

# Overview of Non communicable diseases in India

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**NOTE:**

**Please do not quote unpublished data from this presentation**

# Outline

- What is the burden of NCD in India ?
- What are the putative factors for the high CVD burden in India?
- What are the dynamics of CVD in India?
- What are the challenges to reducing the burden

# Obituary: 2005

- 9.8 million deaths in 2005
- 3.8 million deaths at ages 30-69 years
- 2.1 million due to one of the 5 leading causes: of which at least a quarter could be avoided

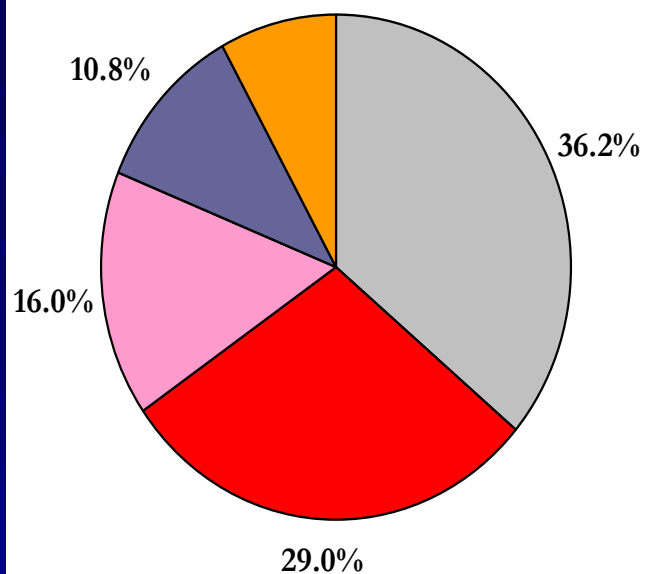
## Top 5 Causes

Cause	Current Deaths (000)	Avoidable Deaths (000)
IHD,HHD	600	256
TB	395	110
COPD	404	72
Cancer	371	74
Cerebro-vascular	317	56

Estimated avoidable deaths are calculated based on statistics of the region where sub-national ( 6-regions) minimum risk had been reported for each cause

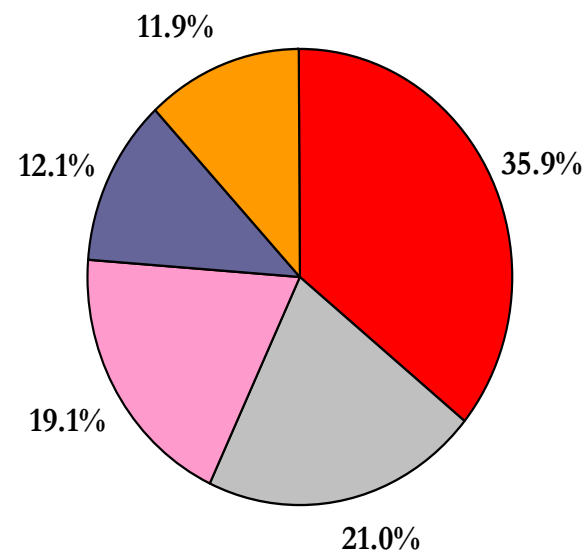
$$\text{avoidable deaths} = [(\text{national \%} - \text{regional minimum \%}) / \text{national \%}] * (\text{Current deaths})$$

**Main Causes of Death in India  
2005**



- Communicable Diseases
- Cardiovascular Diseases
- Other Chronic Diseases
- Injuries
- Cancer

**Main Causes of death in India  
Projected: 2030**



Source: WHO Infobase

# RISING CHRONIC DISEASE BURDENS

	2000	2025
No. of Persons with <b>HYPERTENSION</b>	118 Million	214 Million
No. of Persons with <b>DIABETES</b>	32 Million	69.8 Million*
No. of Persons Dying from <b>TOBACCO</b>	900,000	2 Million +

\*84 million by 2030 according to recent IDF estimates

## Deaths from smoking in year 2010 in India

Age range	Women	Men	Both
Ages 30-69	93,000	579,000	672,000
All adults 20+	128,000	807,000	935,000

**Annual deaths from smoking will rise from 930,000 to 1,000,000 during 2010s**

Source: Jha et al, NEJM, Feb 2008

# INDIA: Years of life lost among 30 year old smokers \*

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Men who smoke bidis	6 years
Women who smoke bidis	8 years
Men who smoke cigarettes	10 years

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\* At current risks of death versus non-smokers, adjusted for age, alcohol use and education  
(note that currently, few females smoke cigarettes)

Source: Jha et al, NEJM, Feb 2008

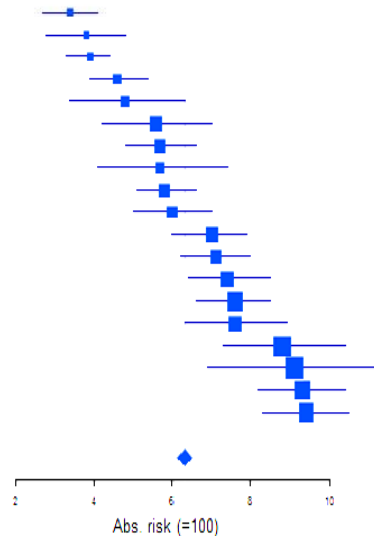
# Heart attack MEN aged 30-69 years

# Heart attack WOMEN aged 30-69 years

[1] Ischaemic hypertensive heart diseases

Male 30-69

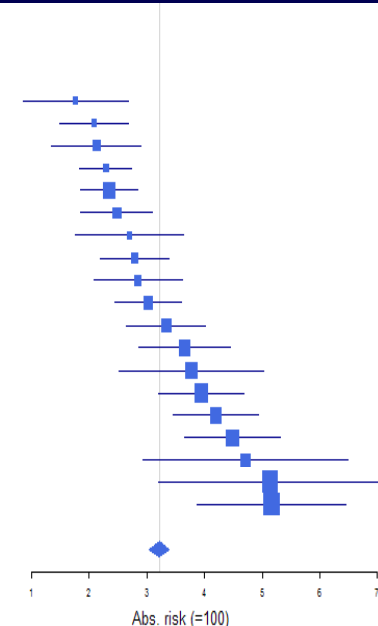
Region	State	Sample	Percent	Rank	Death (000)	Risk (99%CI)
E	Orissa	157	8.7	[4]	8.5	3.4 (2.7-4.1)
NE	Assam	106	8.7	[4]	6.2	3.8 (2.8-4.8)
C	Uttar Pradesh	323	10.7	[3]	38.2	3.9 (3.3-4.4)
C	Bihar	249	13.0	[1]	22.7	4.6 (3.9-5.4)
C	Chhatisgarh	71	12.8	[2]	5.7	4.8 (3.4-6.3)
N	Jammu & Kashmir	106	20.3	[1]	3.5	5.6 (4.0-7.7)
C	Rajasthan	239	18.2	[1]	18.0	5.7 (4.8-6.6)
E	Jharkhand	78	14.3	[1]	9.7	5.7 (4.1-7.4)
F	West Bengal	403	17.8	[1]	30.7	5.8 (5.1-6.6)
C	Madhya Pradesh	222	15.6	[1]	21.6	6.0 (5.0-7.0)
W	Maharashtra	337	20.5	[1]	44.5	7.0 (6.0-7.9)
S	Karnataka	349	18.6	[1]	25.7	7.1 (6.2-8.0)
W	Gujarat	297	20.8	[1]	24.7	7.4 (6.4-8.5)
S	Kerala	438	25.8	[1]	17.3	7.6 (6.6-8.5)
N	Haryana	215	22.5	[1]	9.5	7.6 (6.3-8.9)
N	Punjab	210	27.9	[1]	14.2	8.8 (7.3-10.4)
N	Delhi	116	29.5	[1]	8.0	9.1 (6.9-11.4)
S	Tamil Nadu	496	26.4	[1]	44.2	9.3 (8.2-10.4)
S	Andhra Pradesh	484	24.5	[1]	48.6	9.4 (8.3-10.5)
<b>All India</b>		<b>5384</b>	<b>17.7</b>	<b>[1]</b>	<b>412.5</b>	<b>6.3 (6.1-6.5)</b>



[2] Ischaemic hypertensive heart diseases

Female 30-69

Region	State	Sample	Percent	Rank	Death (000)	Risk (99%CI)
C	Chhatisgarh	23	6.2	[7]	2	1.8 (0.9-2.7)
E	Orissa	87	6.7	[6]	4.8	2.1 (1.5-2.7)
N	Haryana	53	10.7	[3]	2.2	2.1 (1.4-2.9)
C	Uttar Pradesh	162	7.7	[4]	19.4	2.3 (1.8-2.7)
S	Kerala	146	17.2	[2]	5.3	2.3 (1.8-2.8)
C	Rajasthan	100	12.1	[3]	6.9	2.5 (1.9-3.1)
NE	Assam	58	7.4	[6]	3.6	2.7 (1.8-3.6)
E	Bihar	142	9.1	[4]	12	2.8 (2.2-3.4)
C	Madhya Pradesh	91	9.4	[4]	9.2	2.8 (2.1-3.6)
E	West Bengal	178	12.4	[3]	13.3	3.0 (2.4-3.6)
S	Karnataka	146	13.6	[2]	10.7	3.3 (2.7-4.0)
W	Gujarat	123	15.2	[1]	10.7	3.7 (2.9-4.5)
N	Jammu & Kashmir	58	16.6	[3]	1.9	3.8 (2.5-5.0)
W	Maharashtra	177	18.2	[1]	22.7	3.9 (3.2-4.7)
S	Tamil Nadu	206	16.1	[1]	18.7	4.2 (3.5-4.9)
S	Andhra Pradesh	193	17.5	[1]	21.4	4.5 (3.7-5.3)
E	Jharkhand	47	13.3	[1]	6.9	4.7 (2.9-6.5)
N	Delhi	46	21.4	[1]	3.4	5.1 (3.2-7.1)
N	Punjab	103	23.6	[1]	7.1	5.2 (3.9-6.5)
<b>All India</b>		<b>2322</b>	<b>12.3</b>	<b>[2]</b>	<b>186.9</b>	<b>3.2 (3.0-3.4)</b>

