Benefits analysis – a quick summary of recent developments and activities

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Task Force on Integrated Assessment Modelling

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Recent developments

- Methods
  - COMEAP, DG ENV and NO_2
  - COMEAP cardiovascular morbidity
  - Interpretation of air quality and health impacts
  - Guidelines for BCA (Gates Foundation)
  - REACH and socio-economic analysis, OECD SACAME Project
- Policy analysis
  - BAT assessment and IED derogation
  - Continued involvement of international organisations (e.g. CCAC, OECD)
  - Wider international interest at government and company levels
    - OECD, Australia, South Africa
  - Local interest
    - NHS in UK

COMEAP, DG ENV, NO_2

- Growing literature (post HRAPIE)
- Issues under review:
  - ‘Thresholds’, ‘cut-points’ ?
  - Size of response function ?
  - Overlap with PM ?
  - Correct modelling of concentration in relation to the epidemiological studies

- COMEAP – UK Committee on the Medical Effects of Air Pollutants

NO_2: HRAPIE, COMEAP positions

		Band	RR	Averaging	Overlap with PM
Mortality, all ages	Acute	A*	1.0027	Daily 1 hr max, all	-
Resp. Hosp Admissions, all ages	Acute	A*	1.018	24 hr mean, all	-
Bronchitis ages 5-14	Chronic	B*	1.021	Annual, all	-
Mortality, ages 30+	Chronic	B*	1.055	Annual >20ug.m^{-3}	Up to 33%
COMEAP position					
Mortality, ages 30+	Chronic	B*	1.025	Annual (no threshold)	?

New report headlines: Range of impacts linked to air pollution

- Link to many diseases including:
  - Cancer
  - Asthma
  - Stroke
  - Heart disease
  - Diabetes
  - Obesity
  - Dementia

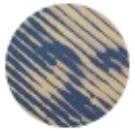
Ongoing COMEAP work on cardiovascular morbidity

- Focus on effects of chronic exposure
- Mechanisms group has provided draft report
- Epidemiology / impact assessment group will produce draft later this year (?)
  - Use of microsimulation approaches for health impact assessment
  - Consideration of whether microsimulation offers significant benefits for air quality policy work

Health impact functions – review work elsewhere

- WHO process
- Other countries ?
  - Useful to know what else is going on

Interpretation of impacts



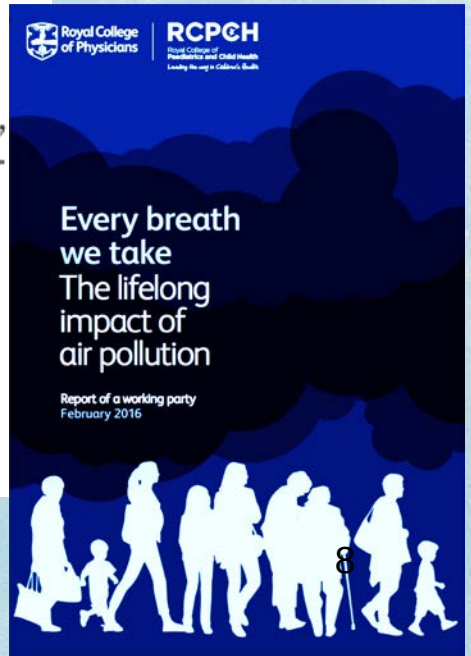
David Spiegelhalter Follow

Statistician, communicator about evidence, risk, probability, chance, uncertainty, etc. Chair, Winton C...

Feb 20 · 11 min read

Does air pollution kill 40,000 people each year in the UK?

Air pollution is news. The Daily Mail claims that *Air pollution is 'killing 40,000 a year in the UK'* Greenpeace says *40,000 lives were cut short by air pollution in the U.K.*, while the Guardian reports *Air pollution crisis 'plagues' UK, finds UN human rights expert*. But where does the 40,000 figure come from, what does it mean, and is there really a 'crisis'? I discovered that digging down to the basis for this figure required some statistical detective work, so brace yourself for some forensic details…



