HEALTH IMPACT ASSESSMENT OF AIR POLLUTION

ENHIS-1 PROJECT: WP5 HEALTH IMPACT ASSESSMENT

LOCAL CITY REPORT

Lille

Summary of main findings for Lille

In 2001 the PM_{10} annual mean (SD) was 21 (12) µg/m^3 (27 (19) µg/m^3 when a correction is applied in order to compensate losses of volatile compounds due to the TEOM measurement method), above the 1999/30/EC Directive limit value for 2010 (20 µg/m^3), and below that established for 2005 (40 µg/m^3). For the summer period of the same year, the mean (SD), P5 (5th percentile) and P95 of the maximum daily 8-hour moving average concentration of ozone (O_3) were 73 (26), 38 and 127 µg/ m^3.

Regarding children, infant mortality in Europe is quite low and consequently, the expected attributable number of deaths related to air pollution is also very low. All other things being equal, the reduction of the annual average levels of PM_{10} to 20 µg/m^3 would prevent 0.71 total postneonatal deaths. Reducing PM_{10} daily mean values to 20 µg/m^3 would prevent 15.7 hospital respiratory admissions of children under 15 years old.

As far as short-term effects of O_3 in summer are concerned, all other things being equal, each reduction by 10 µg/m^3 of the daily maximum 8-hour moving average concentrations would delay 11.52 deaths per year in the general population in the study area, 4.98 from cardiovascular diseases, and 3.06 from respiratory causes. In terms of hospital admissions, this would represent 1.4 respiratory admissions in the adult (15-64 years old) population and 6.89 in the population over 64 years.

Summary of HIA of outdoor air pollution in Lille in ENHIS-1

Health outcome	**Population**	**Pollutant**	**Period**	**Mean type**	**RR (for 10 µg.m^3 increase)**	*References*	**Number of attributable cases by scenario[1]**	
Mortality							**Ozone: Reduction by 10 µg.m^3**	**PM_{10}: Reduction by 5 µg/m^3**
Total mortality excluding external causes (ICD9 < 800 - ICD10 A00-R99)	All ages	O_3 8h max	Summer[2]	Daily	1.0031 (1.0017-1.0052)	Gryparis et al 2004	11,52	
Cardiovascular mortality (ICD9 390-459 - ICD10 I00-I99)					1.0046 (1.0022-0.0073)		4.98	
Respiratory mortality (ICD9 460-519 - ICD10 J00-J99)					1.0113 (1.0074-1.0151)		3.06	
Total postneonatal mortality	1 month-1 year	Corrected PM_{10}[3]	Year	Annual	1.048 (1.022-1.075)	Lacasaña et al 2005		8.12
Postneonatal respiratory mortality (ICD9 460-519 - ICD10 J00-J99)					1.216 (1.102-1.342)			0
Postneonatal Sudden Infant Death Syndrom Mortality (ICD9 798.0 - ICD10 R95)					1.12 (1.07-1.17)	Woodruff 1997		8.65
Morbidity								
Emergency room visits for asthma (ICD-9 codes 493. ICD-10 codes J45, J46)	< 18 years	O_3 1h max	Year	Daily	1.0115 (1.0067-1.0163)	CARB 2004	Not available	
Cough	< 18 years	Measured PM_{10}			1.0407 (1.0202-1.0511)	Ward and Ayres 2004		Not available
Lower respiratory symptoms LRS	<18 years	Measured PM_{10}			1.0407 (1.0202 -1.617)	Ward and Ayres 2004		Not available
Hospital respiratory admissions (ICD9 460-519 - ICD10 J00-J99)	< 15 years	Measured PM_{10}			1.010 (0.998-1.021)	Anderson et al 2004		31,24
Hospital respiratory admissions (ICD9 460-519 - ICD10 J00-J99)	15 - 64 years	**O_3 8h max**	Summer		1.001 (0.991-1.012)		2.57	
Hospital respiratory admissions (ICD9 460-519 - ICD10 J00-J99)	> 64 years				1.005 (0.998-1.012)		12.64	

[1] For ozone: absolute reduction by 10 µg/m^3. For PM_{10} absolute reduction by 5 µg/m^3.