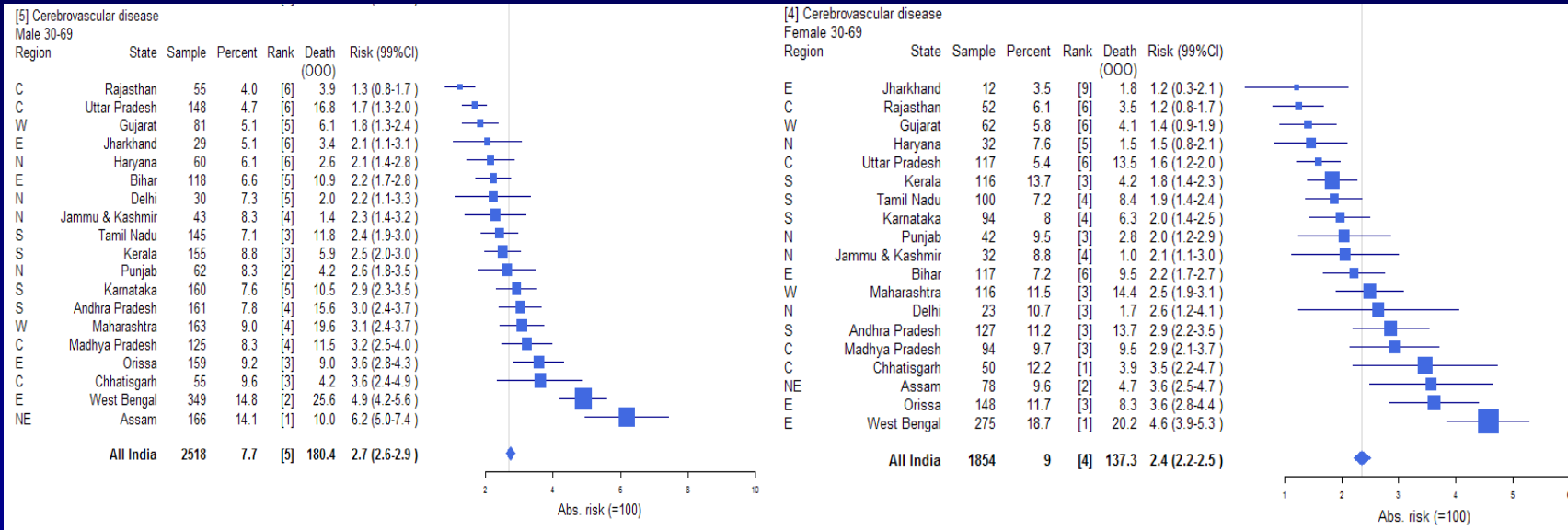


Box size represents proportional death of the state . Regions : C – Central, E – East, N – North, NE – Northeast, S – South, W - West

Data from the Million Death Study By Jha et al

# STROKE MEN aged 30-69 years

# STROKE Women aged 30-69 years



Box size represents proportional death of the state . Regions : C – Central, E – East, N – North, NE – Northeast, S – South, W - West

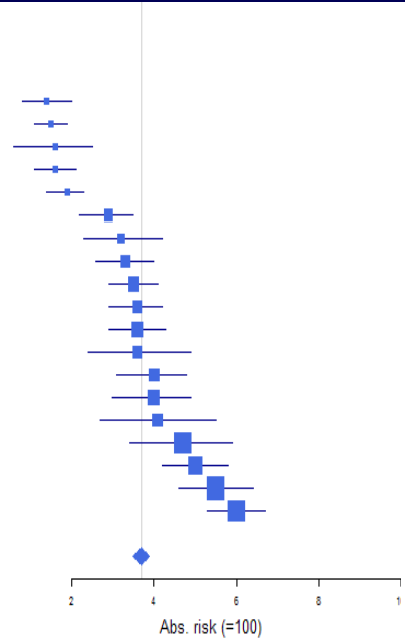
# Chronic Lung Disease MEN aged 30-69 years

# Chronic Lung Disease Women aged 30-69 years

[3] Chronic pulmonary diseases

Male 30-69

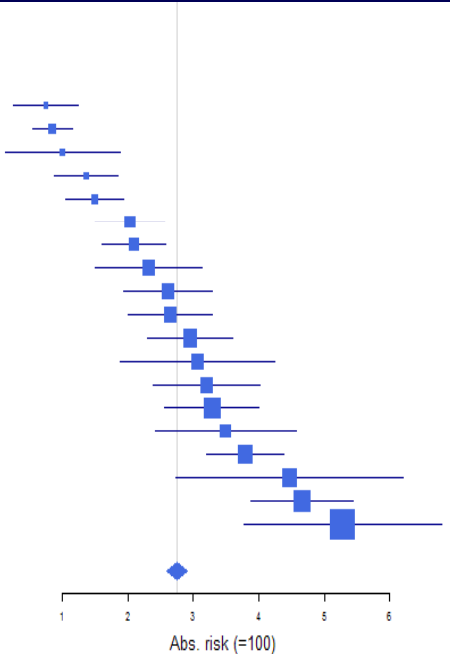
Region	State	Sample	Percent	Rank	Death (000)	Risk (99%CI)
N	Punjab	35	4.5	[6]	2.3	1.4 (0.8-2.0)
S	Kerala	94	5.3	[5]	3.6	1.5 (1.1-1.9)
N	Delhi	24	4.9	[6]	1.3	1.6 (0.6-2.5)
E	Orissa	71	4.2	[7]	4.1	1.6 (1.1-2.1)
S	Tamil Nadu	111	5.4	[5]	9.1	1.9 (1.4-2.3)
W	Maharashtra	157	8.4	[5]	18.2	2.9 (2.2-3.5)
NE	Assam	79	7.1	[5]	5.0	3.2 (2.3-4.2)
W	Gujarat	156	8.9	[4]	10.6	3.3 (2.6-4.0)
E	West Bengal	248	10.5	[3]	18.2	3.5 (2.9-4.1)
S	Andhra Pradesh	188	9.2	[2]	18.3	3.6 (2.9-4.2)
E	Bihar	204	10.8	[3]	17.8	3.6 (2.9-4.3)
C	Chhatisgarh	53	9.6	[4]	4.2	3.6 (2.4-4.9)
C	Madhya Pradesh	167	10.3	[3]	14.2	4.0 (3.1-4.8)
N	Haryana	116	11.4	[2]	4.8	4.0 (3.0-4.9)
E	Jharkhand	54	10.3	[3]	7.0	4.1 (2.7-5.5)
N	Jammu & Kashmir	90	16.7	[2]	2.8	4.7 (3.4-5.9)
S	Karnataka	292	13.0	[2]	18.0	5.0 (4.2-5.8)
C	Rajasthan	272	17.6	[3]	17.4	5.5 (4.6-6.4)
C	Uttar Pradesh	538	16.7	[1]	59.5	6.0 (5.3-6.7)
<b>All India</b>		<b>3177</b>	<b>10.5</b>	<b>[3]</b>	<b>243.7</b>	<b>3.7 (3.5-3.9)</b>



[3] Chronic pulmonary diseases

Female

Region	State	Sample	Percent	Rank	Death (000)	Risk (99%CI)
N	Punjab	17	3.4	[7]	1.0	0.7 (0.3-1.2)
S	Kerala	54	6.3	[4]	1.9	0.9 (0.6-1.2)
N	Delhi	10	4.0	[6]	0.6	1.0 (0.1-1.9)
E	Orissa	53	4.4	[7]	3.1	1.4 (0.9-1.8)
S	Tamil Nadu	83	5.7	[5]	6.7	1.5 (1.1-1.9)
W	Maharashtra	103	9.5	[4]	11.9	2.0 (1.5-2.6)
E	West Bengal	133	8.5	[4]	9.2	2.1 (1.6-2.6)
N	Haryana	58	11.7	[2]	2.4	2.3 (1.5-3.1)
W	Gujarat	101	10.8	[3]	7.6	2.6 (1.9-3.3)
S	Andhra Pradesh	119	10.3	[4]	12.7	2.7 (2.0-3.3)
S	Karnataka	142	12.0	[3]	9.4	3.0 (2.3-3.6)
C	Chhatisgarh	45	10.9	[2]	3.5	3.1 (1.9-4.2)
C	Madhya Pradesh	119	10.6	[2]	10.4	3.2 (2.4-4.0)
C	Rajasthan	155	16.1	[1]	9.2	3.3 (2.6-4.0)
NE	Assam	75	9.3	[4]	4.6	3.5 (2.4-4.6)
C	Uttar Pradesh	292	12.8	[2]	32.3	3.8 (3.2-4.4)
E	Jharkhand	43	12.7	[2]	6.6	4.5 (2.7-6.2)
E	Bihar	242	15.2	[1]	20.1	4.7 (3.9-5.4)
N	Jammu & Kashmir	82	22.5	[1]	2.6	5.3 (3.8-6.8)
<b>All India</b>		<b>2074</b>	<b>10.5</b>	<b>[3]</b>	<b>160.0</b>	<b>2.8 (2.6-2.9)</b>



