Department of Environmental Health Engineering

World Health Organization
Collaborating Centre for Occupational Health

Centre for Advanced Research On Environmental Health
Indian Council of Medical Research

Using the GBD results for progress on Air Quality Management in India

Some challenges, many opportunities

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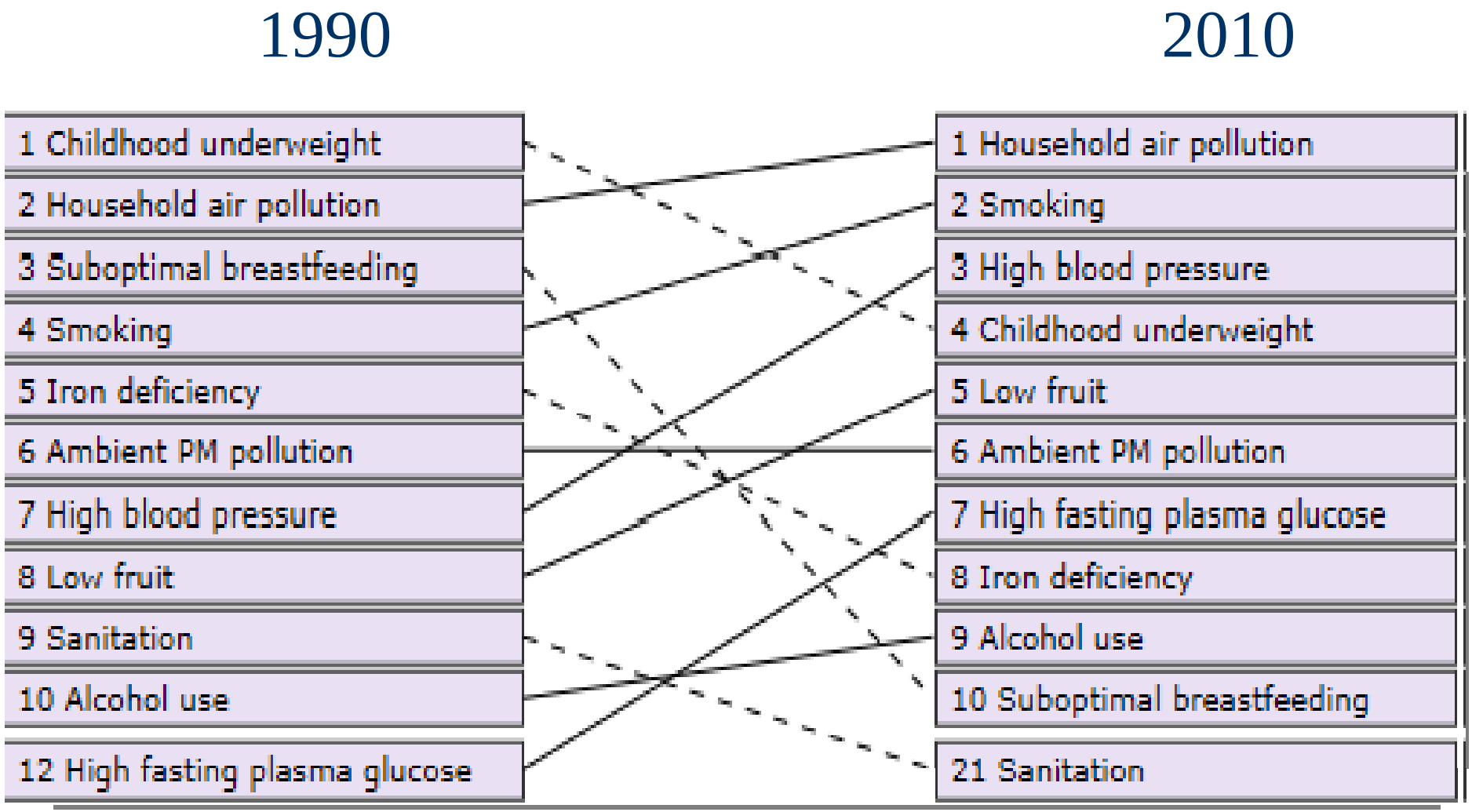
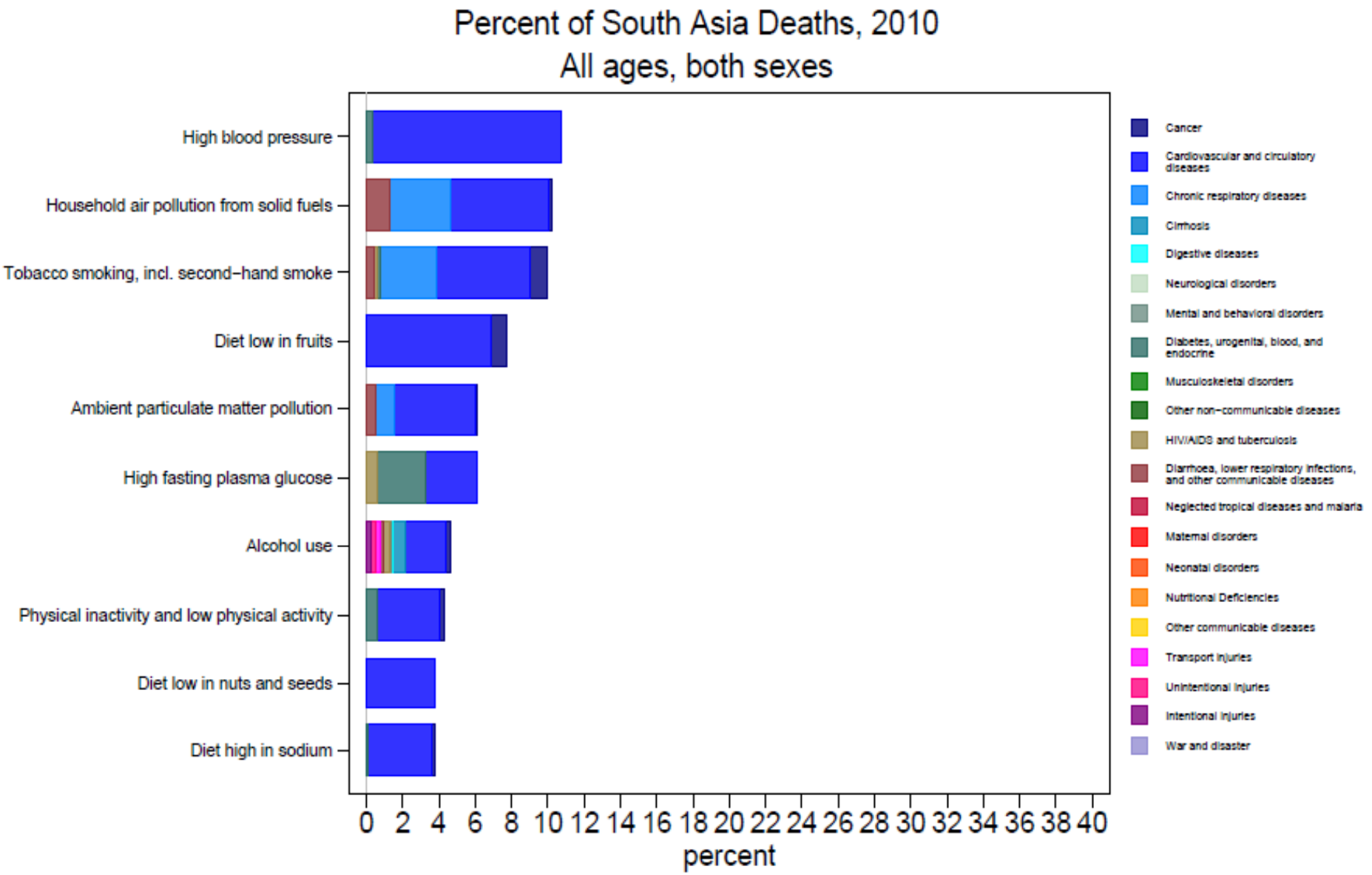
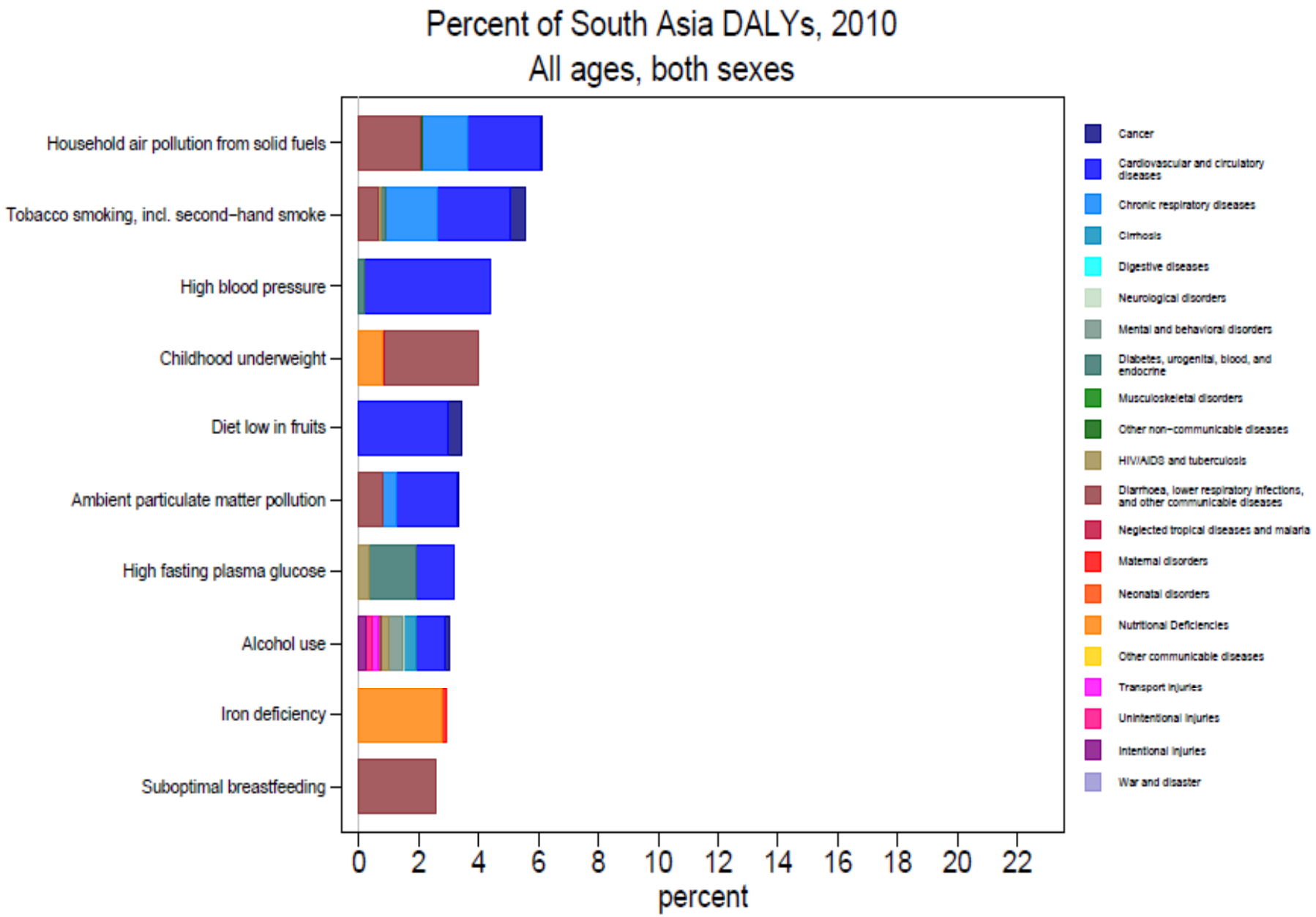
DALYS. South Asia by Risk Factor




