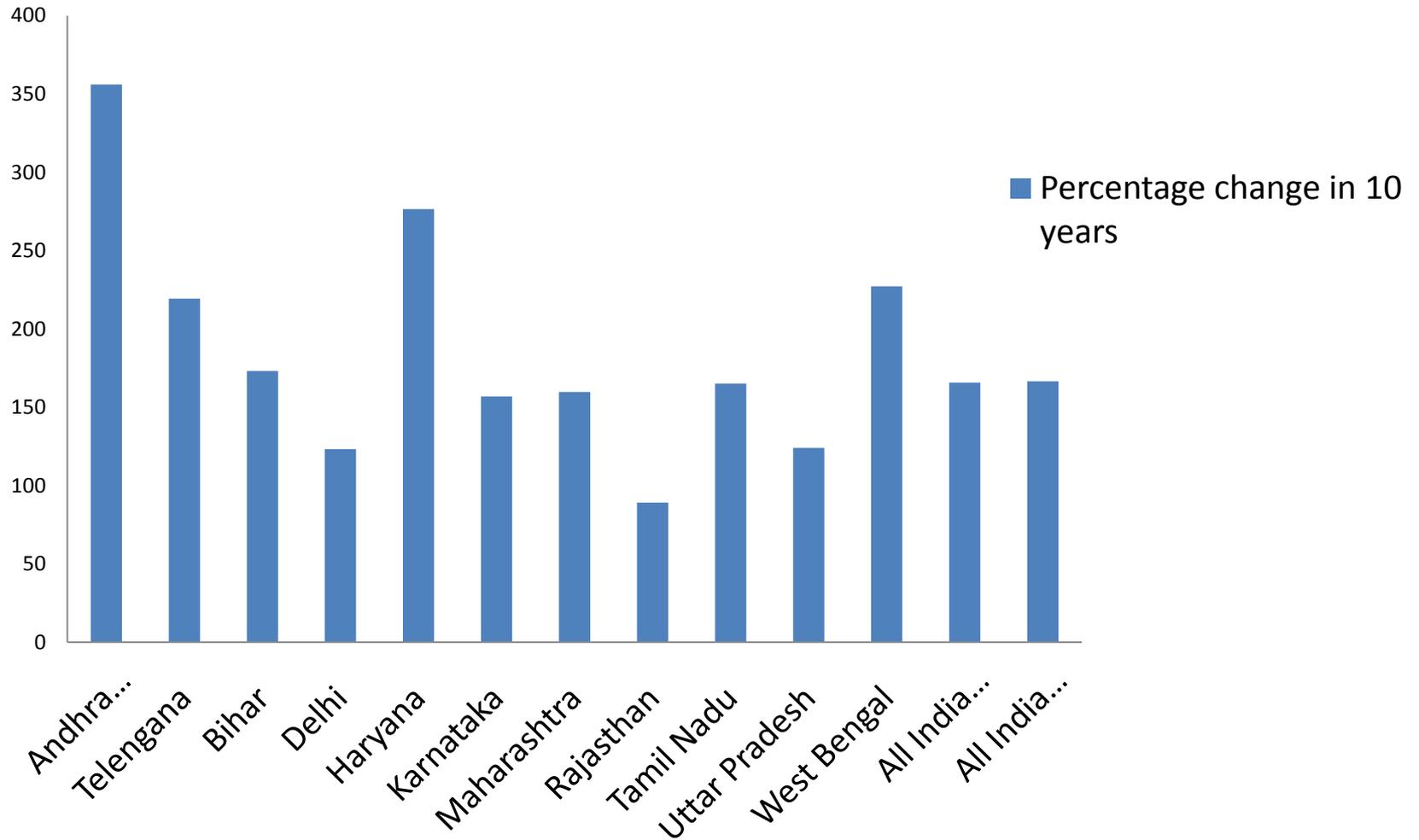
State	2004		2014	
	Percentage of people suffering from air-pollution related diseases	Percentage of people using clean source of fuel	Percentage of people suffering from air-pollution related diseases	Percentage of people using clean source of fuel
Andhra Pradesh	29.54	64.07	20.04	86.26
Telengana	29.54	64.07	35.64	91.08
Bihar	49.99	53.37	51.22	55.13
Delhi	28.51	87.05	58.66	97.68
Haryana	36.43	73.9	51.97	84.94
Karnataka	28.13	56.74	37.34	80.02
Maharashtra	34.02	71.19	46.93	84.68
Rajasthan	38.84	64.33	44.12	71.33
Tamil Nadu	35.63	55.09	28.20	82.96
Uttar Pradesh	45.97	51.55	46.38	69.27
West Bengal	22.25	48	29.73	56.5
All India (Urban)	37.2	60.26	40.45	74.9
All India (Total)	43.1	21.44	45.00	34.87