Calculation of the 40,000 figure

- COMEAP: $PM_{2.5}$ deaths = 29,000
  - https://www.gov.uk/government/publications/comeap-mortality-effects-of-long-term-exposure-to-particulate-air-pollution-in-the-uk
- Defra: NO_2 deaths = 23,500
  - https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/460401/air-quality-econanalysis-nitrogen-interim-guidance.pdf
- Combined = 40,000 +/-25%
  - Assumes greater overlap than Defra

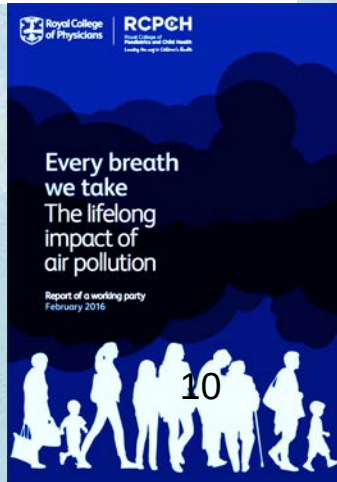
COMEAP results in more detail

Table 1. COMEAP results for effects of outdoor $PM_{2.5}$ exposure on mortality for the UK[2]

Measure of mortality	Impact
Number of attributable deaths	28,861
Attributable deaths per 100,000 aged over 30 years	75
Burden on total survival (life-years lost)	340,000
Difference in life expectancy for the 2008 cohort (days)	
Females	194
Males	182

Highlights different ways of representing mortality impacts of air pollution

Averages at ~12 years of lost life expectancy per equivalent attributable death



Consequences for valuation

- Real number of deaths ‘linked’ to air pollution is likely higher than estimates derived from analysis (COMEAP)
- But effect for average affected individual can be small
- Interpret 40,000 (or other) estimate as ‘equivalent attributable deaths’
  - Provides support for using the VSL
- But estimate of life years lost requires less ‘interpretation’
  - Provides support for continuing to use the VOLY

- Highlights need for care in understanding impacts in order to get the unit values right

Guidelines for Benefit Cost Analysis (Gates Foundation)

- Workshop May 11th Seattle (deadline for registration 4th May: https://sites.sph.harvard.edu/bcaguidelines/scoping/)

Guidelines for Benefit Cost Analysis (Gates Foundation)

- Scoping phase:
  - Identify currently available guidance
  - Examine commonalities, differences, gaps
  - Identify major funders and users of benefit-cost analysis
  - Explore major challenges
  - Review recent benefit-cost analyses
  - Develop plans for Phase 2

Other initiatives: REACH and socio-economic analysis (SEA)

- Regulation on Registration, Evaluation, Authorisation and Restriction of Chemicals
- Introduced by EU in 2006
- Requires SEA for restriction proposals and some authorisation applications
- Some common ground with air quality:
  - Mercury, lead, some VOCs
  - Some major air pollutant emitters

Other initiatives: Valuation studies under REACH SEA

- Skin and respiratory sensitisation
- Kidney failure
- Infertility and developmental problems
- Cancer
- https://echa.europa.eu/documents/10162/13630/echa_review_wtp_en.pdf

ECHA Cancer valuations

Table A 2: Estimates of values of statistical life, case of cancer and morbidity due to cancer based on the estimates in Table A1