[2] Definition of summer period : 01 April – 30 September

[3] PM_{10} reference papers for HIA on postneonatal mortality use gravimetric methods to measure PM_{10}. If the local air quality network uses automatic methods (TEOM or other) a correction factor is required to compensate for loss of volatile compounds: if available, a local correction factor recommended by the air quality network or, by default, the European factor 1.3.

Introduction

In the North of France, the metropolitan area of Lille has a population slightly more than 1 million inhabitants. Its population is relatively young compared to other French cities with only 12.8% of people aged 65 years +.

In comparison, with the national level, the metropolitan area of Lille, is characterized by an 19% excess of mortality all causes in men and of 14% in women, an 27% excess of death du to cancer in men and of 20 % in women.
More precisely, this excess of mortality is of 40% for lung cancer in men and 30% for breast cancer 74 % [1]. We also observe 19% of excess of cardiovascular mortality in men and of 12 % in women, as well an 31.5% % excess of ischiemic cardiovascular mortality in men and of 26 % in women. [2]

In the 90's, in the region North of France, the post neonatal mortality rate has been decreasing constantly. In 1999, it was slightly higher than in France: 1.6 vs 1.8 per 10000 alive births.[3]

An air pollution Health Impact Assessment (HIA) have been previously carried out in the Lille study area, especially during the phases 2 and 3 of the Apheis program. The most recent analysis (Apheis 3) estimated that, for over 30 old people, reducing the annual $PM_{2.5}$ average pollution level by 3.5 µg/m^3, could theoretically avoid about 8 years of life lost per 100 000 inhabitants, in 2001.

As well, if all the daily means of PM_{10} would be kept to 20 µg/m^3, 190 deaths and around 600 hospital admissions could have been avoided per year in Lille in 2001.

This report presents the results obtained for the Lille study area. After a brief description of air pollution sources, exposure and health data, the results of the HIAs conduced on postneonatal mortality, cardiovascular and respiratory mortality, and respiratory hospital admissions in relation with ozone (short-term) and PM_{10} (short- and long-term) are presented.

This work has been carried out within the framework of work package WP5 on health impact assessment of ENHIS-1 project (www.enhis.net).

Sources of air pollution

In the urban community of Lille, the main source of air pollution is traffic responsible of 72% of NOx emissions, 66% of CO emissions and 42 % of non methane volatile organic compound. In these last years, the concentrations in NO2 diminish and currently seldom exceeded the limit values, the SO2 air concentrations decreased, industries continuing to play major role (49%) in this air pollution. The concentrations in O3 and PM_{10} are in rise and going beyond occasionally the legal limit threshold.

Exposure data

- Air pollution data was provided by the Lille metropole air quality network : ATMO Nord-Pas de-Calais. Five urban monitoring sites provided with PM_{10} data and six urban and peri-ruban monitoring sites measured the levels of ozone within the study area in 2001.

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[1] *Source: Mortality by cancer in Nord-Pas-de-Calais : Observatoire Régional de la Santé Nord-Pas-de Calais: Report, February 2003*

[2] *Source : INSEE Rgp 99, INSERM Centre d'épidémiologie sur les causes médicales de décès-CépiDc. Traitement ORS Nord - Pas-de-Calais.*

[3] *Source: Fédération nationale des observatoires régionaux de la santé fédération www.fnors.org/Score/accueil.htm*

- For HIA purpose for chronic exposure, ENHIS recommended to correct TEOM PM_{10} in order to compensate losses of volatile compounds, because the corresponding RRs were obtained using gravimetric PM_{10} as a measure of exposure. In Lille, as part of the French national pilot program for PM surveillance, specific polynomial regression has been used for each city PM_{10} correction. The coefficients of these regressions were derived from parallel PM_{10} measurements within each city[4].