Percent of South Asia Deaths, 2010
All ages, both sexes
High blood pressure
Household air pollution from solid fuels
Tobacco smoking, incl. second−hand smoke
Diet low in fruits
Ambient particulate matter pollution
High fasting plasma glucose
Alcohol use
Physical inactivity and low physical activity
Diet low in nuts and seeds
Diet high in sodium
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40
percent
Cancer
Cardiovascular and circulatory diseases
Chronic respiratory diseases
Cirrhosis
Digestive diseases
Neurological disorders
Mental and behavioral disorders
Diabetes, urogenital, blood, and endocrine
Musculoskeletal disorders
Other non−communicable diseases
HIV/AIDS and tuberculosis
Diarrhoea, lower respiratory infections, and other communicable diseases
Neglected tropical diseases and malaria
Maternal disorders
Neonatal disorders
Nutritional Deficiencies
Other communicable diseases
Transport injuries
Unintentional injuries
Intentional injuries
War and disaster


Percent of South Asia DALYs, 2010
All ages, both sexes
Household air pollution from solid fuels
Tobacco smoking, incl. second−hand smoke
High blood pressure
Childhood underweight
Diet low in fruits
Ambient particulate matter pollution
High fasting plasma glucose
Alcohol use
Iron deficiency
Suboptimal breastfeeding
0