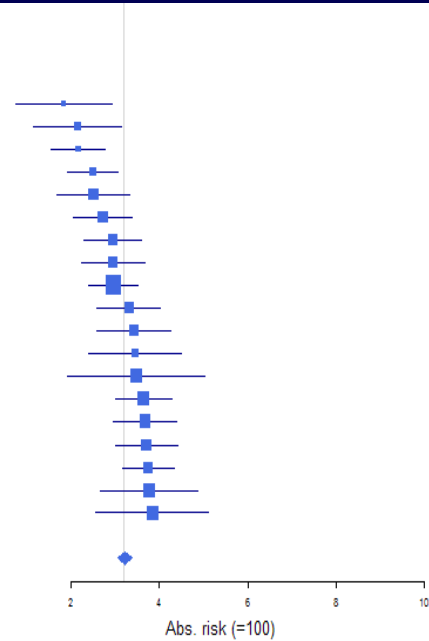
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# Cancer MEN aged 30-69 years

# Cancer Women aged 30-69 years

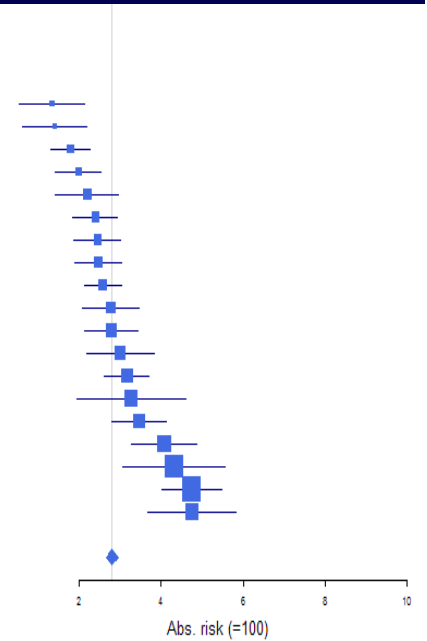
[1] Cancer  
Female

Region	State	Sample	Percent	Rank	Death (000)	Risk (99%CI)
E	Jharkhand	19	5.4	[6]	2.8	1.8 (0.8-2.9)
C	Chhatisgarh	31	7.6	[4]	2.4	2.2 (1.2-3.2)
E	Orissa	85	6.9	[5]	4.9	2.2 (1.6-2.8)
E	Bihar	119	8.2	[5]	10.9	2.5 (1.9-3.1)
N	Haryana	63	12.9	[1]	2.6	2.5 (1.7-3.3)
C	Rajasthan	103	13.3	[2]	7.6	2.7 (2.1-3.4)
W	Maharashtra	134	13.3	[2]	16.6	3.0 (2.3-3.6)
W	Gujarat	118	12.4	[2]	8.7	3.0 (2.2-3.7)
S	Kerala	184	21.5	[1]	6.7	3.0 (2.4-3.5)
S	Andhra Pradesh	137	12.8	[2]	15.7	3.3 (2.6-4.0)
C	Madhya Pradesh	98	11.3	[1]	11.0	3.4 (2.6-4.3)
NE	Assam	73	9.6	[3]	4.7	3.4 (2.4-4.5)
N	Delhi	34	15.4	[2]	2.5	3.5 (1.9-5.0)
E	West Bengal	212	15.2	[2]	16.4	3.6 (3.0-4.3)
S	Karnataka	174	15.0	[1]	11.8	3.7 (3.0-4.4)
S	Tamil Nadu	175	14.0	[2]	16.3	3.7 (3.0-4.4)
C	Uttar Pradesh	261	12.6	[3]	31.7	3.7 (3.2-4.3)
N	Punjab	80	17.3	[2]	5.2	3.8 (2.7-4.9)
N	Jammu & Kashmir	61	16.7	[2]	1.9	3.8 (2.6-5.1)
	<b>All India</b>	<b>2418</b>	<b>12.3</b>	<b>[1]</b>	<b>187.4</b>	<b>3.2 (3.1-3.4)</b>



[4] Cancer  
Male 30-69

Region	State	Sample	Percent	Rank	Death (000)	Risk (99%CI)
E	Jharkhand	19	3.4	[9]	2.3	1.3 (0.5-2.1)
C	Chhatisgarh	23	3.7	[8]	1.6	1.4 (0.6-2.2)
E	Bihar	88	5.2	[7]	8.6	1.8 (1.3-2.3)
E	Orissa	89	5.1	[6]	5.0	2.0 (1.4-2.5)
N	Punjab	56	7.0	[4]	3.6	2.2 (1.4-3.0)
S	Tamil Nadu	128	6.8	[4]	11.3	2.4 (1.9-2.9)
S	Andhra Pradesh	124	6.4	[5]	12.7	2.5 (1.9-3.0)
W	Maharashtra	121	7.2	[6]	15.7	2.5 (1.9-3.0)
C	Uttar Pradesh	212	7.1	[4]	25.1	2.6 (2.1-3.0)
C	Madhya Pradesh	102	7.2	[5]	10.0	2.8 (2.1-3.5)
C	Rajasthan	120	8.9	[4]	8.8	2.8 (2.2-3.4)
N	Haryana	89	8.9	[4]	3.7	3.0 (2.2-3.8)
E	West Bengal	225	9.8	[4]	16.9	3.2 (2.6-3.7)
N	Delhi	38	10.6	[2]	2.9	3.3 (1.9-4.6)
S	Karnataka	181	9.1	[3]	12.6	3.5 (2.8-4.1)
W	Gujarat	162	11.4	[3]	13.6	4.1 (3.3-4.9)
N	Jammu & Kashmir	80	15.5	[3]	2.6	4.3 (3.1-5.6)
S	Kerala	276	16.3	[2]	10.9	4.7 (4.0-5.5)
NE	Assam	129	10.9	[3]	7.8	4.7 (3.7-5.8)
	<b>All India</b>	<b>2570</b>	<b>7.9</b>	<b>[4]</b>	<b>184.0</b>	<b>2.8 (2.7-2.9)</b>



Box size represents proportional death of the state . Regions : C – Central, E – East, N – North, NE – Northeast, S – South, W - West



**Aizawl:** World's highest incidence of lower pharyngeal and tongue cancers in men

**New Delhi:** World's highest incidence of gall bladder cancer in women

**Wardha:** World's highest incidence of mouth cancer

**Pondicherry:** Among the world's highest incidence rates of mouth and tongue cancers in men

**Kohima:** One of the world's highest incidence rates of nasopharyngeal cancer

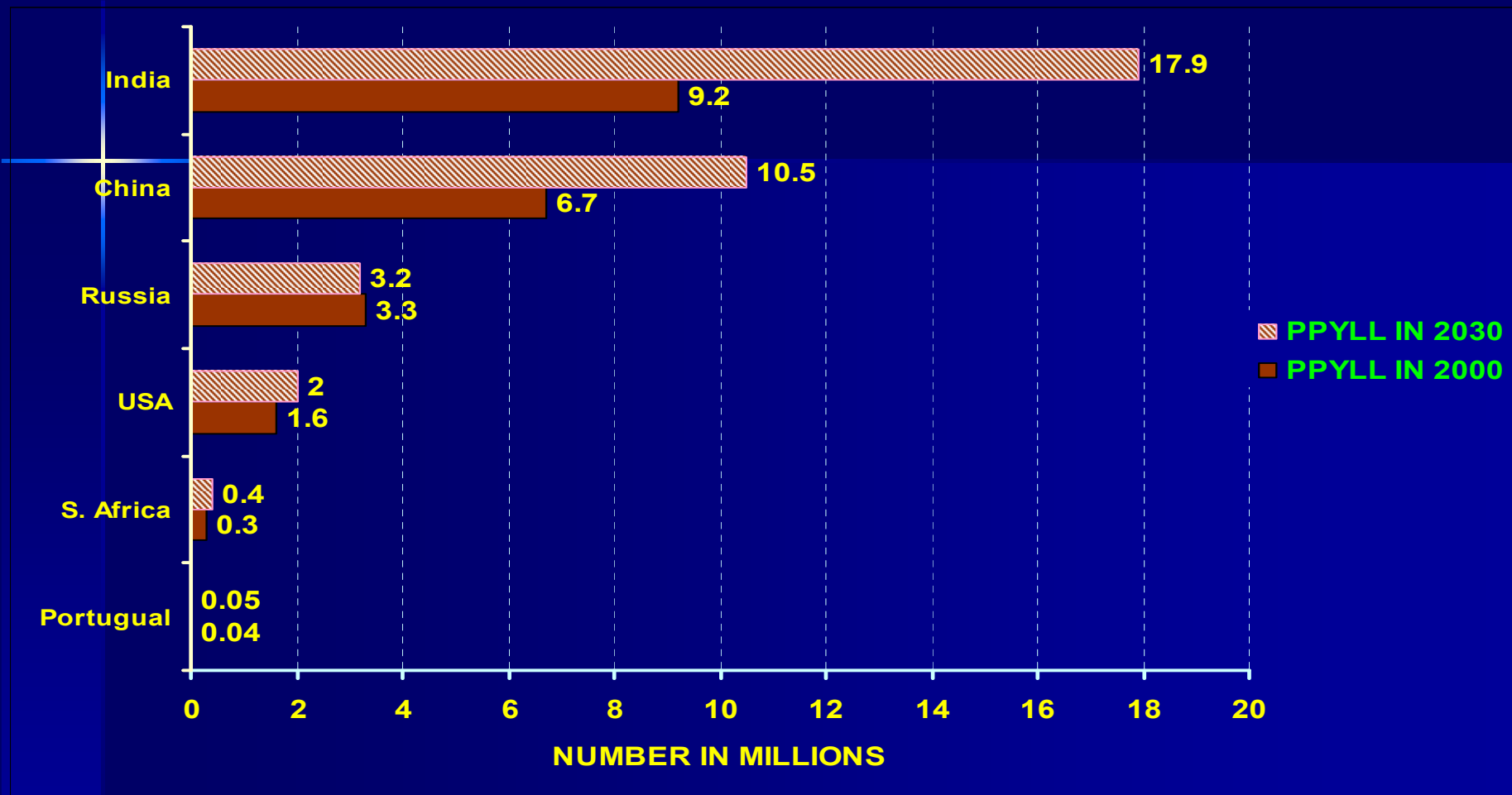
# Neglected Chronic Diseases Carry Economic Costs

- In **2005**, it was estimated that India lost **9 billion** USD in national income from premature deaths due to heart disease, stroke and diabetes.
- These losses are expected to cumulatively lead to **237 billion** USD by 2015.