Source: Authors' calculation based on NSS 60th and 71st rounds unit level data

Figure 1. Average number of days spent on restricted activities due to diseases caused by air pollution

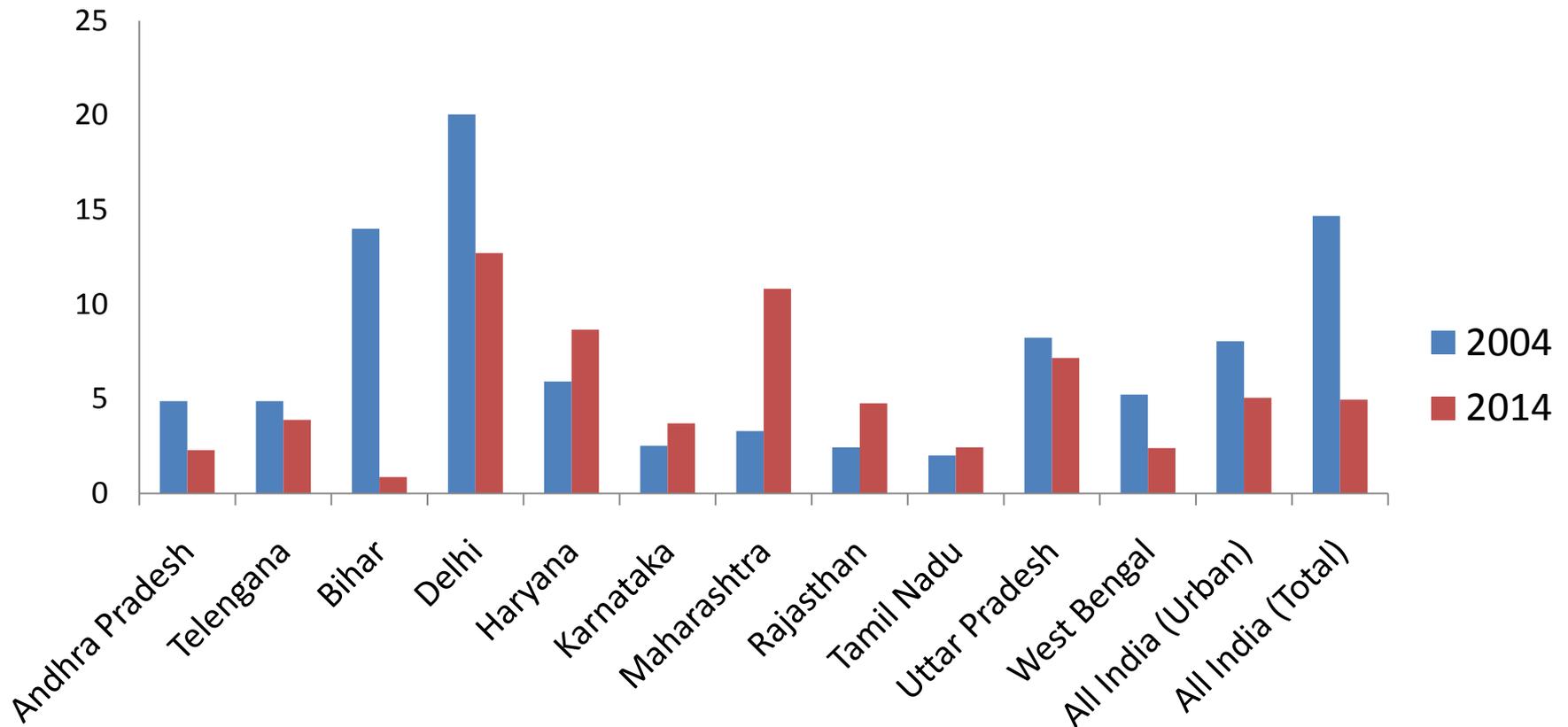


## Percentage change (increase) of health expenditure burden due to air pollution related diseases in urban areas in 10 years