- How indicators have been calculated:

    - PM_{10}: daily exposure indicator has been calculated as the arithmetic mean of the daily concentrations of the stations.

    - Ozone: the daily maximum 1-hour indicator has been calculated as the arithmetic mean of the 1-hour maximum of the stations. The daily maximum 8-hour moving averages of each day have been calculated as the arithmetic mean of the maximum 8-hour moving averages of the stations for the summer period (1st April to 30th September).

- The annual mean level (SD) of corrected PM_{10} in Lille was 27 (19) µg/m^3, and P5 and P95 of the daily mean values were, respectively, 11 µg/m^3 and 54 µg/m^3. The mean (SD), P5 and P95 of the daily maximum 8-hour moving average concentrations of O_3 were, respectively, 73 (26), 38 and 127 µg/ m^3, and those of the daily maximum 1-hour concentrations 64 (32), 12 and 126 µg/m^3. (Table 1 and figures 1 -3)

- Corrected PM_{10} levels were lower than the limit value for 2005 (40 µg/m^3). However, corrected PM_{10} levels were slightly higher than the limit value for 2010 (20 µg/m^3). Daily ozone levels (both 1-hour and 8-hour maximum) show a large variability. There are a few days during the summer when ozone levels are higher than 120 µg/m^3. In 2001 the information threshold (180 µg/m^3 for 1-hour average) was never overshot.

- Daily corrected PM_{10} levels show a smaller variability. During more than 72% of the days, the daily mean value is less than 30 µg/m^3. During slightly less than 42% of the days, the daily mean value is lower than 20 µg/m^3. Three days reach a level greater than 140 µg/m^3).

Table 1. Descriptive statistics for ozone and PM_{10} levels in Lille area, 2001

	O3 8h - summer	O3 1h max - year	Corrected PM_{10} - year
Number	183	365	365
Minimum	19	2	7
Percentile 5	38	12	11
Percentile 25	55	48	16
Median	69	62	22
Percentile 75	82	80	32
Percentile 95	127	126	54
Percentile 98	133	148	76
Maximum	153	174	210
Daily mean	73	64	27
standard error	26	32	19
% missing values	0.00%	0.00%	0.00%

[4] Jean-Luc HOUDRET, François MATHE. Programme pilote national de surveillance des particules PM10 et PM2.5. Ecole des mines de Douai, Département Chimie et environnement, Etude n°10. 2003

