GENERATING HEALTH AND MORTALITY DATA TO ENABLE STUDIES ON HEALTH IMPACT OF AIR POLLUTION IN INDIA

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Much is unknown about the health impacts of air pollution - from biological mechanisms by which pollutants damage tissues to potential health costs associated with growing worldwide fossil fuel use and associated emissions.

To understand the health consequences of air pollution under future development scenarios, one must know

First: the degree to which air pollution exposure poses a health risk today

Second: apply this knowledge to a range of development, policy etc., to improve public health decision making

2 steps are involved

- 1. quantify current health impacts
- 2. extrapolate to alternative places/times

These are linked through data needs.

To quantify current risk associated with air pollution

- Epidemiologists correlate patterns in air pollution exposure and health response to determine *exposure-response functions.*
- In practice, this is estimated to be *concentration-response function*

What do these functions indicate?

- Specify the risk of a particular health outcome, (e.g., asthma, bronchitis, premature mortality) relative to an incremental increase in air pollution exposure, controlling for other known risk factors.

Metrics used by Epidemiologists and Environmental assessors

- Health Outcome
- Air pollution Concentration and
- Concentration-response functions

Epidemiologists

- Use health and air pollution data as inputs
- Calculate exposure-response relationships

Risk assessors

- Take air pollution and exposure response functions, and sometimes baseline health survey data, as inputs

- Calculate possible health impacts under alternative scenarios

Epidemiologists thus need measurements of health outcomes, whereas both epidemiological and risk assessment studies need data on air pollution exposures

Health response data

- Hospital records
- Death certificates
  (less expensive and time consuming)
- individual monitoring (lung function)
  (not so)

Limitations:

- Data source not perfect
- 'total' health response on a particular day or location is restrictive
- But still provides information which facilitates comparison of health impact assessment across regions, as things are becoming more systematic

Choice of the health outcome depends on the objective of the Health Impact Assessment (HIA)

Some focus on mortality only
(as life expectancy)

others on mortality, morbidity
(cardio-pulmonary diseases)

Mortality

- 2 designs are helpful
- Time series studies of daily mortality
- Cohort studies of mortality over extended periods

Useful data

- All cause mortality
- Cause specific deaths
- Cardiovascular diseases
- Chronic non-malignant respiratory diseases
- Cardio-pulmonary diseases
- Lung cancer
- Age specific deaths

Which health outcome can be considered in HIA of air pollution?

- Broad spectrum
- Acute and chronic effects
- Ranges from mild irritation to death
- Therefore, all are potentially relevant

Fig. 1. Air pollution health effects pyramid (adapted from ATS 2000)