Burden of health expenditure has increased to a great extent

# Average of percentage of income lost due to ailment related to air-pollution

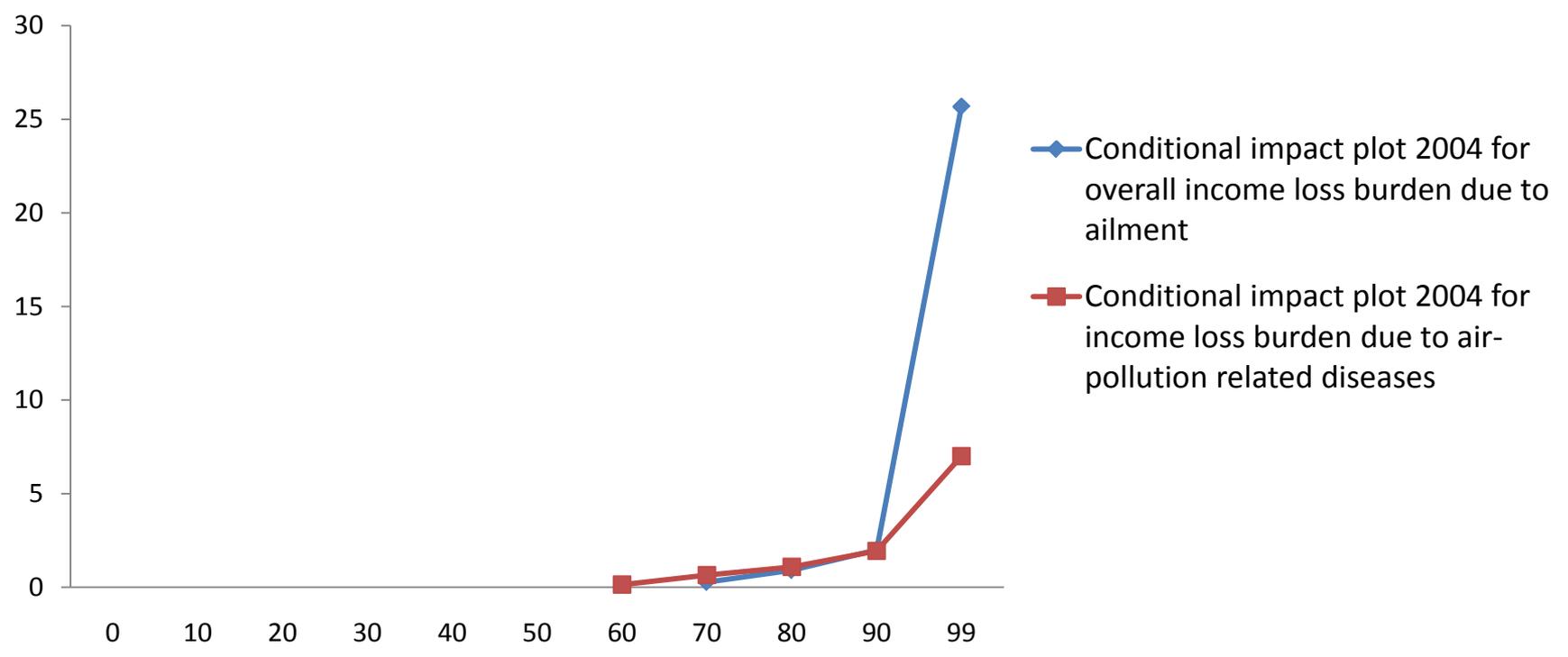


Except Haryana, Karnataka, Maharashtra and Rajasthan the burden of income loss due to air pollution related diseases has gone down

