Health impact assessment of PM$_{10}$ exposures in the city of Caen, France.

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Context and objectives

The city of Caen is located in north-western France. Air pollution is mainly due to traffic sources. The aim of this work is to assess the public health impact of both short (with short term effects) and chronic (with long term effects) exposures to PM$_{10}$.

Methods

The standard World Health Organisation (WHO) methodology (1) for an Health Impact Assessment (HIA) has been used to calculate the attributable deaths and hospital admissions. Population exposure is estimated from PM$_{10}$ (Particulate Matter <10 µm) concentrations collected by the local air quality measurement network : Aircom. The relative risks have been modelled by the exposure-risk functions established in epidemiologic studies carried out in the general population. The Aphea-2 (2-4) program, wich combines european time-series studies, have been used for short exposures effects, and a meta risk calculated (5) from cohort studies for long exposures effects. Health impact have been calculated with the EIS-PA software (6) to assess :

• for the short exposures : total impact with reference to the baseline level of 10 µg/m3, health gain for a daily 10 % reduction of pollution, health gain for a daily compliance to 40 µg/m3 (EU regulatory level for annual mean in 2005)

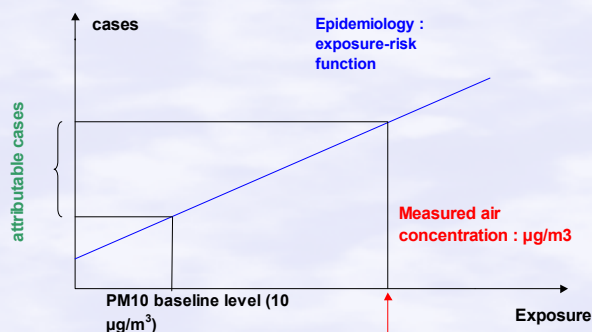• for the chronic exposures : health gain for a 5 µg/m3 annual reduction.

Fig 1. HIA principle

	PM10 (µg/m3)
Min	2
P 5	7
P 25	12
P 50	17
P 75	25
P 95	42
Max	87
Daily mean	19
Standard deviation	11,4
% missing values	1%

Table 1. PM 10 outdoor exposures, Caen 1998-2002.

Findings

Table 2 : health impact of outdoor particulate air pollution. Caen 1998-2002.

|	Health effect	Attributable cases (CI 95 %)
Short term	Anticipated death	26 (17-35)
	Respiratory hospital admissions	16 (11-23)
	Cardiovascular hospital admissions	27 (11-44)
Long term	Mortality	90 (54-126) *

* for a 5 µg/m^3 reduction of the annual mean.

Fig 2. Health efficiency of particulate air pollution policy scenarios, Caen 1998-2002.
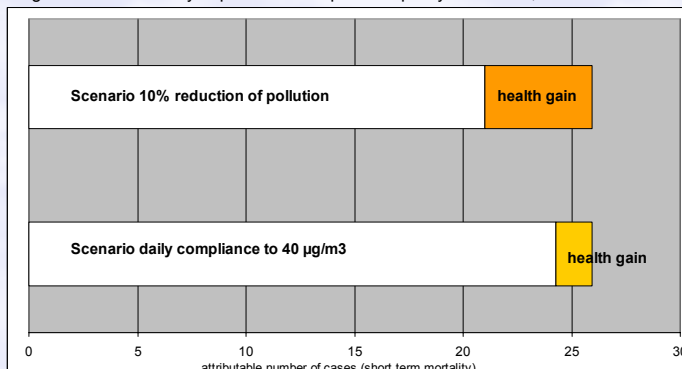
Reducing daily levels of pollution is more efficient than avoiding peaks. Health impact is mainly due to moderate, but frequent, levels of pollution.

Fig 3, Health impact vs exposure levels. Caen 1998-2000.
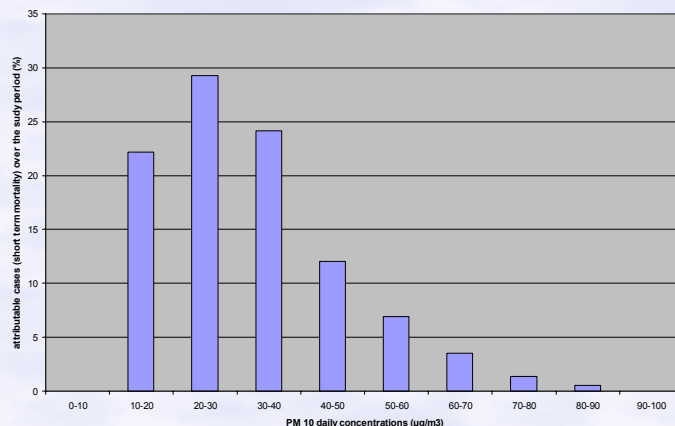
Discussion

Some major uncertainties and ways of reducing it :

• **long term effects : validity in Europe, and accuracy of relative risks : to go ahead with European cohort studies**

• **hazard identification/health end points : major effects such as bronchitis and asthma attacks could not be assessed : to know the local baseline risks in France**

Variability and its uses :

• **geographic : when necessary (town planning), needs to be assessed with population time activity patterns inquiries and city wide PM10 measurements**

• **temporal : it has been used here to describe the respective contribution of polluted and 'normal' days.**

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