



Business Environment Council

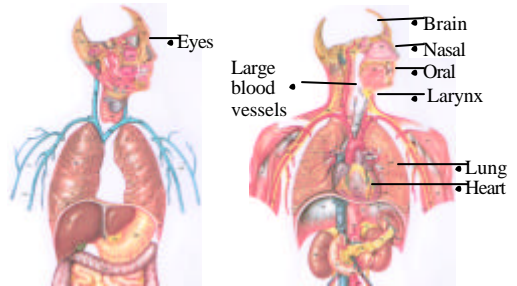
AIR POLLUTION AND HEALTH: The Silent Killer

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AIR POLLUTION TARGET VITAL ORGANS



Encyclopaedia Britannica, Inc.

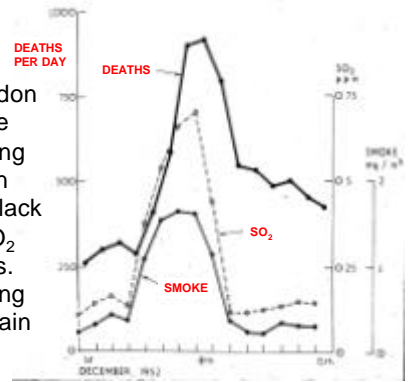
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In the London smog of 1952, bus conductors walked in front of the bus to show the drivers the road ahead.



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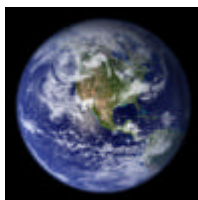
In the London smog there was a strong association between black smoke, SO₂ and deaths. Coal burning was the main source.



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AIR POLLUTION: a global epidemic

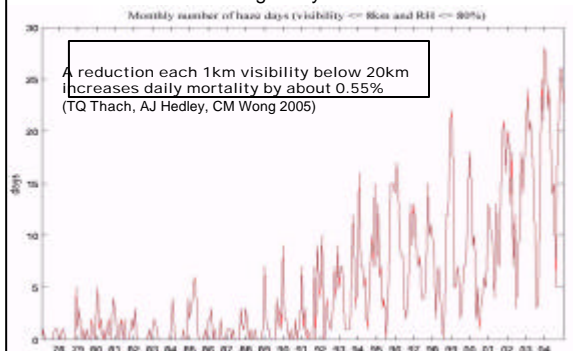
- World Health Organisation estimates 1.73 and >9 million lost life years
- In Asia pollution causes loss of health, life, crops and economic growth
- New research in Asia is needed to identify harm, costs and drive environmental policies



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Visibility Report (1977 – 2004)

From original by HKUST





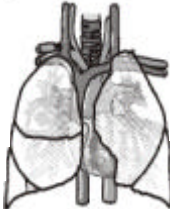
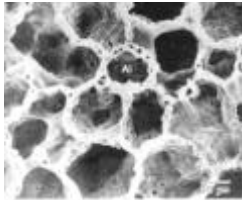
“Criteria” Air Pollutants

FINE PARTICULATES (<2.5 micrometres*)	GASES
<ul style="list-style-type: none"> • Carbon • Sulphate • Nitrate • Metals 	<ul style="list-style-type: none"> • Nitrogen oxides • Sulphur oxides • Ozone

* micrometre = millionth of a metre

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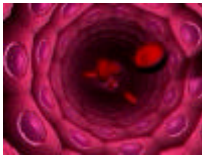
Sensitive receivers of polluted air: Inflammation in the pulmonary alveoli

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The arterial endothelial cell: loss of control of coagulation and arterial dilatation

Air pollutants damage clotting mechanisms and the lining cells of arteries reducing ability to deliver oxygen to vital organs



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The pyramid of harm from pollution