*Source: World Health Organization*

# YEARS OF LIFE LOST DUE TO CVD IN POPULATIONS

Aged 35-64 Years: Leeder et al.2004



*PPYLL= Potentially Productive Years of Life Lost*

Five- year increase in life expectancy gives a country a 0.3-0.5 % higher annual GDP growth rate in subsequent years ( Barro R 1996: Health and economic growth; PAHO)

**Chronic Diseases are huge burden to individuals and their families: Data from the micro economic study in patients with ACS/stroke in Trivandrum, Harikrishnan et al ( unpublished data)**

Out of pocket expenditure	85%
Catastrophic health expenditure	73%
Distress financing	49%
Reduction in work activities/work time	>80%
Decrease in income	32 %
Impact on household productivity	10 %

**The highest impact was observed in the poorest tertile**

# Case Study 1

## Mr. M\* & Family

- Age: 50 yrs
- HH: Wife, 2 children
- Co-morbidities: DM & HT
- Underwent angiogram and angioplasty
- Present monthly HH income: INR 1,950
- Previous monthly income: INR 23, 250
- Staying with help of sister and family
- No form of health security
- Spent INR 79, 567 on two admissions (out-of-pocket)

“I cannot walk even till the road without chest pain but how can I sit at home? Even my daughter who is still studying, takes tuitions before she goes for her classes and my wife has also started working, so I have to at least do my share. If I walk to the agarbatti rolling factory and just sit there doing only supervision, I will get Rs. 30 a day”

# Special features of Chronic Diseases in India

- Younger age at onset.
- ? Special predilection : diabetes and some forms of cancer
- ? Risk factor differences : dyslipidemia, higher proportion body fat, indoor air pollution
- ? High case fatality: unaffordability, higher risk , compliance issues
  - *Indian urban population are exposed to some of the highest pollutant levels in the world*
  - *Indoor air pollution contributes 4.2–6.1% of the national disease burden and 6.3–9.2% of the burden for women and children under 5, who make up about 44% of the population<sup>+</sup>*

## International comparison of 2 year outcomes among patients of ACS: results of OASIS registry II

	Deaths % (95% CI)	Death/MI %(95% CI)
Countries of OASIS registry 1	12.2 (9.4-10.8)	17.7 (16.8-18.6)
China	6.9 (5.9-7.9)	12.9 (11.5-14.3)
India	15.0 (12.1-17.8)	21.3 (18.0-24.4)
Lithuania and Slovenia	12.4 (7.8-16.8)	19.7 (13.9-25.2)
Ukraine and Russia	11.3 (9.7-13.2)	22.1 (19.5-24.5)

# Why are Indians at a higher risk of NIDDM & CHD?

- Fetal programming
- Early life influences
- Higher % Body Fat/  
Preferential  
deposition of fat in  
the upper body
- Insulin Resistance
- ↓ HDL
- ↑ Small Dense LDL
- ? Genetic Factors

## Conventional Risk Factors Propelled By

- Urbanization
- Industrialization
- Globalization
- Aging

# INTERHEART STUDY

**About 90% of CHD Risk (“PAR”) can be explained by 9 Risk Factors:**

- **Smoking**
- **Dyslipidemia (↓Apo A/ Apo B Ratio)**
- **High BP**
- **Diabetes**
- **Abdominal Obesity**
- **Psychosocial Factors**
- **Fruits & Vegetables**
- **Exercise**
- **Alcohol**

**INTERHEART India:  
Similar results  
Joshi et al; JAMA 2007**

***Some Myths and truths about the  
dynamics of CVD in India***

# ***Some Myths and truths about the dynamics of CVD in India***

**Myth:** They only occur in individuals with higher socio-economic status.

**Truth:** *CVD risk factors are equally, if not more, prevalent among lower SES and educational status*

*According to Indian studies, lower SES is a strong risk factor for occurrence of MI and worse outcome*

***CASE-CONTROL STUDY OF AMI  
DELHI – BANGALORE; Rastogi et al.  
AJCN:2004***

350 cases (<75 years of age)

700 controls (matched for age, gender, hospital)

<b>Variable</b>	<b>Age &amp; Sex Adjusted RR</b>	<b>Multivariate RR</b>
<b><i>Education</i></b> (none vs. highest level)	2.0 (1.0, 3.9)	2.2 (0.9, 5.3)
<b><i>Household Income</i></b> (<3000 vs. ≥10,000 Rs/month)	1.6 (1.1, 2.5)	1.5 (0.8, 2.7)

Other studies: Pais et al, Mohan et al  
and Gupta et al

# CVD RISK FACTOR SURVEY IN 10 INDUSTRIES

## Risk Factors by Educational Status

	ES I	ES II	ES III	ES IV	P for trend
<b>Tobacco Use*</b>	0.2	0.6	2.7	42.1	*
<b>Diabetes</b>	4.2 1	4.8 1.1 (0.6-1.8)	9.8 2.4 (1.5-3.8)	11.2 2.8 (1.8-4.4)	<0.001
<b>Hypertension</b>	15.3 1	18.4 1.2 (1.0-1.5)	23.8 1.7 (1.4-2.1)	34.7 2.9 (2.4-3.5)	<0.001
<b>Metabolic Syndrome</b>	29.0 1	30.7 1.1 (0.8-1.4)	40.8 1.7 (1.3-2.1)	39.4 1.6 (1.2-2.0)	<0.01

ES I: Post Graduate; ES II: Graduate; ES III: Secondary or High School;  
ES IV : Primary or Illiterate

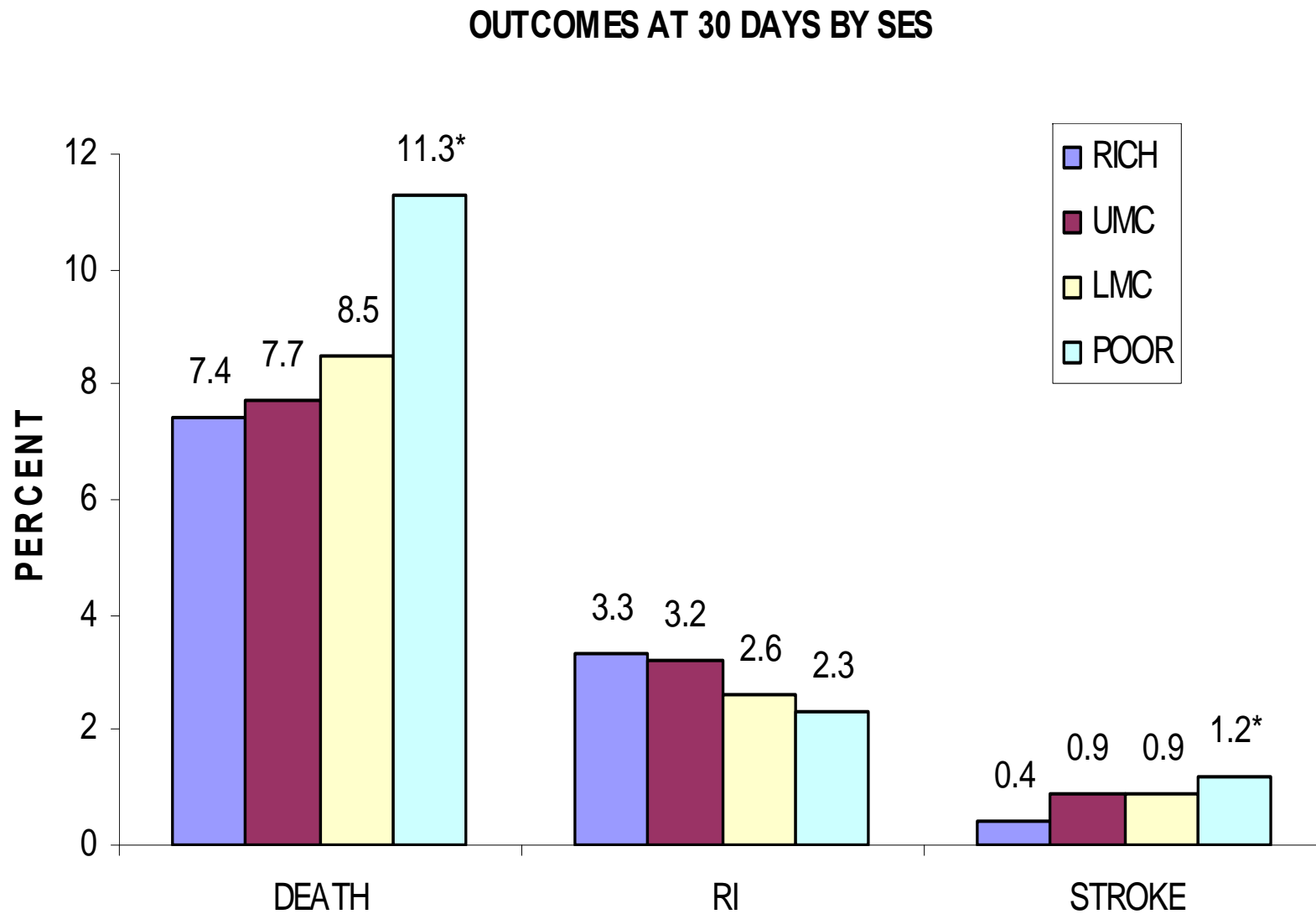
Reddy KS, Prabhakaran D, Jeemon P et. al. Proc Natl Acad Sci U S A. 2007 Oct 9;104(41):16263-8.

