Social Costs of Morbidity Impacts of Air Pollution

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Outline of Talk

- Purpose of OECD Research Project
- Defining the social cost components of air pollution-induced health impacts
- Recommended unit values for specific health end-points for use by OECD
- Lessons for impact assessment of chemicals management

Purpose of Research

Purpose: Inform the development, by the OECD, of improved estimates of the social costs of human morbidity impacts resulting from air pollution

<u>Component Tasks</u>

- **Develop a core set of health end-points to be covered when estimating the costs of morbidity** (Hurley, IOM)
  - Identify a consistent and comprehensive “core” set of health endpoints for the assessment of the morbidity costs of air pollution.
  - Define the social cost components of air-pollution induced health impacts

- **Review of current partial or comprehensive estimates of the cost of morbidity from air pollution and suggested values for use by OECD**

Defining the social cost components of air pollution-induced health impacts

Cost Category	Description of Cost Category
Resource costs	*Avertive expenditures*, e.g., staying inside to avoid air pollution *Mitigating expenditures*, including the direct medical and non-medical costs associated with treatment for the health impact
Plus	
Opportunity costs	Costs related to loss of productivity and/or leisure time due to the health impact
Plus	
Disutility costs	Pain, suffering, discomfort and anxiety linked to the illness
Equals	
Economic value of avoiding the health impact	

Economic theory suggests aggregate costs will be minimised: implies balancing these cost components

Checklist of potential over-lapping cost components

		Secondary cost			
		Disutility	Productivity costs	Averting costs	Medical costs
Original cost	Disutility	n/a	√	√	√
	Productivity costs	-	n/a	-	-
	Averting costs	√	√	n/a	√
	Medical costs	√	√	√	n/a

Original cost indicates the cost component intended for measurement,

Secondary cost indicates components with which it may potentially overlap.

For example, a questionnaire that asks an individual to state her WTP to avoid disutility cost component needs to be designed so that she does not include financial as well as non-financial concerns in her assessment of her loss of welfare.

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Health end-points considered for Valuation: Selection Process

- Pollutant-health combinations where a real (causal) relationship is supported by current scientific evidence, as assessed by expert groups

- Identified pollutant-outcome pairs that had been used in quantification in at least one of three sources.
- In practice, aimed for pollutant-health combinations that had been selected
  (a) both by US EPA and by the European Commission; or
  (b) selected by WHO for Global Burden of Disease.

Health end-points considered for Valuation (Social Welfare Cost)

Chronic bronchitis – unit value per new case;

Hospital admissions (Respiratory & Cardiovascular) – unit value per new case;

Work-loss days – unit value per day;

Restricted activity days – unit value per day;

Acute lower respiratory infections (ALRI) in children aged less than 5 years – unit value per new case.

Acute bronchitis in children – unit value per new case.

Method for deriving monetary values for avoiding health end-points

- Consistent with values needed to undertake social cost-benefit analysis, these values measure the effect on social welfare, in monetary terms.

- The component costs that constitute each unit value were derived from peer-reviewed literature, plus other literature: in AQ context & other contexts

→ Selection criteria:
  - quantity;
  - transferability;
  - quality

Method for deriving monetary values for avoiding health end-points (2)

- Studies compiled into geographical areas:
  - N. America
  - Europe
  - China & India
  - Other

- 10 – 20 studies for each health end-point, though very disparate

- 90% of studies from OECD countries

Results: Example Compilation Table – Chronic Bronchitis

Study/ date/ Location; Pollution type; Methodology type; Peer-reviewed or not	Value per new case (mean/median; range). Original currency year; USD_{2010}	Comments
Primary valuation studies – North America		
Viscusi et al. (1991); United States; Contingent valuation – Willingness to pay Peer-reviewed	Chronic bronchitis: USD_{1987}: 457 000 – 960 000 Median values for alternative risk-risk and risk-money trade-offs. **USD_{2010}: 877 440 – 1 843 200.**	WTP Disutility; 389 respondents. Survey did not mention other cost components though these might have been considered by respondent. 13 dimensions of CB described (see Annex 3); focused on a severe definition of CB.
Krupnick & Cropper (1992); United States; Contingent valuation – Willingness to pay Peer-reviewed	Chronic: USD_{1991}: 460 000 – 1 060 000 Median values for alternative risk-risk trade-offs **USD_{2010}: 883 200 – 2 035 200.**	WTP Disutility; used Viscusi questionnaire to derive WTP from respondents familiar with illness (see Annex 3). Respondents were asked whether loss of income was consideration but explicitly asked respondents to exclude resource costs in questionnaire.

Suggested unit values for selected morbidity end-points USD_{2010}

Health end-point	Central unit value	Range (lower – higher)
Cases of chronic bronchitis	334 750	41 700 – 889 800
Hospital admission cases	2 000	600 – 3 300
Work loss days	Country-specific (e.g. US $130)	Country-specific
Restricted activity days & Minor restricted activity days	RAD: 170 MRAD: 62	RAD: 41 – 268 MRAD: 53 – 70
Acute lower respiratory infections in children aged < 5 years	464	301– 511
Acute bronchitis in children	464	301– 511

Aggregate Morbidity Valuation: fixed % of Mortality?

- Marking up mortality costs (valued using VSL methods) by 10%-15% would give a quantified estimate which, despite its simplicity, looks to be in the right ballpark

- But:
  - beware of preferred valuation metrics (e.g. VSL, VOLY)
  - Be alert to context specificity (e.g. different pollutant mixes & concentrations)

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Lessons for impact assessment of chemicals management

- Depth of evidence base – on both epidemiology and valuation – allows this type of informal meta-analysis

- Even so, (poor) quality and (low) quantity of some evidence ensures that uncertainty parameterisation remains high

→ Health impact valuation of chemicals need not be afraid of proceeding without perfect evidence base