# Burden of income loss due to diseases

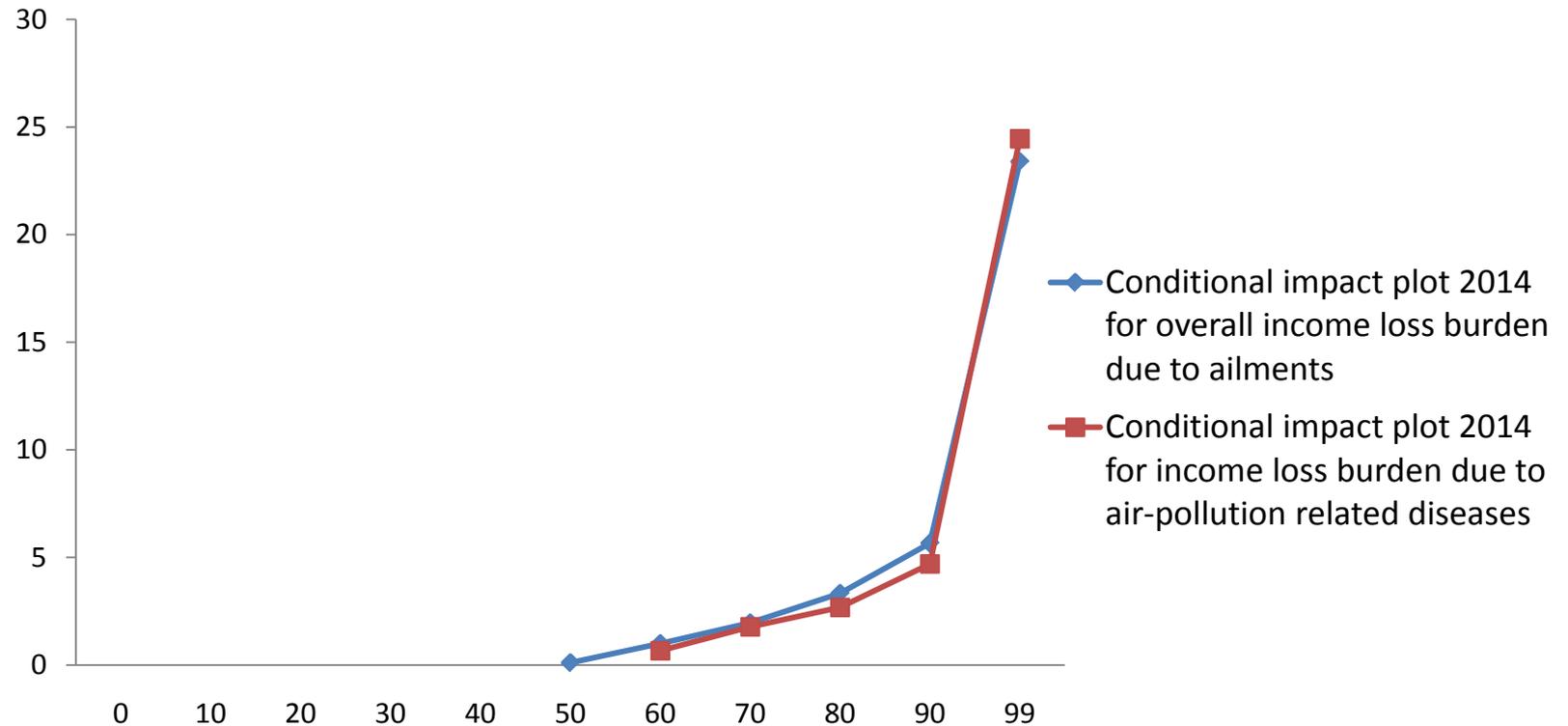
- Model 1: For other ailments in urban India
- Model 2: For diseases related to air-pollution in urban India
- Both models are run for 2004 and 2014
- [reg 2004.docx](#)
- [reg 2014.docx](#)

Figure 1. Conditional impact of number of restricted days on burden of income loss in urban India in 2004: Overall illness by illness due to air pollution