**THE SOCIO-ECONOMICALLY  
DISADVANTAGED GROUPS  
ALSO FARE WORSE  
IN RECOGNITION OF RISK  
FACTORS AND ACCESS TO  
GOOD CLINICAL CARE**

## Treatment and outcomes of acute coronary syndromes in India (CREATE): a prospective analysis of registry data

	Rich	Upper middle class	Lower middle class	Poor	p value
N	1078 (5.3%)	4590 (22.5%)	10737 (52.5%)	3999 (19.6%)	
Key investigations					
Any cardiac enzyme	988 (91.6%)	3803 (82.9%)	7816 (72.8%)	2388 (59.7%)	<0.0001
Coronary angiography	441 (40.9%)	1636 (35.6%)	2310 (21.5%)	341 (8.5%)	<0.0001
Key treatments					
Thrombolysis†	309 (60.6%)	1610 (64.5%)	4092 (62.9%)	1494 (52.3%)	<0.0001
Antiplatelet drugs	1046 (97.0%)	4481 (97.6%)	10524 (98.0%)	3917 (97.9%)	0.12
Beta blockers	634 (58.8%)	2811 (61.2%)	6656 (62.0%)	1983 (49.6%)	<0.0001
Lipid-lowering drugs	660 (61.2%)	2693 (58.7%)	5816 (54.2%)	1440 (36.0%)	<0.0001
ACE inhibitor or ARB	681 (63.2%)	2619 (57.1%)	6131 (57.1%)	2162 (54.1%)	<0.0001
Anticoagulants	964 (89.4%)	3854 (84.0%)	8821 (82.2%)	3007 (75.2%)	<0.0001
Percutaneous coronary intervention‡	165 (15.3%)	594 (13.0%)	691 (6.4%)	80 (2.0%)	<0.0001
Coronary artery bypass graft surgery‡	81 (7.5%)	226 (4.9%)	257 (2.4%)	27 (0.7%)	<0.0001

# Outcome at 30 Days By SES



\*  $p < 0.01$

## Prevalence, Awareness, and Treatment Status of Hypertension (>140/90 mm Hg) in Studies Conducted Among nonrepresentative Indian Subpopulations

Study	Prevalence, %	Awareness, % of Prevalent	Treatment, % of Prevalent
Reddy et al, 2006	27.7	37.3	30.3
Prabhakaran et al, 2005	30.0	31.5	-
Deepa et al, 2003	22.1	37.3	18.7
Hypertension Study Group, (urban); 2001	70	46.6	41.6
Hypertension Study Group, (rural); 2001	55	61.4	53
Gupta et al, 1995	30.9	13.1	8.0

Perkovic V, Huxley R, Wu Y, Prabhakaran D and Macmahon S  
Hypertension. 2007 Dec;50(6):991-7

# Some Myths and Truths About CVD In India

**Myth:** A disease virtually unknown in the rural population

**Truth:** *Emerging as a leading cause of death even in rural areas*

# ANDHRA PRADESH RURAL CAUSE OF DEATH STUDY (2004)

- Godavari Districts : 45 villages
- Population : 180, 162
- Deaths : 1534 Deaths
- Cause of Death : Verbal Autopsy (MPWs)  
Assignment (Physicians)
- Response Rate for VA : 98%
- Circulatory System Deaths\* : 32%  
(CHD = 14%, stroke = 13%)

- Joshi R. et al (IJE 2006)

\* 27% of these deaths occurred below the age of 60 years

# Some Myths and Truths About CVD In India

**Myth: CVD in India is largely genetically determined.**

*Truth: Environmentally determined factors are more important than genes*

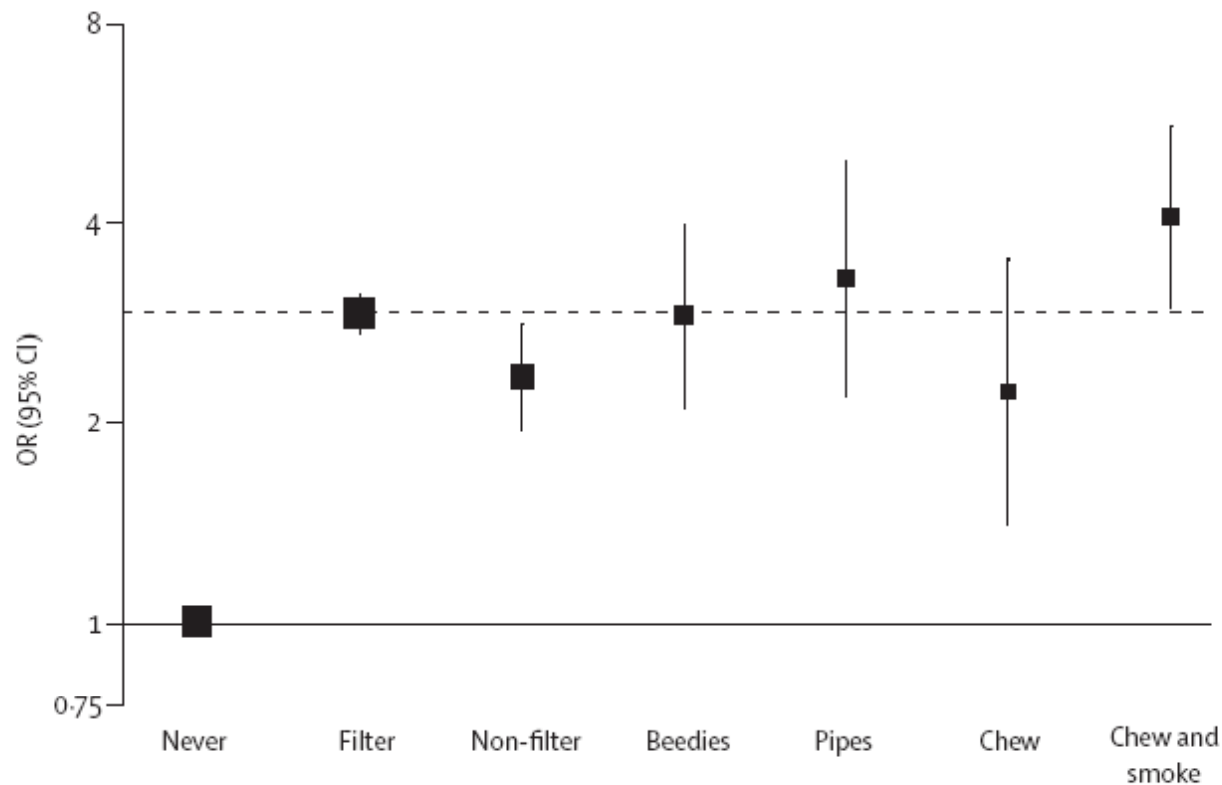
*OR/RR of tobacco, BP, glucose , lipids: 2-3*

*OR/RR of genes: 1-1.5*

- | **Some not so well known facets.....**
- | **Some less emphasized facts.....**

# What is not well known about smoking

- Relationship of Bidi Smoking and CVD
- Relationship of non smoking forms of tobacco and CVD
- The relationship of smoking and metabolic disorders