Fig 1. Distribution of O3 8h max in Lille - summer 2001

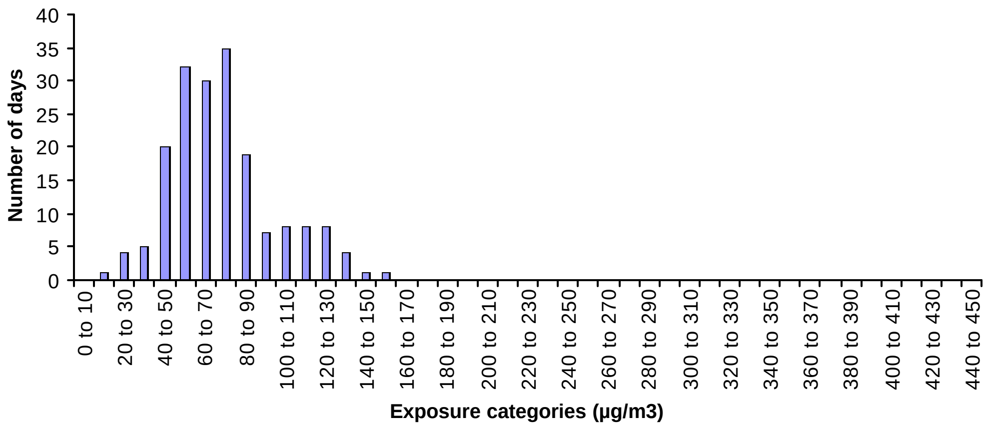


Fig2. Distribution of O3 1h max in Lille - year 2001

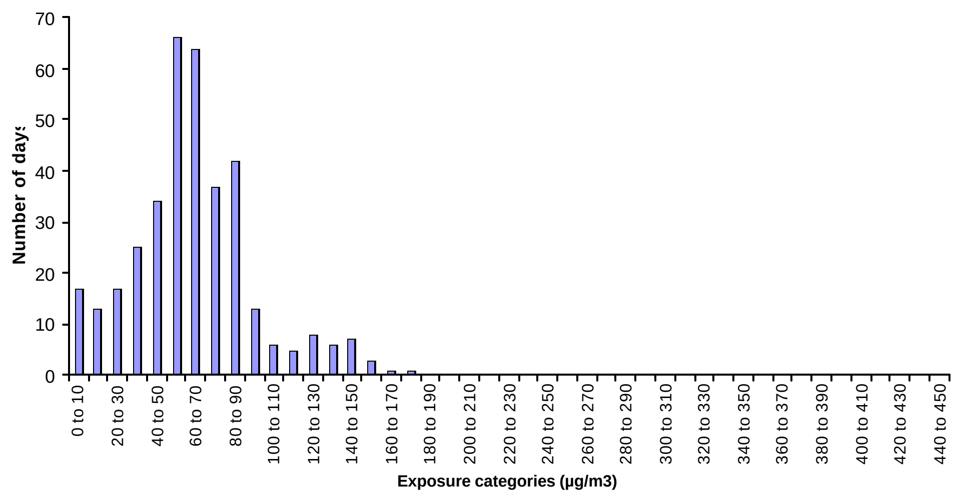
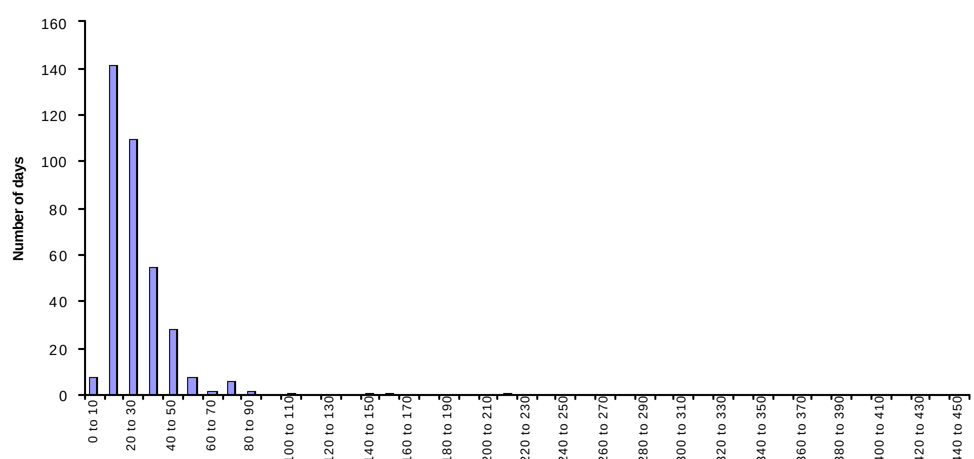


Fig 3. Distribution of corrected PM_{10} in Lille - year 2001



Health data

- Mortality data were obtained from the Institut National de la Santé et de la Recherche Médicale (CepiDC). The CepiDC is a register. There are no missing data, and a quality control program is applied. Death causes for year 2001 were coded according to ICD-10. Most of the coding (about 80%) was automated.
- Hospital admissions data concerned public hospitals and were extracted from the Information Systems Medicalisation Program (PMSI) by the French Institute of Public Health (InVS). These data represent about 80% of the total hospital admissions performed in the whole study area, and contain both emergency and scheduled hospital admissions. Hospital admissions causes for year 2001 were coded according to ICD-10.
- Data concerning specifically emergency hospital admissions, emergency room visit for asthma, cough or lower respiratory syndromes were not available for Lille study area, and hence no HIA was conduced for these indicators.