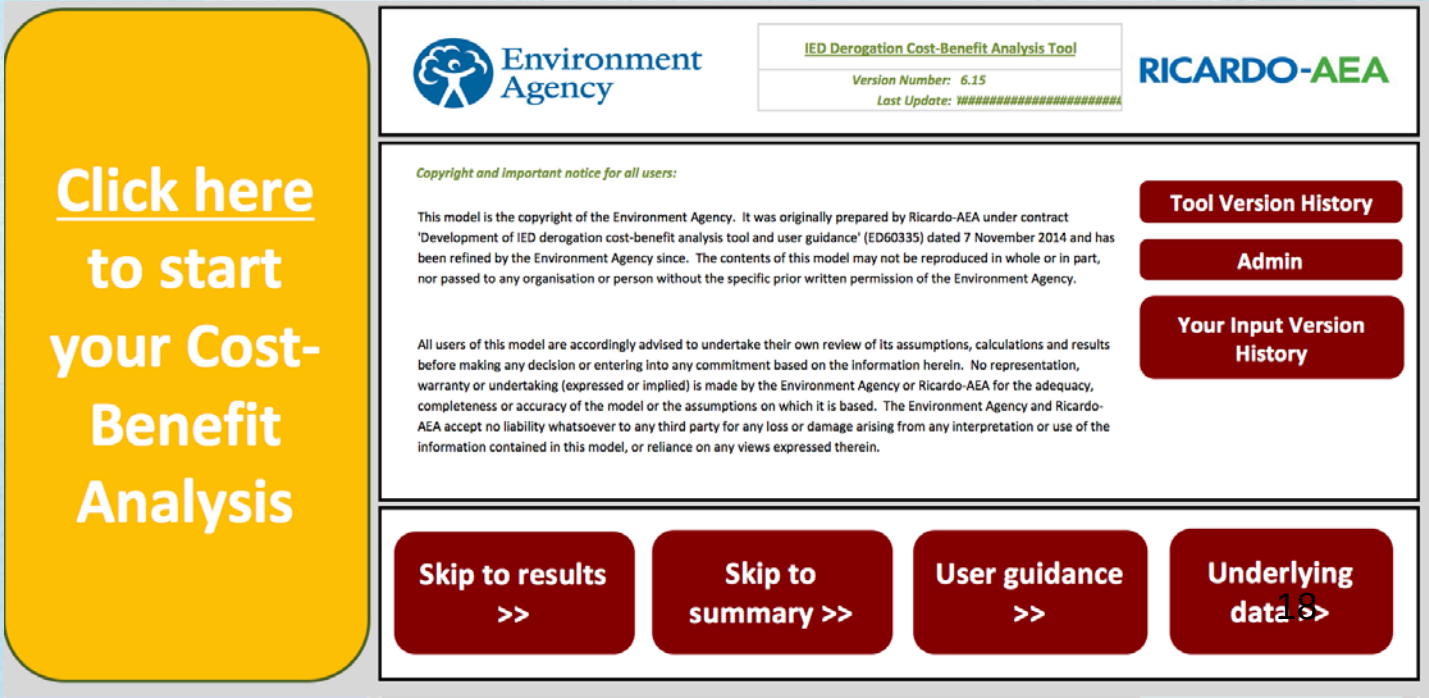
	Willingness-to-pay (WTP) (€$_{2012}$) for EU28 (rounded)	Scaled[1)] WTP values (€$_{2012}$) for EU28 [unscaled, raw values in brackets]
Value of statistical life (VSL)	**3,500,000**	3,517,094 [3,003,496]
Value of a statistical case of cancer (VSCC)	**350,000**	354,651 [302,862]
Value of cancer morbidity (VCM)	**410,000**	410,653 [350,686]

Other initiatives: SACAME

- “Socio-economic Analysis of Chemicals by Allowing a better quantification and monetisation of Morbidity and Environmental impacts”
- http://www.oecd.org/fr/env/outils-evaluation/sacame.htm

IED derogation assessment tool

- Provided by the Environment Agency in England and equivalents in devolved administrations
- https://www.gov.uk/government/publications/industrial-emissions-directive-derogation-cost-benefit-analysis-tool/ied-derogation-cost-benefit-analysis-cba-tool-user-guide