2
4
6
8
10
12
14
16
18
20
22
percent
Cancer
Cardiovascular and circulatory diseases
Chronic respiratory diseases
Cirrhosis
Digestive diseases
Neurological disorders
Mental and behavioral disorders
Diabetes, urogenital, blood, and endocrine
Musculoskeletal disorders
Other non−communicable diseases
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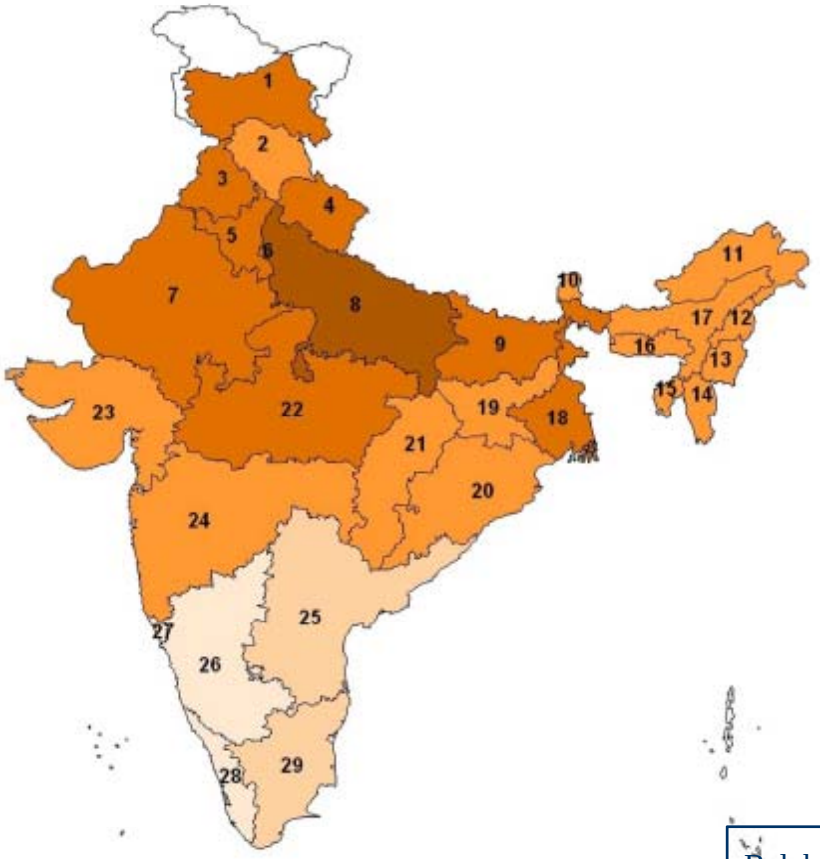
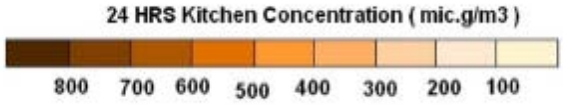
Nutritional Deficiencies
Other communicable diseases
Transport injuries
Unintentional injuries
Intentional injuries
War and disaster

The Challenge

- *The burden is not decreasing and the evidence is unequivocal !*
- *The burden is seamless across rural –urban boundaries*
- *Interventions to tackle OAP and HAP would have to be in sink(at least in some measure)*
- *WHO-AQGs are universally applicable for defining counterfactuals but NAAQM focused only on the urban*
- *Density of intervention efforts would need to be substantively increased to achieve and demonstrate health benefits*
- *Range of health effects are broader and magnitudes bigger than previously estimated (more chronic outcomes included in the ambit)*
- *Multitude of competing risk factors*

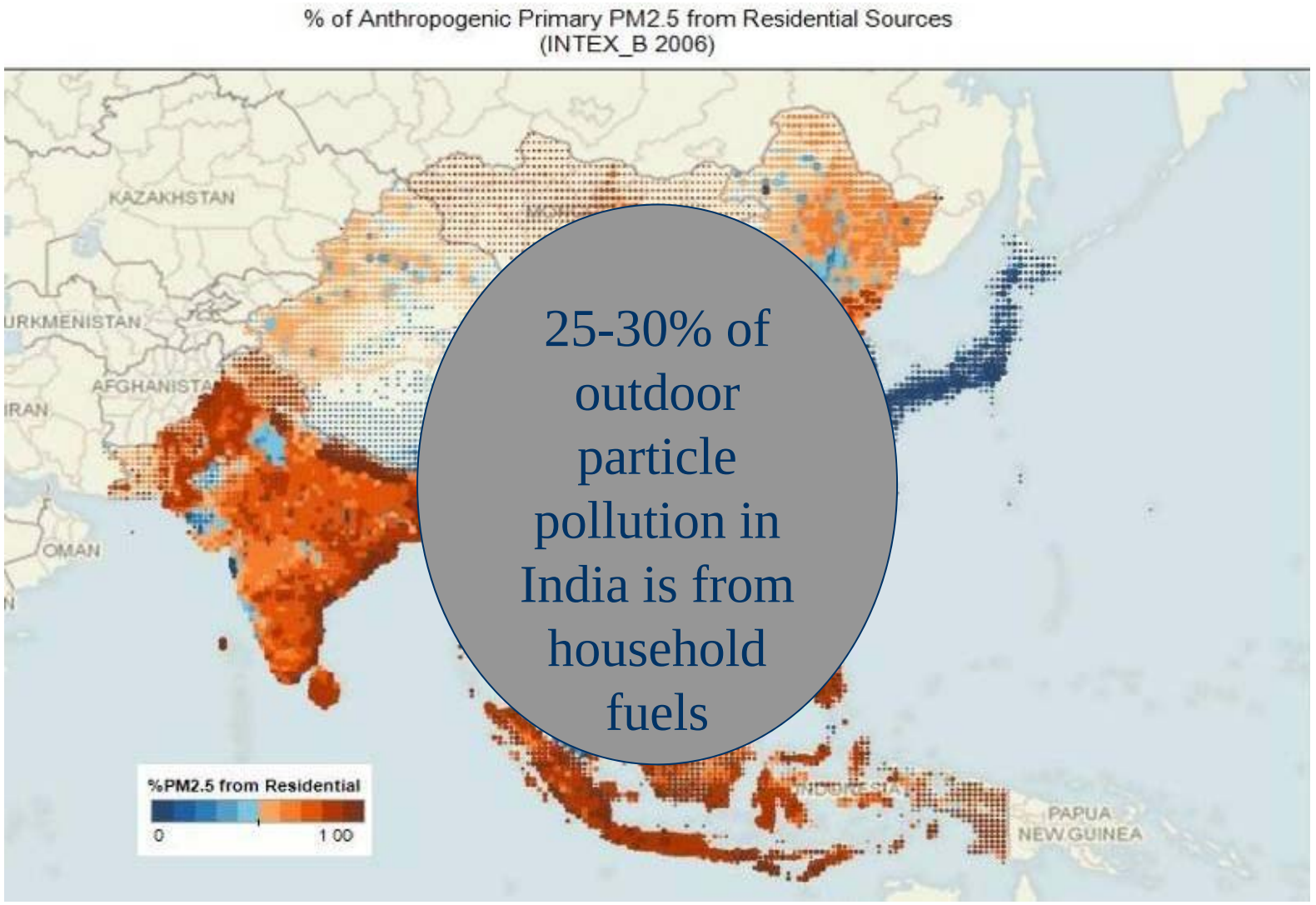
National Level Household Air Pollution Exposure Estimates