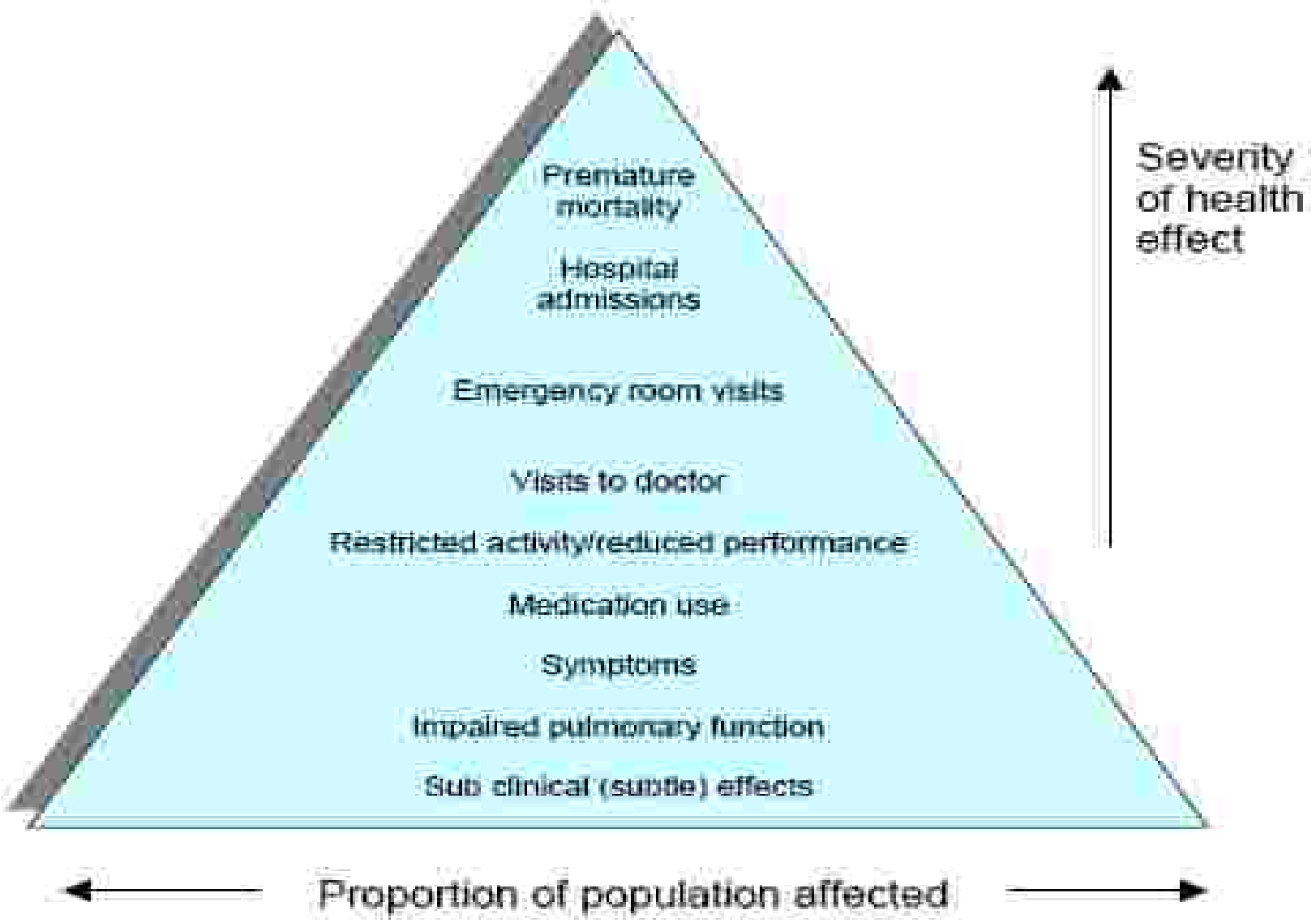
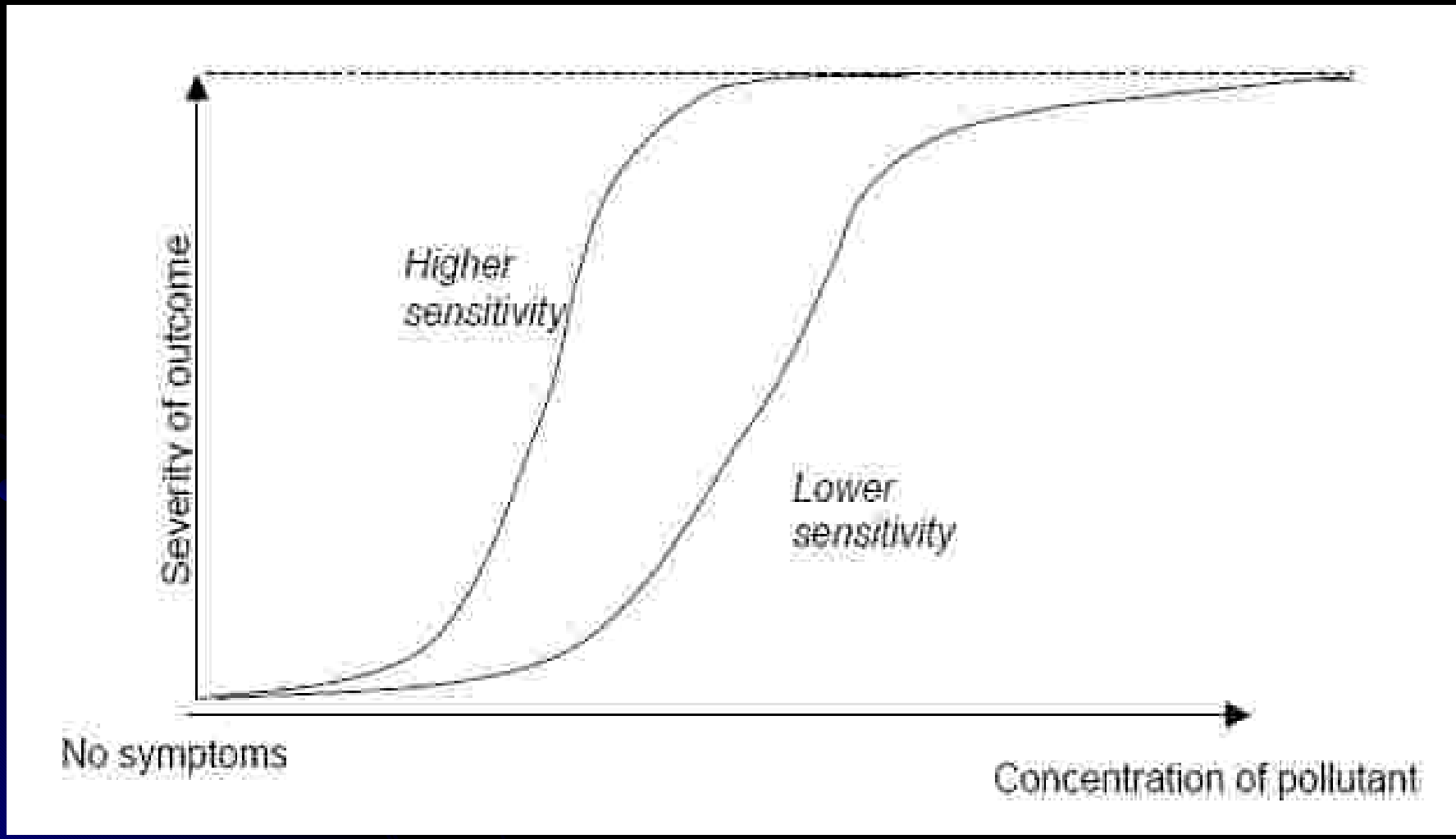


Fig. 2. Severity of health response to air pollutant in relation to subject's sensitivity



HEALTH OUTCOMES POTENTIALLY RELEVANT FOR HEALTH IMPACT ASSESSMENT OF AIR POLLUTION

Acute Outcomes

- Daily mortality
- Respiratory hospital admissions
- Cardiovascular hospital admissions
- Emergency room visits for respiratory and cardiac problems
- Primary care visits for respiratory and cardiac conditions
- Use of respiratory and cardiovascular medications
- Days of restricted activity
- Work absenteeism
- School days missed
- Self-medication
- Avoidance behavior
- Acute symptoms
- Physiologic changes, e.g. in lung function

Chronic disease outcomes

- Mortality (in infants and adults) from chronic cardio-respiratory disease
- Chronic respiratory disease incidence and prevalence (including asthma,
- COPD, chronic pathological changes)
- Chronic change in physiologic function
- Lung cancer
- Chronic CVD

Reproductive outcomes

- Pregnancy complications (including fetal death)
- Low birth weight
- Pre-term delivery

THANK YOU