Valuation data in the tool

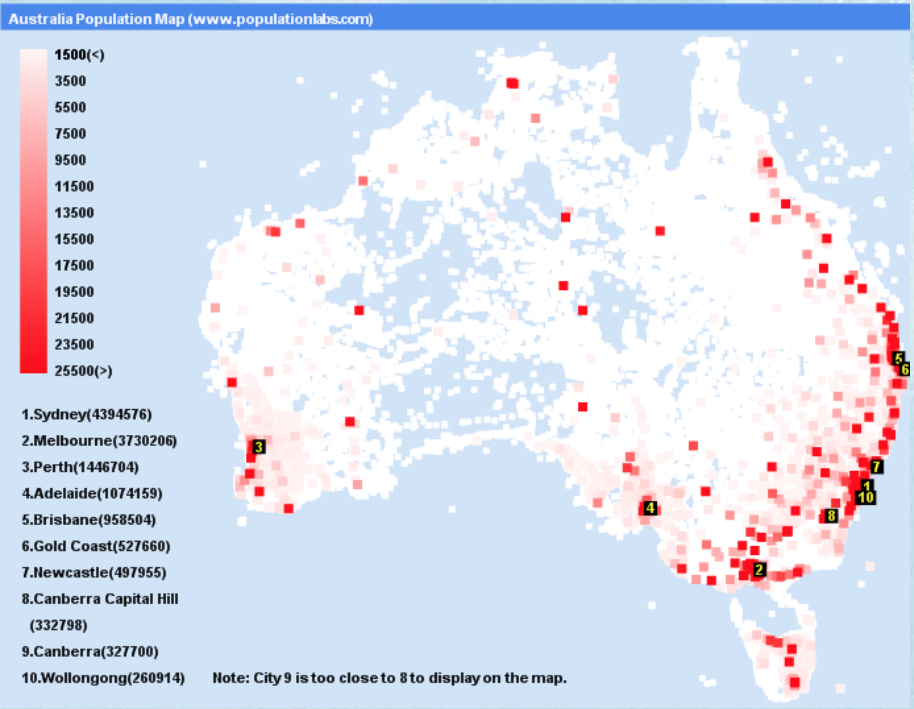
Air Quality Damage Costs <Back to List

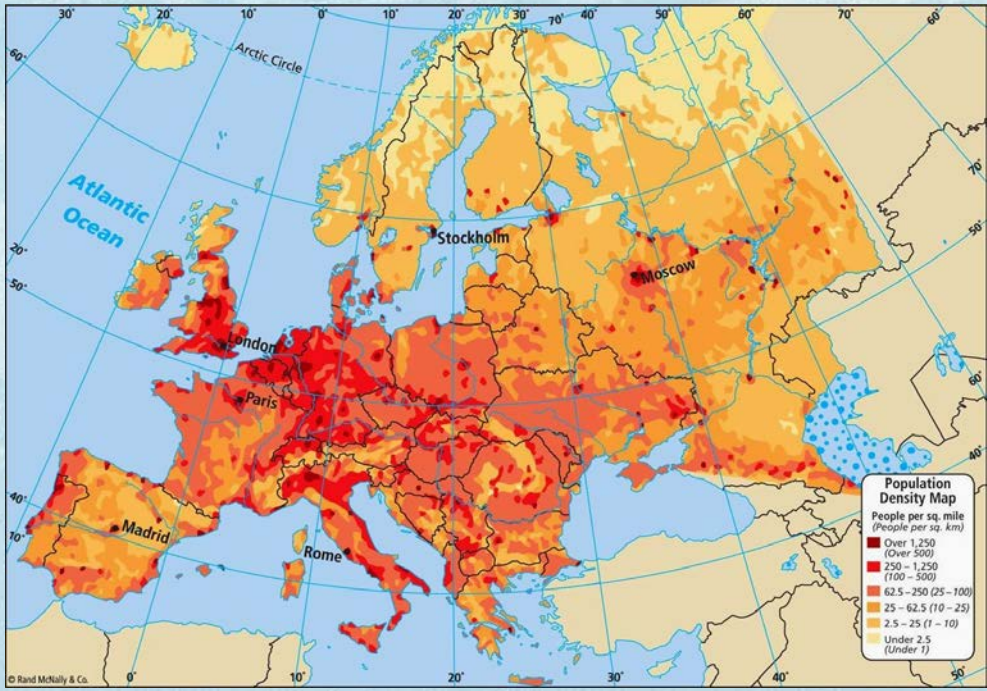
Damage costs for use in analysis	
Uplift Rate	1.02 (?)
Price base	0
Original price base	2015
IGCB NOX price base	2015
Deflation factor	#N/A
IGCB NOX Deflation factor	#N/A