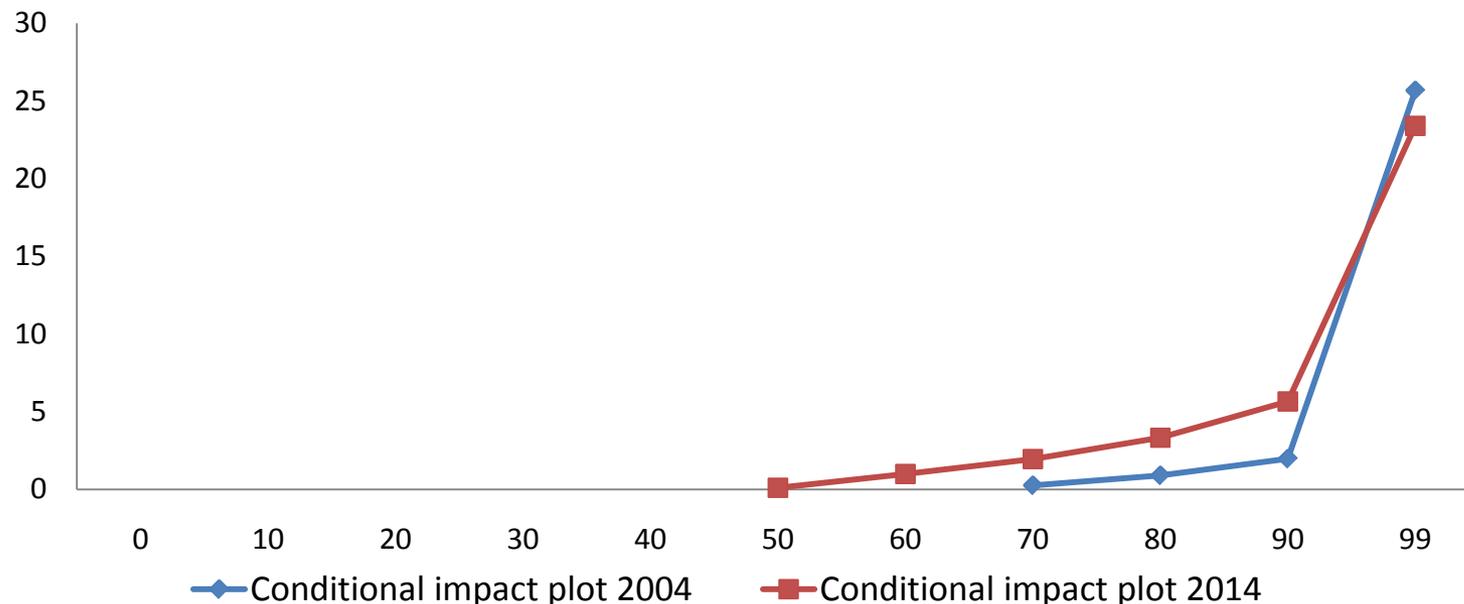
Overall illness used to have more impact on income loss compared to air pollution related diseases in 2004

Figure 2. Conditional impact of number of restricted days on burden of income loss in urban India in 2014: Overall illness by illness due to air pollution