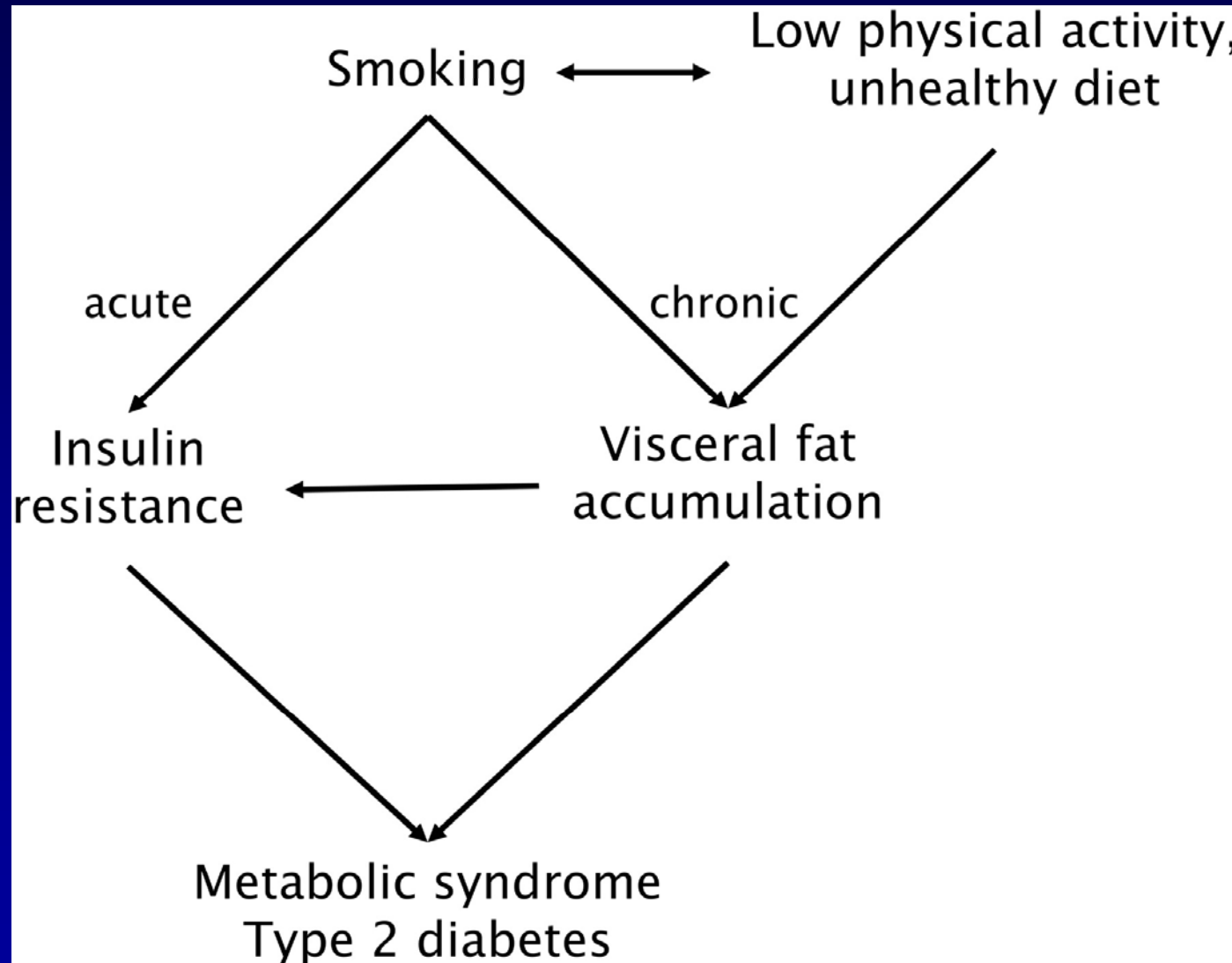


### Risk of AMI associated with type of tobacco used

OR for current smokers=2.95 (95% CI 2.77-3.14) indicated by broken horizontal line. Never=never smokers. Filter=filter cigarettes. Non-filter=non-filter cigarettes. Beedies=smoking beedies alone. Pipes=smoking pipes/cigars. Chew=chewing tobacco alone. Chew and smoke=both chewing and smoking tobacco.

- Bidi smoking risk similar to cigarette smoking (OR 2.89)
- Chewing tobacco imposed more than twice the risk (OR 2.2)
- Additive risk when smoking & chewing were combined

# Links among smoking, insulin resistance, visceral fat accumulation and metabolic syndrome and type 2 diabetes



# *Lipids*

**LDL and Apo B**

# INDIANS IN COMPARISON TO OTHER ETHNIC GROUPS

For any given level  
of Total/LDL  
cholesterol

TC : HDL Ratio is higher

**INCREASED  
ATHEROGENICITY OF THE  
LIPID POOL**

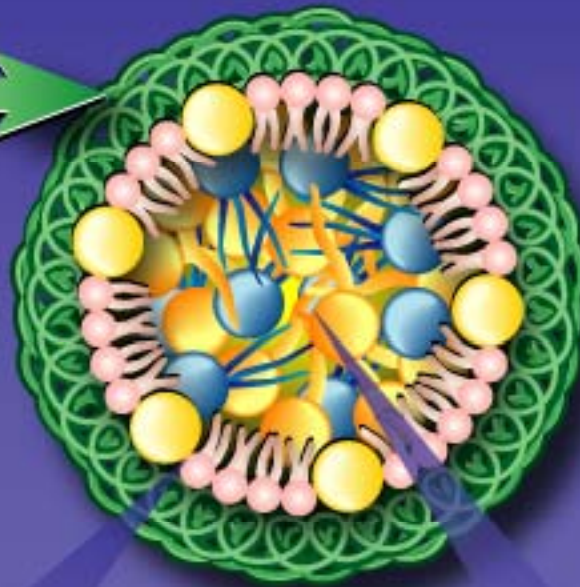
Small dense LDL fraction is high

Hyper TG and Hyper apo B

# This is an LDL particle

LDL types 1,2, 3

**apoB**



**Polar Surface Coat**

*Phospholipid*



*Free Cholesterol*



**Nonpolar Lipid Core**

*Cholesterol Ester*



*Triglyceride*



# *INTERHEART SA vs OC*

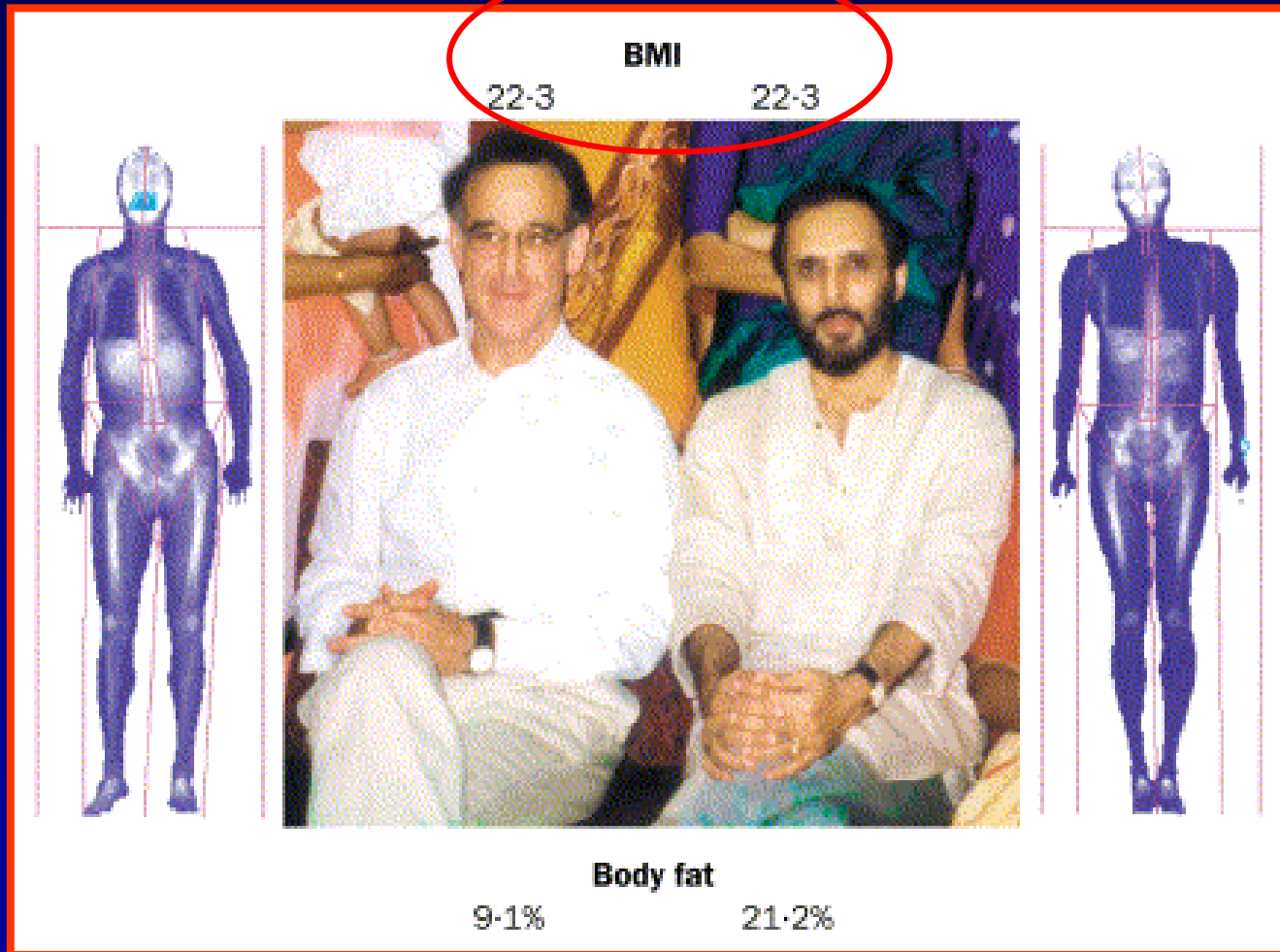
<b>Risk Factor</b>	<b>Cases SA</b>	<b>Cases OC</b>
<b>apoB/apoA-I</b>	<b>61.5%</b>	<b>48.3%</b>
<b>Smoking</b>	<b>61.6%</b>	<b>65.7%</b>
<b>Hypertension</b>	<b>29.6%</b>	<b>40.5%</b>
<b>Diabetes</b>	<b>20.2%</b>	<b>18.2%</b>
<b>WHR</b>	<b>44.0%</b>	<b>46.7%</b>

# *The role of central obesity*

## **Fact:**

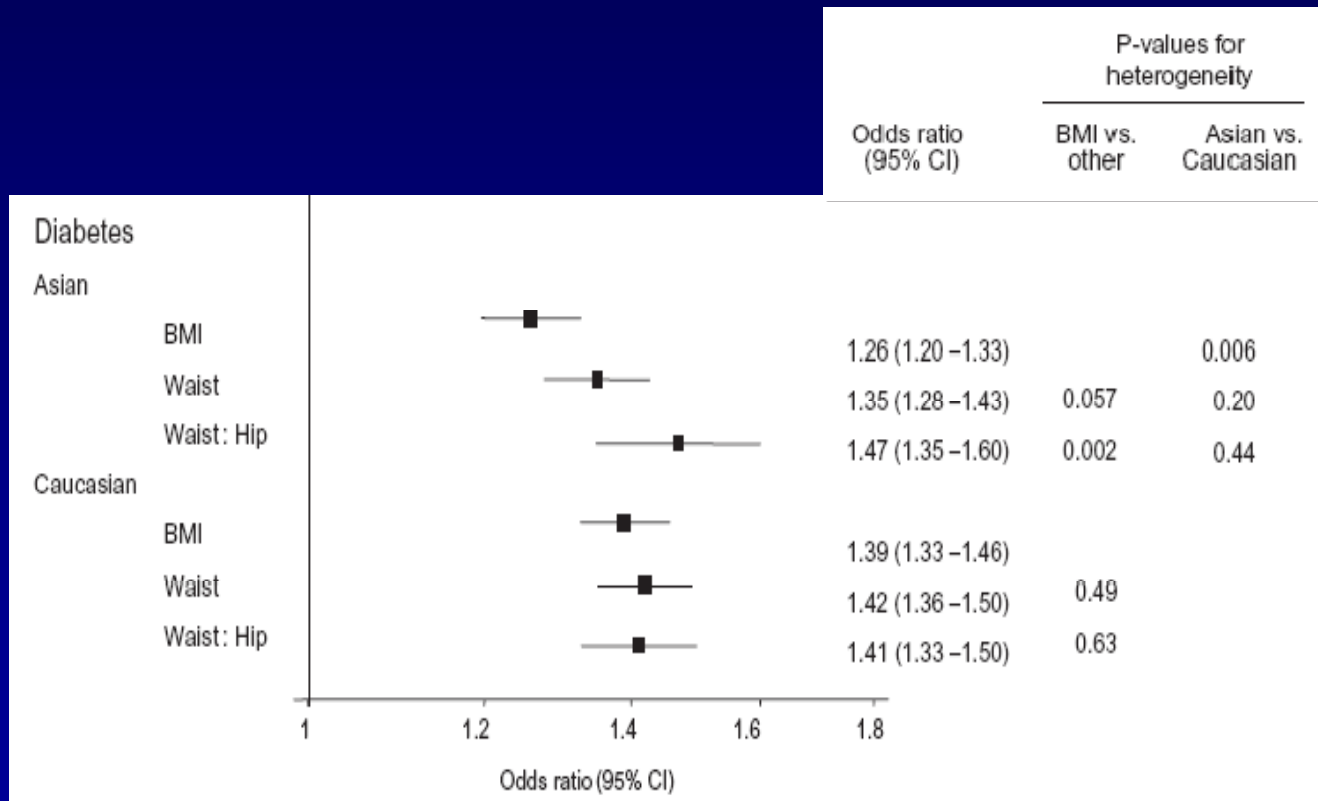
*For any given weight the proportion of body fat is high and centrally distributed*