The daily mean of deaths in the general population (excluding external causes) was 20.7 (daily rate: 1.9 per 100,000 persons) among those 6.1 (daily rate: 0.6 per 100,000 persons) were due to cardiovascular causes, and 1.3 (daily rate: 0.1 per 100,000 persons) were due to respiratory causes.

The total number of postneonatal deaths in 2001 was 22 (annual rate 151.1 per 100,000), among which 10 were classified as sudden infant death syndrome.

During 2001, the daily rate of respiratory hospital admissions for children under 15 was 1453 per 100,000, this rate among people aged 65 and more was 2139 per 100, this for people age between 15 and 64: 390 per 100,000 (Table 2)

Table 2 . Descriptive statis tics for health outcomes in Lille area, 2001

Health outcome	ICD9	ICD10	Annual number	Annual rate per 100 000	Daily mean (SD)	Daily rate per 100 000	Annual incidence rate (per 100 000)
POSTNEONATAL MORTALITY							
Total			22.0	151.1			
Respiratory *ICD9 460-519 ICD10 J00-J99*	460-519	J00-J99	0.0	0.0			
Sudden infant death syndrome *ICD9 798.0 –ICD10 R95*	798.0	R95	10.0	68.7			
GENERAL POPULATION MORTALITY							
Total mortality all causes *ICD9 <800 ICD10 A00-R99*	<800	A00-R99			20.7 (4.6)	1.9	
Cardiovascular mortality *ICD9 390-459 ICD10 I00-I99*	390-459	I00-I99			6.1 (2.5)	0.6	
Respiratory mortality *ICD9 460-519 ICD10 J00-J99*	460-519	J00-J99			1.6 (1.3)	0.1	
MORBIDITY							
Cough					not available		
Lower respiratory symptoms LRS					not available		
Emergency room visits for asthma - Age < 18 years *ICD9 493, ICD10 J45 J46*	493	J45-J46			not available		
Hospital respiratory admissions - Age < 15 years *ICD9 460-519 ICD10 J00-J99*	460-519	J00-J99					1453.0
Hospital respiratory admissions - Age 15 -64 years	460-519	J00-J99					390.0
Hospital respiratory admissions - Age > 64 years	460-519	J00-J99					2139.0

Health Impact Assessment

Methodology

Health impact of air pollution (AP) has been calculated as the annual number of health events attributable to AP in the target population. A causal relationship between AP and the effects is assumed, and therefore HIA can only be performed for those outcomes with sufficient evidence of causality. Once the effects with sufficient evidence of causal relationship with AP have been determined, the next step is to find the best exposure-response functions (ERFs) for each of the selected outcomes. Table 3 shows the result of a systematic review on these issues carried out by the Bilbao Apheis team[5] for WP5 of ENHIS-1. This table summarizes the health outcomes and ERFs deemed suitable for HIA according to the criteria established by WP5 with the advice of the air pollution experts of WP5[6].

Table 3. Health outcomes and Exposure-response functions (ERFs) selected for health impact assessment