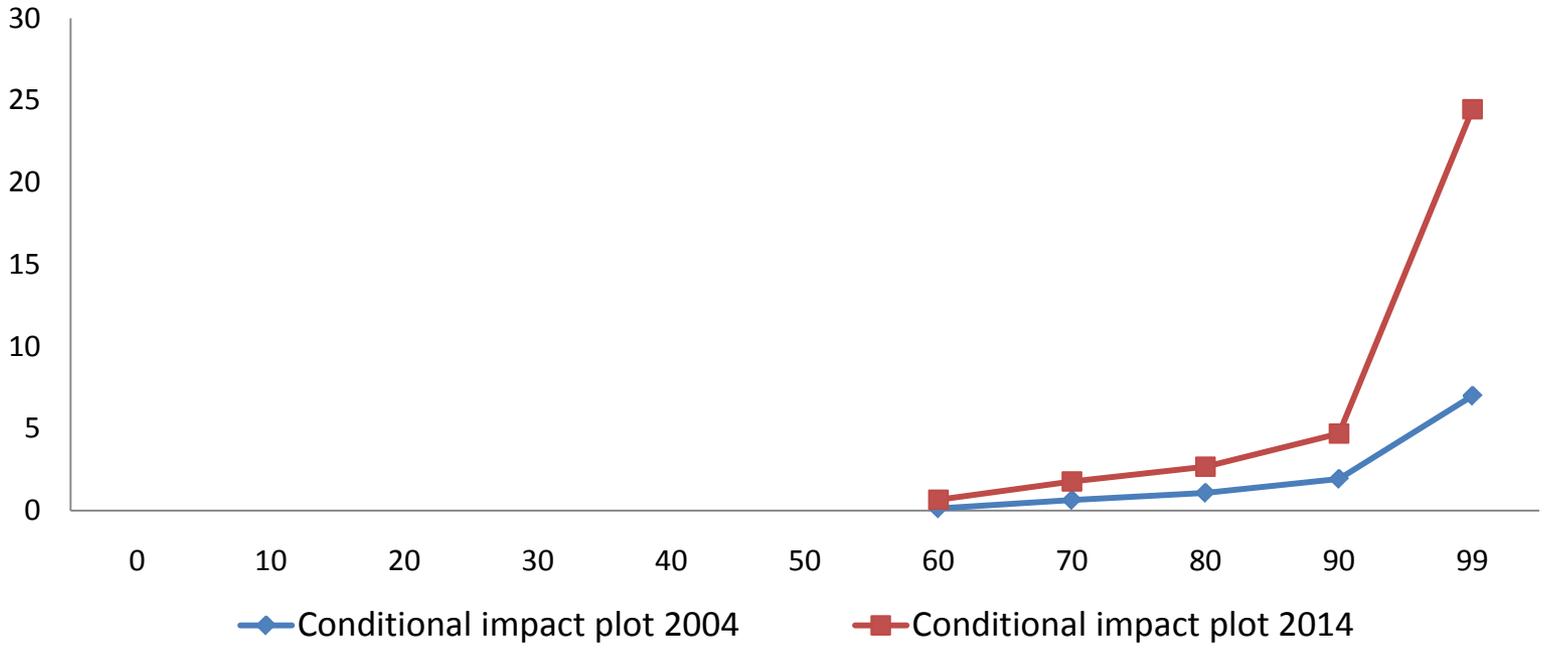
Although the air pollution related diseases start having impact from 60<sup>th</sup> percentile their extent of impact is no less than that of other illness

Figure 3. Conditional impact of number of restricted days on income loss burden due to ailments in Urban India: 2004 vs 2014



Although the impact of any illness on income loss has slightly declined at the higher percentiles it starts now early from 50<sup>th</sup> percentile in 2014  
So, health has become even more an important factor in economic well-being among those whose burden of income loss relatively less.

Figure 4. Conditional impact of number of restricted days on income loss burden due to air-pollution related ailments in Urban India: 2004 vs 2014



Diseases caused by air pollution now (2014) result in income loss burden to a great extent.

# Key findings

- The process of urbanization in India has not been structured and does not follow any uniform pattern.
- With the doubling of class IV cities over the last ten years and gradual shifting of industries (polluting) from the core to the periphery and increase in informal sectors the air pollution is also increased. Proximity of these industries to urban centres led to gradual worsening of air quality. This has been coupled with increasing marginalization of certain section of the society due to the non-availability of health care facility in proximity and also due to poor quality of the available health facilities.
- Air pollution related diseases have resulted in more income loss than any other ailments. Informalisation has made people more vulnerable in the process. These sectors provide casual employment and the entire burden of income loss for the employes has to be borne by them.
- The paper also highlights that the backward class is being affected much compared to other sections of the society and the situation is further aggravated due to the high level of inequality in urban centres.

- Though the awareness about protecting environment has improved overall over the years but air pollution has been in the rise not even in cities but also in other urban conglomerates. With increase in economic growth, the country has improved it's per capita income but with a cost of increased morbidity which results in the burden of economic loss.

# Conclusion

Most sources of outdoor air pollution are well beyond the control of individuals and demand action by cities, as well as national and international policymakers in sector like transport, energy waste management, buildings and agriculture.

Policies should be oriented not only for controlling pollution but also to provide better health facilities for the person being affected by the pollution.

Thank You