Pollutant	EEA Pollutant Name	Data Values - Input Here: IGCB damage costs Low central range	IGCB damage costs High central range	IGCB damage costs Central Estimate	EEA values £/tonne
NOX Domestic	Nox	£ 5,859.00	£ 23,434.00	£ 14,646.00	£ 2,432.16
NOX Agriculture	Nox	£ 2,020.00	£ 8,080.00	£ 5,050.00	£ 2,432.16
NOX Waste	Nox	£ 4,343.00	£ 17,373.00	£ 10,858.00	£ 2,432.16
NOX Industry	Nox	£ 5,253.00	£ 21,010.00	£ 13,131.00	£ 2,432.16
NOX ESI	Nox	£ 505.00	£ 2,020.00	£ 1,263.00	£ 2,432.16
SOX	SO2	£ 1,581.00	£ 2,224.00	£ 1,956.00	£ 9,860.55
PM10 Domestic	PM10	£ 26,396.00	£ 38,311.00	£ 33,713.00	£ 17,041.49
PM10 Agriculture	PM10	£ 9,103.00	£ 13,211.00	£ 11,625.00	£ 17,041.49
PM10 Waste	PM10	£ 19,570.00	£ 28,403.00	£ 24,994.00	£ 17,041.49
PM10 Industry	PM10	£ 23,665.00	£ 34,347.00	£ 30,225.00	£ 17,041.49
PM10 ESI	PM10	£ 2,276.00	£ 3,303.00	£ 2,906.00	£ 17,041.49
Ammonia	NH3	£ 1,843.00	£ 2,685.00	£ 2,363.00	£ 6,496.00
Arsenic	Arsenic				£ 240,617.95

Australian mining – damage guidance

- Previous analysis based on extrapolation of UK damage/tonne estimates to Australia





Pacific Environment Study

- Reviewed evidence, proposed alternative approach
- Limitations of economic approaches also identified
  - Need to ensure protection of small groups against high exposures

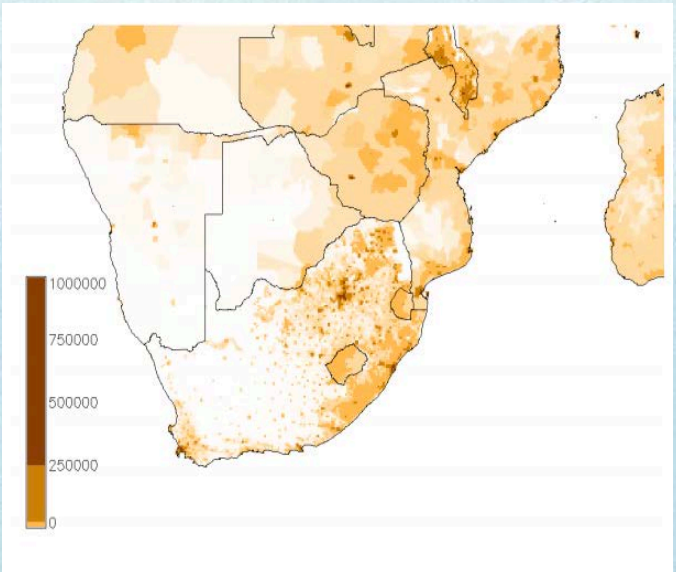
South African coal – power generation study