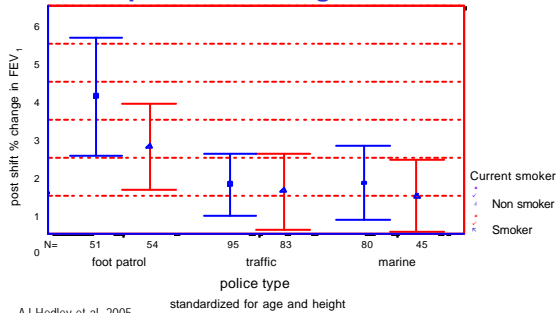
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Slow moving traffic in “canyon streets” causes high roadside concentrations




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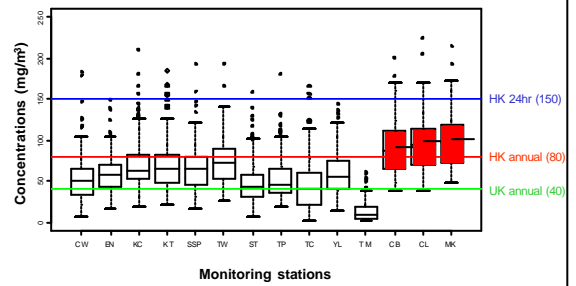
Street level pollution causes acute impairment of lung function



AJ Hedley et al. 2005

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Distribution of daily NO₂ among monitoring stations, 2003



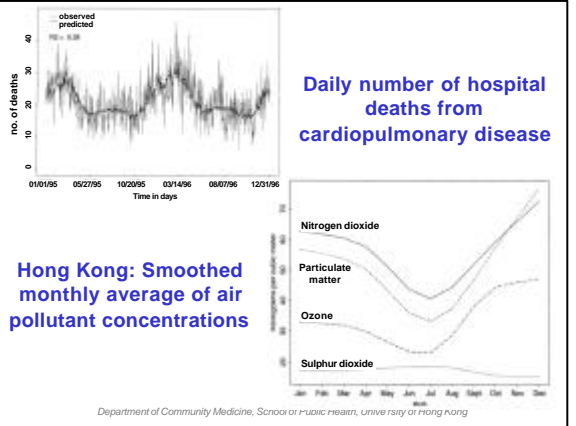
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Current exposure to air pollution

- 46% of people in Hong Kong live 5 minutes from a road with lots of traffic
- 26 hours per week is spent outdoors
- 12 hours (46%) near a busy road
- So more than half the population is exposed regularly to **ROADSIDE** pollution levels



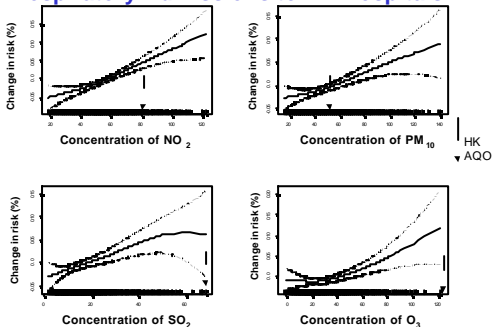
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Hong Kong: Smoothed monthly average of air pollutant concentrations

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Air Quality Standards: do they protect health? Respiratory Admissions to HA Hospitals



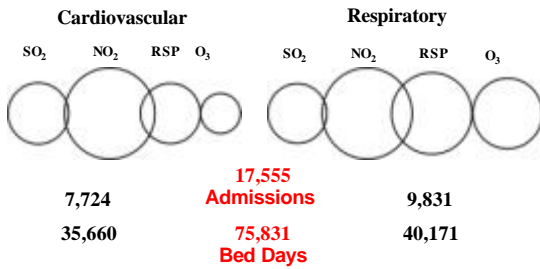
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The harm to health is caused by **average daily levels**, not just by very high levels



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Risk of hospital admissions Hospital Authority patient admissions due to average levels of pollutants



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Avoidable deaths: at 2000 death rates