Yajnik has 21% fat, Yudkin 9%



Yajnik & Yudkin (2004) Lancet.

# Ethnic comparisons of the cross-sectional relationships between measures of body size with diabetes



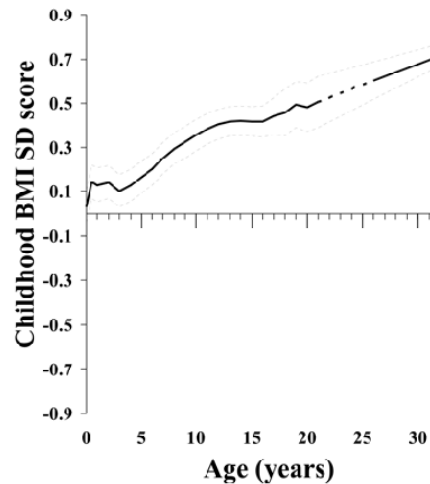
Is there a need for lower cut off for waist circ. and BMI

Huxley et al. , on behalf of the Obesity in Asia Collaboration. Obesity reviews (2008) 9 (Suppl. 1), 53–61

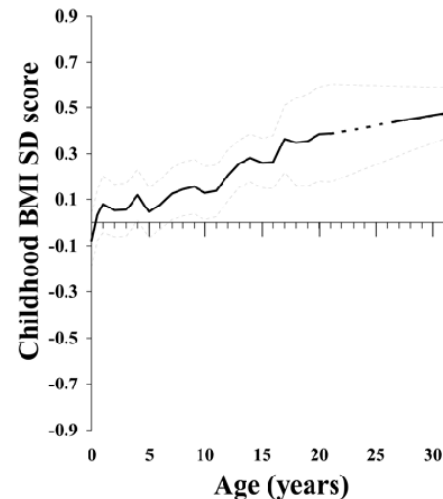
- *Fetal and Early life influences influence adult onset heart disease in a major way*
  - *International studies*
    - *Indian Studies*

# New Delhi Birth Cohort

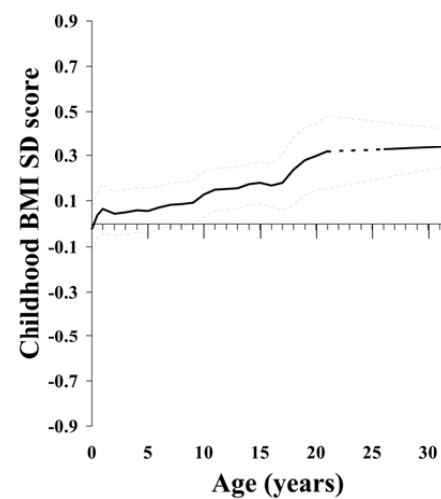
(a) High waist circumference



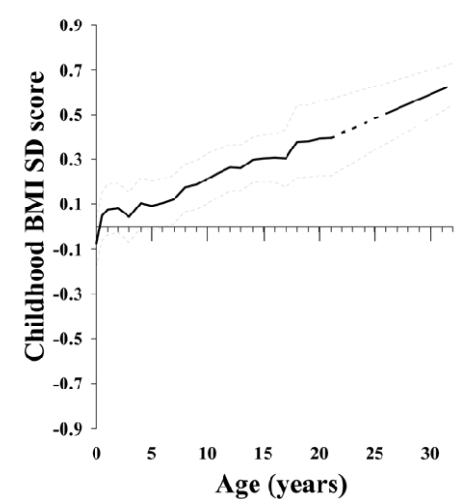
(d) High blood pressure



(c) High triglyceride concentration



(f) Insulin resistance (HOMA)



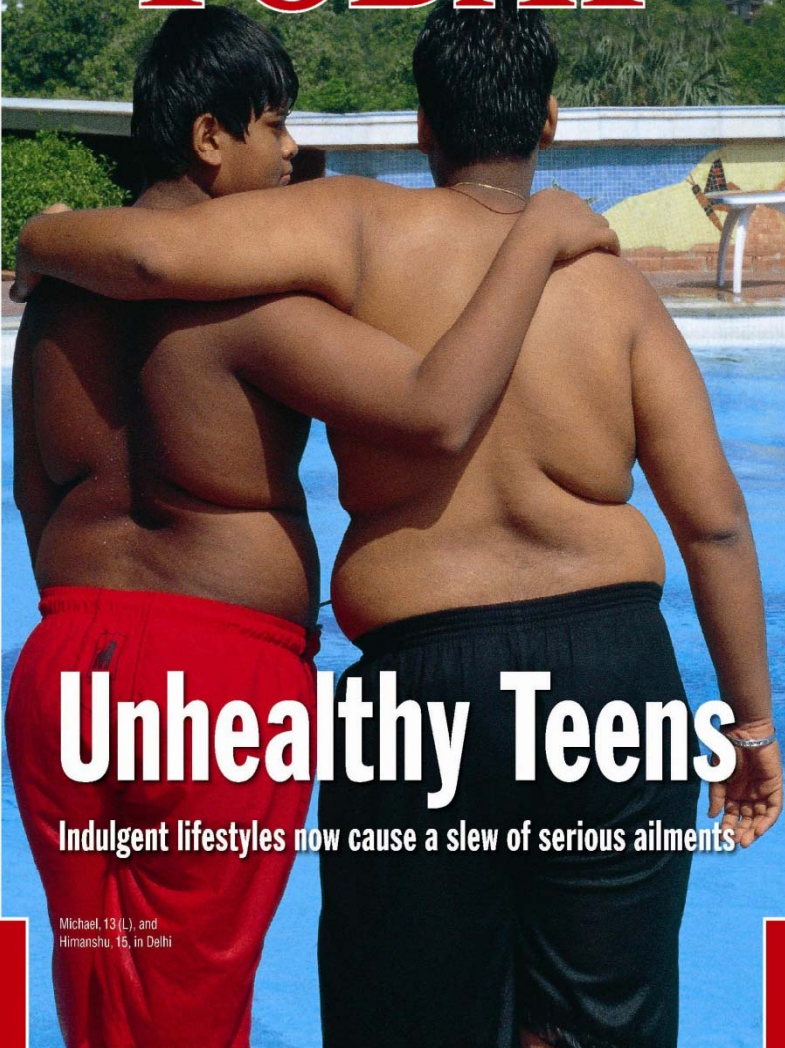
**Subjects with high adult WC, BP, TG and IR had a higher mean BMI than the cohort mean at all ages from birth**