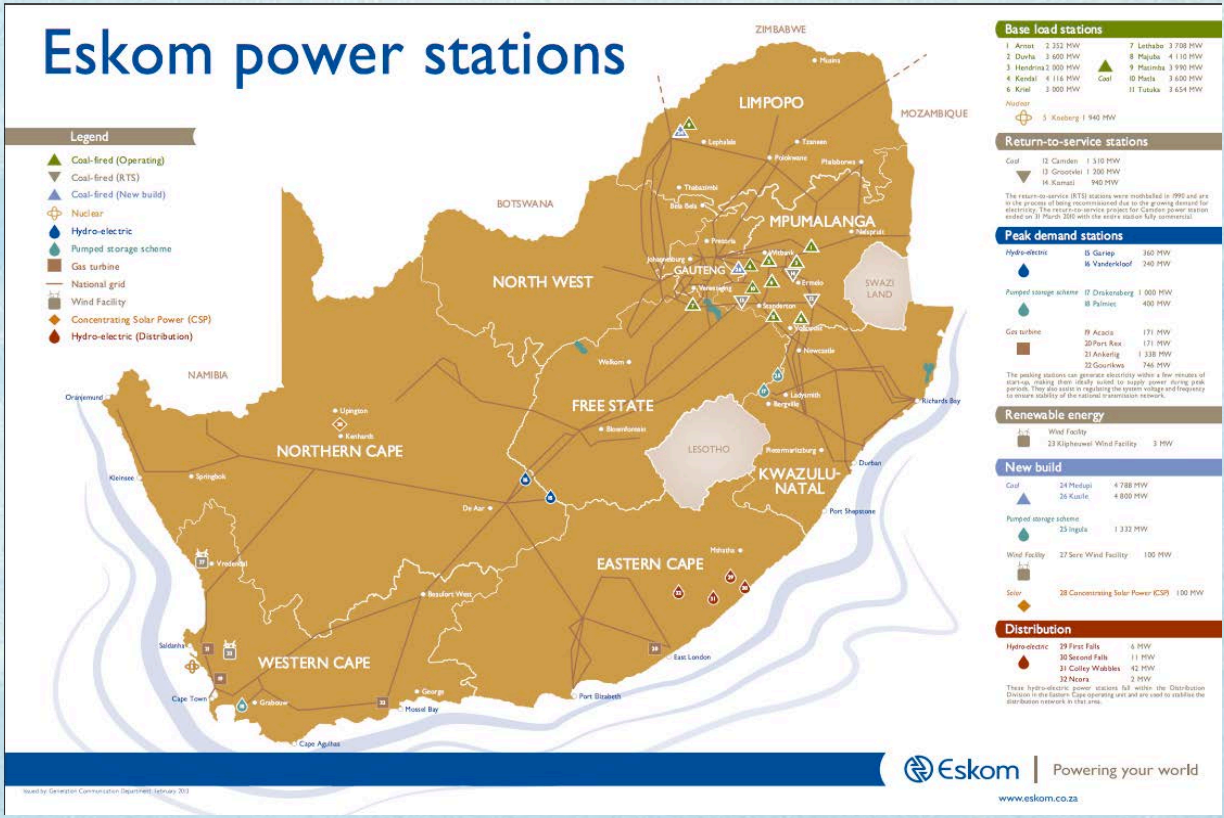
- Input to energy planning for South Africa
- Eskom seeking extensive derogations for coal plant

GROUNDWORK
environmental justice action

South African coal – power generation study

Population distribution





Impact assessment, estimated annual impacts from coal plant in South Africa

	Cases, etc	Value, $int, millions
Equivalent attributable deaths		
Lung cancer	*157*	
Ischaemic heart disease	*1,110*	
Chronic obstructive pulmonary disease	*73*	
Stroke	*719*	
Lower respiratory infection	*180*	
Total equivalent attributable deaths	**2,239**	**2,121.94**
Chronic Bronchitis (adults, cases)	2,781	64.64
Bronchitis in children aged 6 to 12	9,533	2.19
Equivalent hospital admissions	2,379	2.79
Restricted Activity Days (all ages)	3,972,902	132.72
Asthma symptom days (children 5-19yr)	94,680	1.44
Lost working days	996,628	47.05
Total costs		**2,372.78**

NHS transport impacts study

- NHS is one of the world's largest employers

Employer	Employees		Headquarters
	2015[1]	2010[2][3]	
United States Department of Defense	3.2 million		United States
People's Liberation Army	2.3 million		China
Walmart	2.3 million		United States
McDonald's[note 1]	1.9 million	1.7 million	United States
National Health Service	1.7 million	1.4 million	United Kingdom
China National Petroleum Corporation	1.6 million	1.7 million	China
State Grid Corporation of China	1.5 million	1.6 million	China
Indian Railways	1.4 million		India
Indian Armed Forces	1.3 million		India
Hon Hai Precision Industry (Foxconn)	1.3 million	0.8 million	Taiwan[4]

NHS transport impacts study

- Impacts
  - Air pollution, accidents, noise, climate, benefits of active travel
- Scope
  - Staff commuting, business travel, patients, visitors, supply chain
- Resolution
  - Local level (hospital trusts, ambulance trusts, primary care providers)
- Results out soon!

Summary

- Benefits analysis and CBA continue to be used extensively across Europe and increasingly the world
- Growing convergence of approaches
- Broader range of health concerns are being addressed
  - But more need to be considered
- Limited further development regarding:
  - Ecosystem damage assessment
  - Integration of further health impacts
- Useful to know of further applications and developments at the national level (email mike.holland@emrc.co.uk)