Balakrishnan et al. CRA, 2013, under review

%$PM_{2.5}$ from "Residential" Emissions from INTEX_B



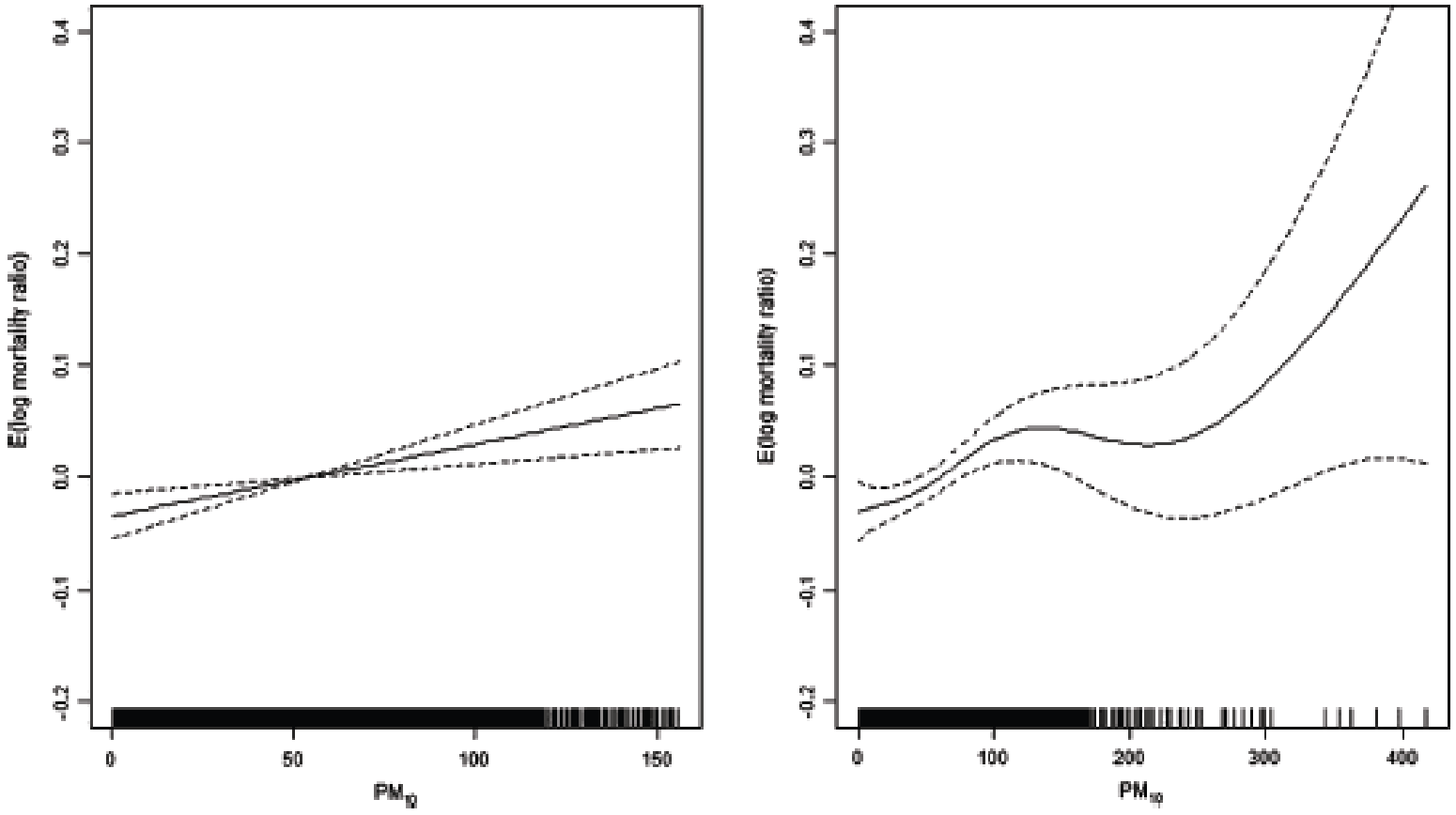
Source: Asian Emission Inventory for NASA INTEX_B 2006 (access