	OUTCOME	POLLUTANT	ERFs	ORIGINAL SOURCE
CHILDREN - PARTICLES				
	Total postneonatal mortality (1 month-1 year)	PM_{10} Annual Mean	RR=1.048 (1.022-1.075) ?10 µg/m^3	Lacasaña et al 2005
	Postneonatal respiratory mortality ICD9 460-519 ICD10 J00-J99	PM_{10} Annual Mean	RR=1.216 (1.102-1.342) ?10 µg/m^3	Lacasaña et al 2005
	Postneonatal Sudden Infant Death Syndrome (SIDS) mortality (normal birth weight =2500g) ICD9 798.0 –ICD10 R95	PM_{10} Annual Mean	Adjusted Odds Ratio AOR=1.12 (1.07-1.17) ?10 µg/m^3	Woodruff et al. 1997
	Cough	PM_{10} Daily Mean	OR=1.041 (1.020-1.062) ?10 µg/m^3	Ward & Ayres 2004
	Lower respiratory symptoms LRS	PM_{10} Daily Mean	OR=1.041 (1.020-1.051) ?10 µg/m^3	Ward & Ayres 2004
CHILDREN – OZONE				
	Emergency room visits for asthma <18 Y ICD9 493, ICD10 J45 J46	Ozone Maximum 1 h	RR=1.0116 (1.0067-1.0165) ?10 µg/m^3	CARB 2004
ADULTS/GENERAL POPULATION				
	Total mortality all causes ICD9 <800 ICD10 A00-R99	Ozone Maximum 8 h Summer	RR= 1.0031 (1.0017-1.0052) ?10 µg/m^3	Gryparis et al 2004 (APHEA 2)
	Respiratory mortality ICD9 460-519 ICD10 J00-J99	Ozone Maximum 8 h Summer	RR= 1.0113 (1.0074-1.0151) ?10 µg/m^3	Gryparis et al 2004 (APHEA 2)
	Cardiovascular mortality ICD9 390-459 ICD10 I00-I99	Ozone Maximum 8 h Summer	RR= 1.0046 (1.0022-1.0073) ?10µg/m^3	Gryparis et al 2004 (APHEA 2)

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5 Cambra K, Alonso E, Cirarda FB, Martínez-Rueda T. Bilbao APHEIS group. Selection of outcomes and exposure response functions for health impact assessment of particles and ozone. Review of the evidence. ENHIS project. WORK PACKAGE 5. Bilbao, February 2005. Http:

6 Ferran Ballester: Valencian School of Health Studies, Valencia, Spain; Sylvie Cassadou: National Institute of Public Health Surveillance, InVS, Toulouse, France; Fintan Hurley: Institute of Occupational Medicine, Edinburgh, Scotland, UK; Nino Künzli: University of Southern California, Division of Occupational and Environmental Health, Los Angeles, CA, USA; Odile Meckel: Institute of Public Health NRW (LOEGD), Bielfeld, Germany; Hans-Guido Mücke: WHO Collaborating Center (Air)-Federal Environmental Agency, Berlin, Germany; Nikolaos Stilianakis: Institute for Environment and Sustainability, European Commission – JRC, Ispra, Italy.

To be coherent with mortality findings, it was decided, with the experts' advice, to include RRs of hospital admissions in the health impact assessment calculations, even if they were not statistically significant. More concretely, it was decided that if there was not any new RR published by the time of making the calculations, the RRs for respiratory hospital admissions from Anderson's meta-analysis could be used, although they were not statistically significant (see Table 2). The rationale for that is that if there is sufficient evidence to accept a causal relationship between air pollution and respiratory mortality -both in children-PM and adults-O_3- we should easily accept that there will also be an impact on hospital admissions.

Table 4. Complementary Exposure-response functions (ERFs) for health impact assesment on respiratory hospital admissions for children (particles) and adults (ozone)

	OUTCOME	POLLUTANT	RR	SOURCE
CHILDREN - PARTICLES				
	Respiratory hospital admissions 0-14 Y ICD9 460-519 ICD10 J00-J99	*PM_{10}* Daily Mean	*RR= 1.010 (0.998-1.021) ?10 µg/m³*	*Anderson 2004*
ADULTS/GENERAL POPULATION				
	Hospital respiratory admissions 15-64 Y ICD9 460-519 ICD10 J00-J99	*Ozone Maximum 8 h*	*RR=1.001 (0.991-1.012) ?10 µg/ m³*	*Anderson et al 2004*
	Hospital respiratory admissions >64 Y ICD9 460-519 ICD10 J00-J99	*Ozone Maximum 8 h*	*RR=1.005 (0.998-1.012) ?10 µg/m³*	*Anderson et al 2004*

Finally, HIA needs defining the evaluation scenarios, i.e. the hypothetical scenario with which we want to compare the current air pollution situation. We calculate the impact on health of the (current) air pollution levels in the city that are above the pollution level of the evaluation scenario. In other words, the attributable number of health events (deaths, hospital admissions…) calculated for each scenario represents the number of events that would be prevented if, all other things being equal, air pollution levels were reduced to the evaluation scenario level. These evaluation scenarios are based on the objectives and limits established in 1999/30/CE, and 2002/3/CE Directives.