Estimate 2,500
 ↓
 95% upper bound 3,800



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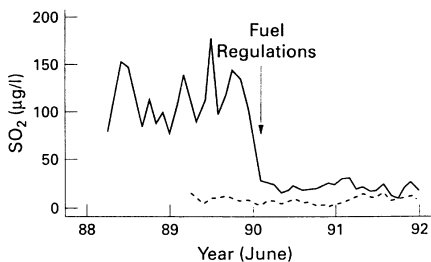
THE HONG KONG AIR QUALITY INTERVENTION 1990



Kwai Tsing
 On July 1st 1990 the Environmental Protection Department restricted the sulphur content of fuel to 0.5% by weight

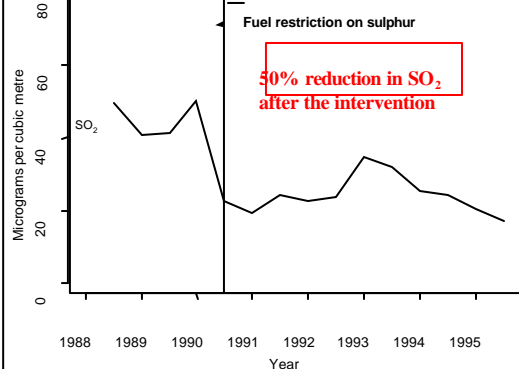
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1990: Reduction in SO₂ following sulphur restriction to 0.5% weight

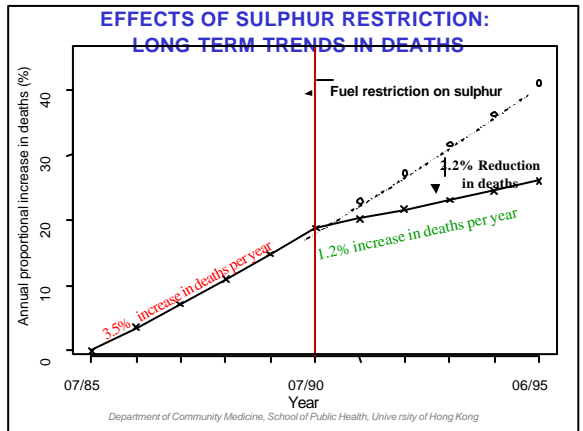
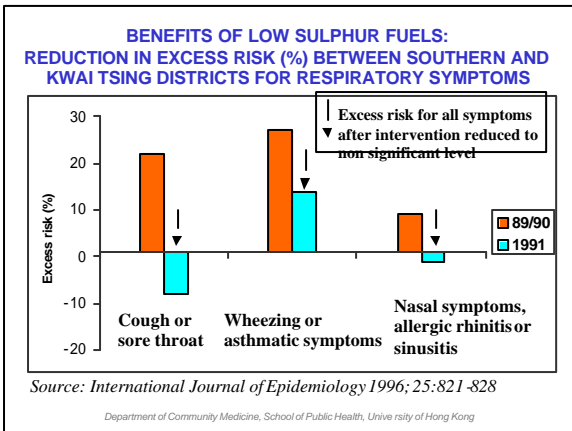
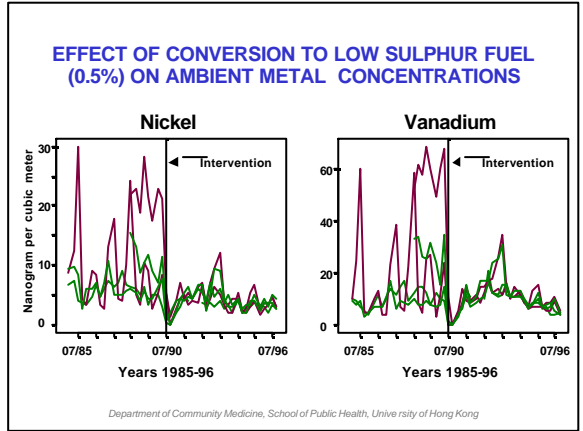
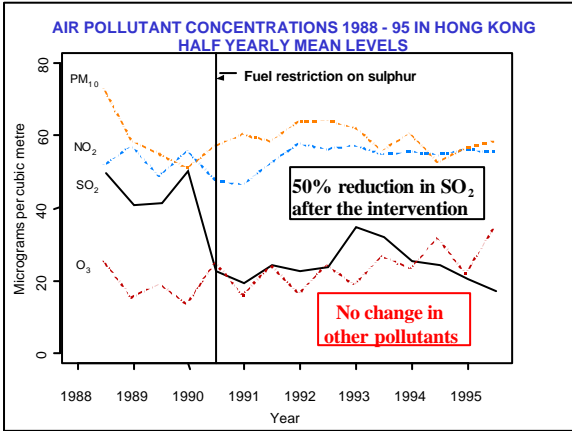