Chafe, 2010

The Opportunities

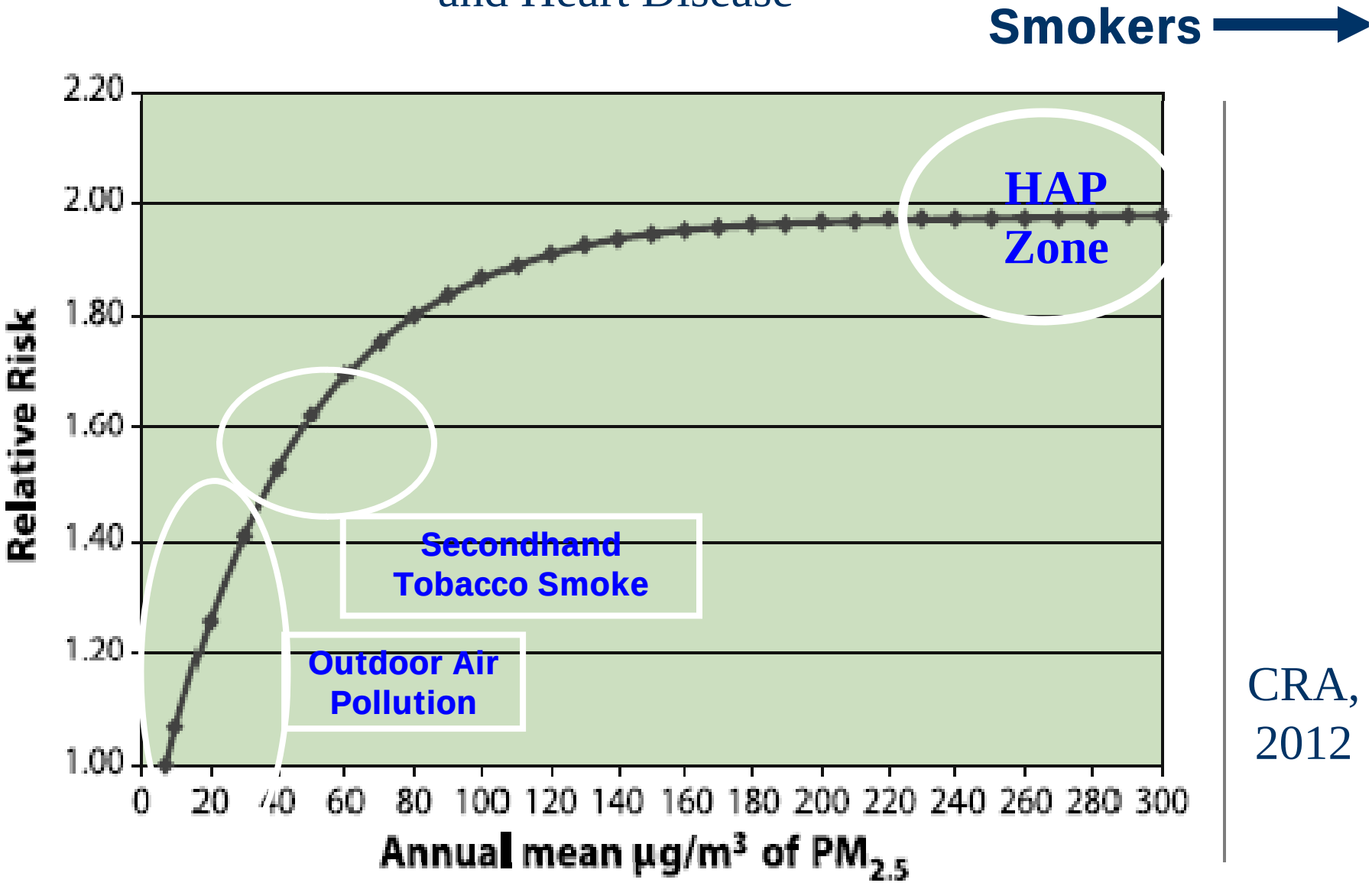
- *Extensive base of ground level air quality monitoring information for both validating models and interpolation on exposure –response curves*
- *Some in-country exposure response for short-term health effects*
- *First ever maternal, child and adult air pollution cohorts launched by ICMR to both develop integrated IERs and develop exposure models for use in on-going cohorts*
- *Multiple CVD /Chronic disease cohorts underway allowing an examination of air pollution as a risk factor*
- *Increasing base of geo-coded health information*