Rs 15

ROMP ON THE RAMP ♦ BLOODY BLUNDER AT JAMMU

AUGUST 4, 2003  
**INDIA  
TODAY**



# Unhealthy Teens

Indulgent lifestyles now cause a slew of serious ailments

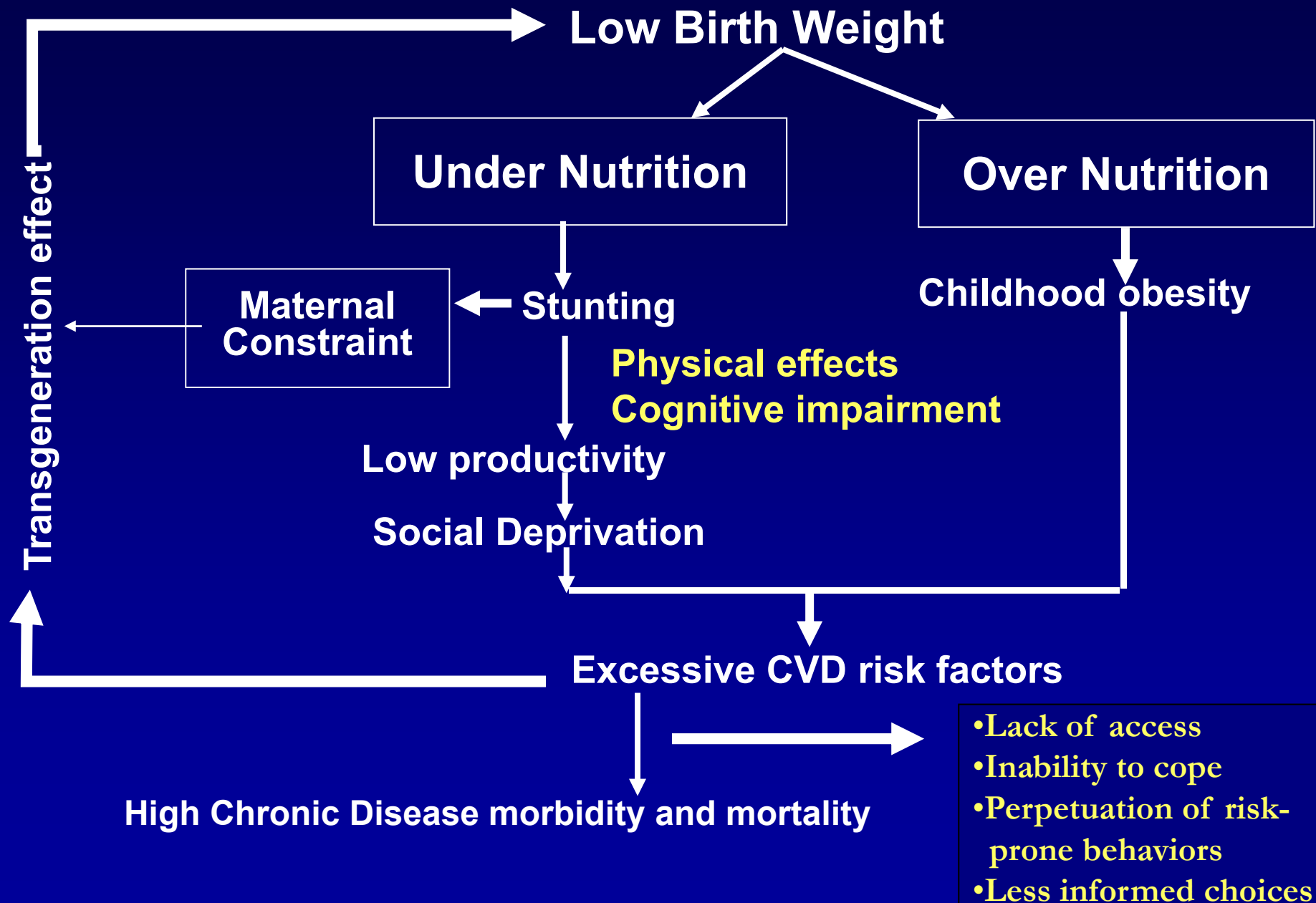
Michael, 13 (L), and  
Himanshu, 15, in Delhi

www.indiatoday.com

*Over weight school children : 10-20%  
Obesity in school children: 2-5%*

*Approximately 10% of all overweight  
and obese children had some degree  
of dysglycemia.*

# RELATIONSHIP OF LBW AND CVD



The Pre-transitional and post transitional diseases interact and impede the achievement of the millennium development goals

Particularly

- **Reducing child mortality**
- **Improving maternal health**
- **Combating HIV/AIDS, malaria and other infectious diseases**

# Estimate of Excess No. of Deaths Associated with Smoking among Indian Adults in 2010, According to Age, Sex, & underlying Cause of Death

Age Group and Underlying Cause of Death	Excess Deaths Associated with Smoking (in thousands)			
	Women		Men	
	<i>no./total no.</i>	%	<i>no./total no.</i>	%
Age 20–29 yr, any cause	2/280	1	9/319	3
Age 30–69 yr†				
Tuberculosis	14/155	9	120/315	38
Respiratory disease	26/259	10	109/353	31
Stroke	5/182	3	42/223	19
Heart disease	8/281	3	110/548	20
Neoplastic disease	9/228	4	67/211	32
Peptic ulcer	2/27	8	11/40	28
Other medical cause‡	29/729	4	120/851	14
Injury§	0/141	0	0/341	0
Any cause	93/2002	5	579/2882	20
Age ≥70 yr, any cause	33/1735	2	219/1628	13
Total (age ≥20 yr), any cause	128/4017	3	807/4829	17

\* Data regarding cause-specific total numbers of deaths have been adjusted according to the total number of deaths from any cause on the basis of predictions by the World Health Organization for 2010.<sup>2</sup> Some percentages reflect the use of rounded numerators and denominators.

# DM & TB: A Systematic Review of 13 observational Studies

- DM is associated with an increased risk of TB [RR= 3.11 (2.27–4.26)]
- DM accounts for 80.5% of incident pulmonary TB among people with diabetes, and 14.8% of incident TB in India
- The population attributable risk for TB imposed by DM and HIV/AIDS are similar
- Disproportionate funding for HIV/AIDS programs

**Conditioning Factors:  
Poverty, Education, Stress**

**Genetics  
Foetal programming  
Life course SES**

**Globalization**

**Lifestyle  
changes**

**Diet**

**Physical  
activity**

**Urbanization**

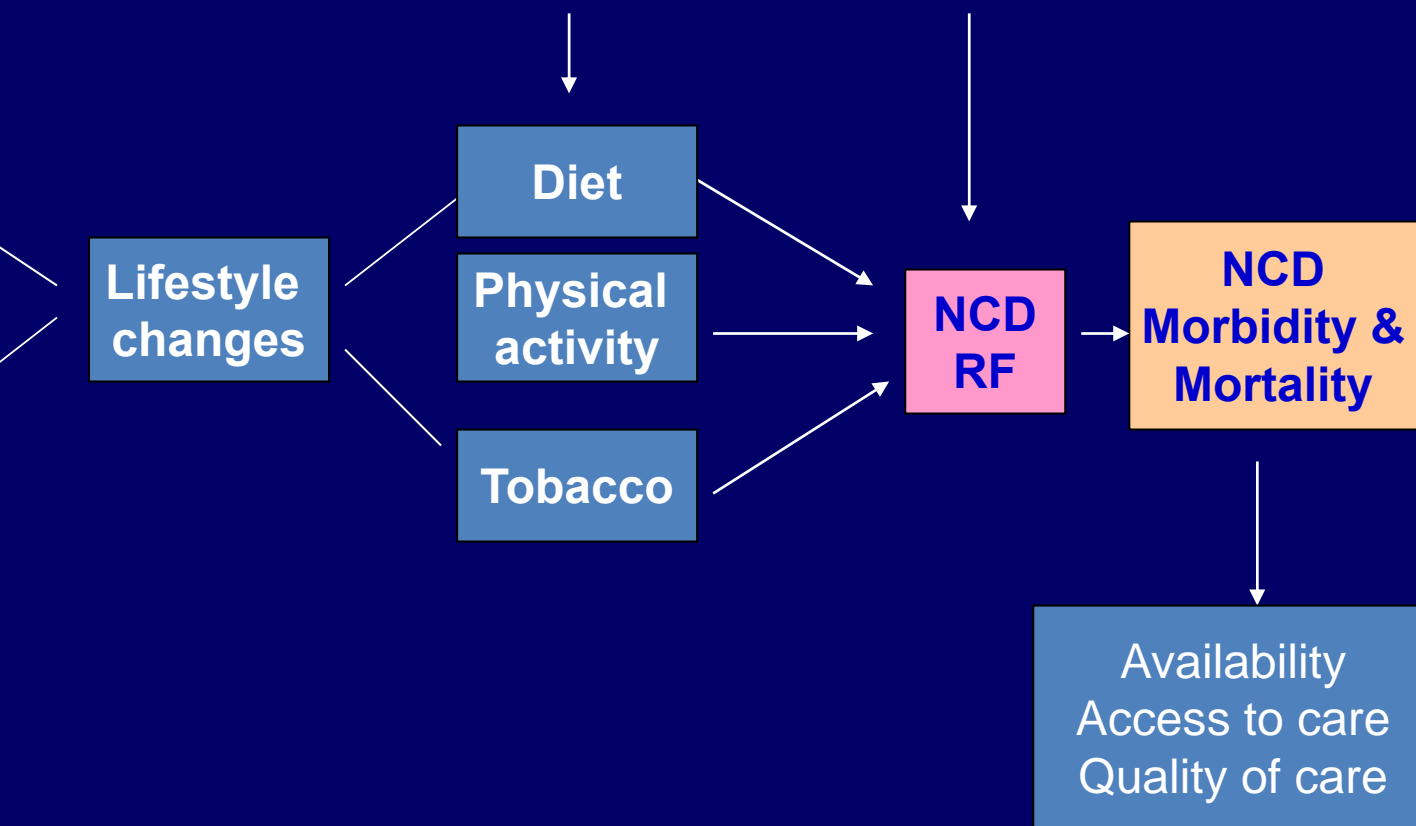
**Tobacco**

**NCD  
RF**

**NCD  
Morbidity &  
Mortality**

**Availability  
Access to care  
Quality of care**

**NCD starts in the womb and ends at the tomb**



# Challenges: Usual suspects

- High burden
- Premature mortality and case fatality
- Health system challenges
- Lack of access
- High cost of care
- Uneven distribution of health care
- Information asymmetry
- Emphasis on curative care over prevention
- Out of pocket expenditure
- Insufficient Human resources

# What do we need to do?

- Policy initiatives to reduce population level risk
  - Tobacco control
  - Dietary Salt reduction: Industry & Individuals
  - Promoting healthy oils
  - Promoting physical activity
- Innovative community based prevention strategies
- Surveillance
- Reducing Individual susceptibility to chronic Diseases
  - Quality Improvement Programs to strengthen secondary prevention
  - Innovative methods of delivering health care/ Alternate health care models
  - Context specific guidelines for disease management
- Translational research ( Bench-Bedside-Beyond):  
T1 —→ Clinical Trials —→ T2
- Look beyond biomedical models

# What will ensure success

- A socio-political approach rather than isolated biomedical approaches

*Medicine is a social science  
and politics is medicine  
on a grand scale*  
Rudolph Virchow