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SULPHUR DIOXIDE CONCENTRATIONS 1988 - 95 IN HONG KONG HALF YEARLY MEAN LEVELS



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Reductions in sulphur avoid premature deaths for hundreds of citizens

- 600 deaths
- 10,000 years of life per year

More deaths would be avoided with bigger reduction in SO₂, and also fine particulates and NO₂

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South China Morning Post

HONG KONG

Forget the smog, let's make money

Hospital admissions rise with pollution academic

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THE \$ COSTS OF AIR POLLUTION: direct costs

- Using ambient levels of NO₂ and PM (NO₂+ 0.58 PM)

Hospital admissions: **HK\$148 million** annually

GP visits: **HK\$1,442 million** annually

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VALUE OF EARLY EFFECTS OF HEALTH DAMAGE TO POLLUTION



- Around 20% population report cough due to air pollution
 - Even if only 10% and if they only cough on 49 worst days
 - 33 million cough days a year**
- If willing to pay \$184 to avoid a cough day
 - = HK\$6 billion per year**

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Valuing life years in economic terms (Hong Kong dollars)

- \$1.5m per life year**, discounted 11% (individual value) or
- \$150,000 per life year**, discounted 3% (societal value)
- \$300-600 billion for those currently alive**

SM McGhee and W Barron
University of Hong Kong

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West Island/South Island rail lines

- If rail lines are built, fewer cars will travel on local roads and traffic-related air pollution will decrease
- We can model the pollution decrease and estimate reduction in:
 - health care expenditure
 - illness episodes
 - hospital admissions death



Civic Exchange and Plan Arch Consultants
for MTRC Ltd Hong Kong

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West Island/South Island rail lines

- With conservative assumptions
 - reductions in hospital admissions, doctor visits and productivity loss **are worth HK\$22.4 million annually**
 - coughs avoided are worth HK\$68 million annually**



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Today sources of pollution are different but the risk to health is increasing



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Eliminate use of "Bunker C" fuel in the Pearl River Delta

"Bunker C" is a dense viscous oil from blending heavy residual oils rich in sulphur and metals



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Conclusion on health and costs

- For air pollution, now have enough local and overseas evidence to estimate the impact on health of variations in pollution
- We can value some these health impacts in \$; both direct costs and e.g. value of life years lost
- **Impact of air pollution from new developments can be valued in health and monetary terms**

There will be a net loss from pollution

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The New York Times

May 7, 2005

Hong Kong's Disneyland

Where's Mickey?
(Hidden in the smog)



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AIR QUALITY: THE PRESENT AND FUTURE INDICATIVES

- Air quality interventions lead to major health gains
- Air quality control needs:
 - * epidemiological data
 - * public support
 - * political will
- **The future for Hong Kong's air is uncertain:**
 - * population growth
 - * demand for energy
 - * need for transportation
 - * non-interventionist culture
 - * doubt about willingness to pay

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In Hong Kong?

- A reduction of $25\mu\text{g}/\text{m}^3$ in PM_{10} adds an average of a whole year of life for every person in the population (US data)
- Hong Kong's ambient particulate level is about $50\mu\text{g}/\text{m}^3$. **Eliminating this would give an average of 2 years of additional life to everyone**
- A reduction of $25\mu\text{g}/\text{m}^3$ SO_2 led to an average 2.5 years of additional

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