HEI-PAPA-Chennai results



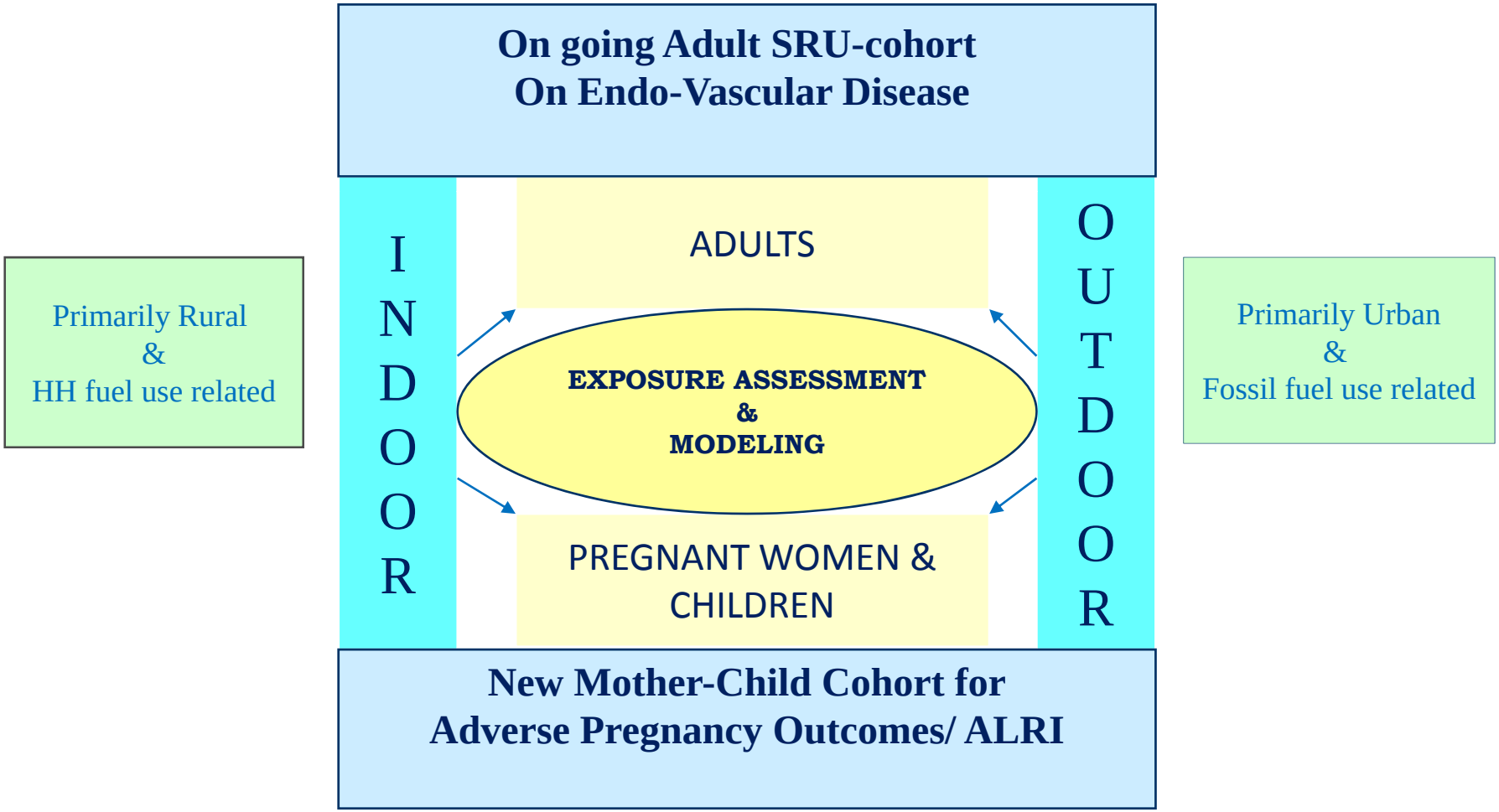
Balakrishnan et al., 2011

Integrated Exposure-Response: Outdoor Air, SHS, and Smoking and Heart Disease



CRA, 2012

ICMR-CAR Research Framework



Brief Overview of ICMR-CAR Objectives

I MC Cohort

- Establish the relationship between air pollution exposures and select pregnancy and early childhood outcomes in a rural urban mother child cohort

II Adult cohort

- Assess exposures for adults in an on-going rural –urban SRU cohort to allow long-term exposure reconstructions and to establish associations with pulmonary function

III Exposure Modeling

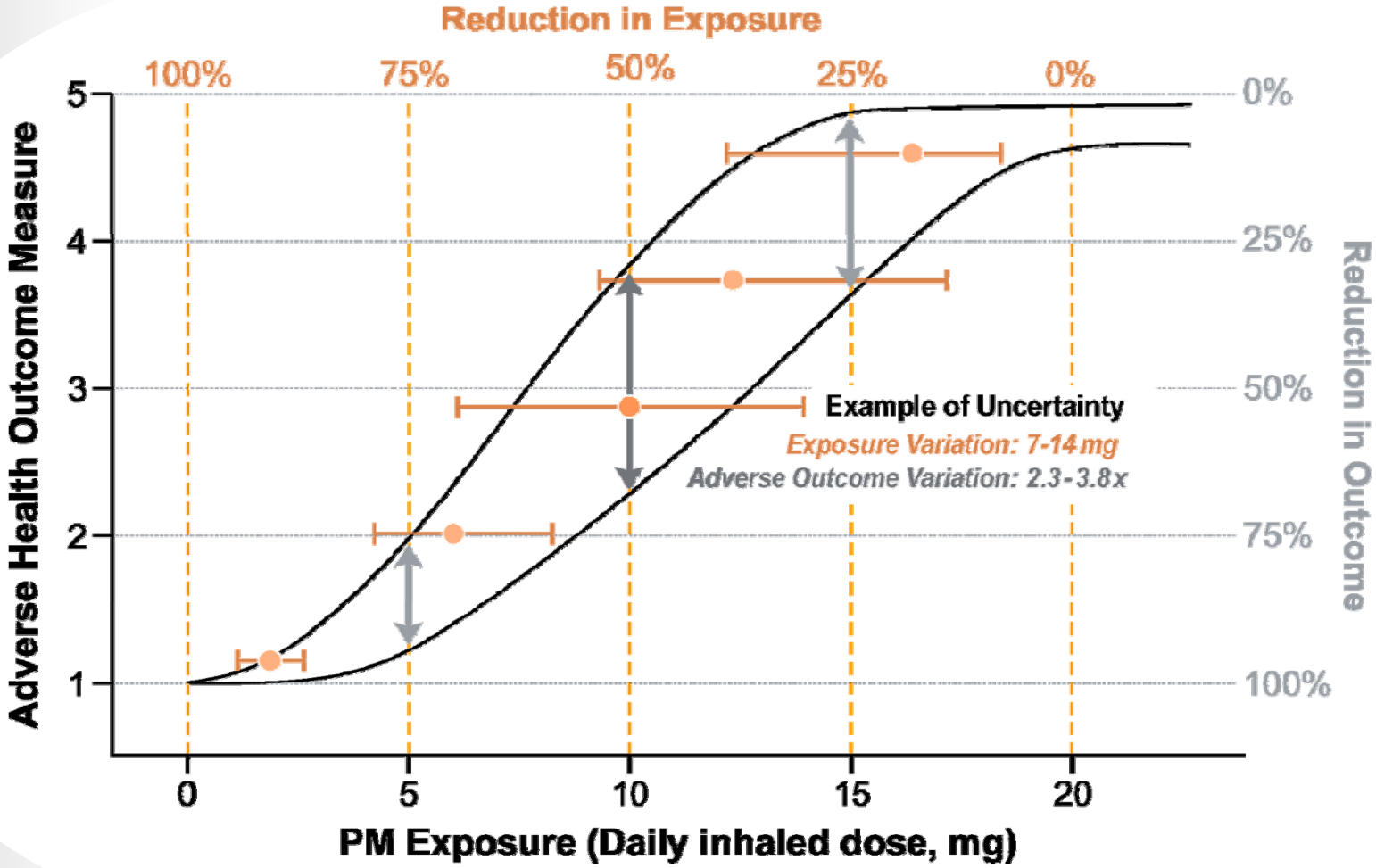
IV Land –Use Regression Modeling

V Gene-Environment Interactions

ICMR-CAR AP-Health Outcomes

- **Pregnancy outcomes**
  - Primary : Birth Weight
  - Secondary: Gestational Age; Spontaneous/missed abortions; Intrauterine fetal demise (IUFD) ;Intrauterine growth retardation (IUGR);Premature birth; Still birth
  - Exploratory: Birth defects
- **Child Health Outcomes**
  - Primary: Acute Respiratory tract infection
  - Secondary: Neonatal & Infant mortality
- **Adult Outcomes**
  - Primary: Pulmonary Function
  - Exploratory: Inflammatory Biomarkers; Endovascular Changes

Moving from use of IERs for burden estimations to ascertaining how clean is clean enough?



Ground Reality on risk perception

Next steps

- *Inform policy actions based on exposure reduction potentials of alternative technologies without requesting additional research (policy for evidence and not evidence for policy)*
- *Launch a national burden of disease assessment focused on OAP and HAP in collaboration with the GBD group*
- *Launch a public portal enabling state level assessments*
- *Direct research efforts towards understanding E-R and intervention impacts*

THANK YOU