HIA scenarios

1 - HIA scenarios for PM_{10}

1.1.- Scenarios for HIA on **short-term** effects of PM_{10} and **cough, lower respiratory symptoms** in people under 18 year (<18), and **hospital respiratory admissions** in people under 15 year (< 15)

1.1.1 Reduction of PM_{10} levels to a 24-hour value of **50 µg/m³** in all days exceeding this value (Limit of 1999/30/CE Directive)

1.1.2. Reduction of PM_{10} levels to a 24-hour value of **20 µg/m³** in all days exceeding this value

1.1.3 Reduction **by 5 µg/m³** of all the 24-hour values

1.2.- Scenarios for HIA on **long-term** effects of PM_{10} and **postneonatal mortality** (total, respiratory and sudden infant death syndrome-SIDS)

1.2.1 Reduction of the annual mean value of PM_{10} to a level of **40 µg/m³** (Limit of 1999/30/CE Directive for 2005)

1.2.2 Reduction of the annual mean value of PM_{10} to a level of **20 µg/m³** (Limit of 1999/30/CE Directive for 2010)

1.2.3 Reduction **by 5 µg/m³** of the annual mean value of PM_{10}

2.- HIA scenarios on short-term effects of Ozone

1.2.1 Daily maximum 1-hour concentration and **emergency room visits for asthma** in people under 18 year (< 18)

1.2.1.1 Reduction of O_3 daily maximum 1-hour concentrations to a level of **180 µg/m^3** in all days exceeding this value (Information threshold of 2002/3/CE Directive)

1.2.1.2 Reduction **by 10 µg/m^3** of the daily maximum 1-hour concentrations

1.2.2 Daily maximum 8-hour moving average concentration and **mortality** in general population

1.2.2.1 Reduction of O_3 daily maximum 8-hour moving average concentrations to **120 µg/m^3** in all days exceeding this value (Limit for health protection of 2002/3/CE Directive)

1.2.2.2 Reduction **by 10 µg/m^3** in the daily maximum 8-hour moving average concentrations.

Findings

For long-term HIA, corrected PM_{10} levels were used as a measure of exposure. The following results were found:

- The annual number of total postneonatal deaths attributable to PM_{10} annual mean value higher than 20 ?g/m^3 was 0,71 (95% CI: 0,33-1,11) which is equivalent to an annual rate of 4,89 deaths per 100,000 (95% CI: 2,25-7,62)

- The annual number of postneonatal SIDS attributable to PM_{10} annual mean value higher than 20 ?g/m^3 was 0.77 (95% CI: 0.45-1.08) which is equivalent to an annual rate 5.25 deaths per 100,000 (95% CI:3.09-7.39)

Short-term HIA of PM_{10} on hospital respiratory admissions were calculated using TEOM PM_{10}, as the corresponding RRs were obtained using TEOM measured values as an assessment of PM_{10} exposure. The annual number of hospital admissions for respiratory causes of children aged less than 15 attributable to PM_{10} levels higher than 20 ?g/m^3 was 15.77 (95%CI: 0-33.4) (95%CI: 0 – 65.4), which is equivalent to an annual rate of 6.6 deaths per 100,000 (95%CI: 0-14.1).

Table 5. Potential benefits of reducing PM_{10} levels. Absolute numbers and rates (per 100 000 children) (95% confidence limits) attributable to the health effects of PM_{10}.

	PM10 reduction	**Number of attributable cases per year**	**Annual rates (per 100.000)**
POSTNEONATAL MORTA LITY	**Corrected * annual mean levels**		
Total	by 5 µg/m^3	0.51(0.24-0.79)	3.49 (1.61-5.42)
	to 20 µg/m^3	0.71(0.33-111)	4.89(2.25-7.62)
	to 40 µg/m^3	NA*	NA
Respiratory	by 5 µg/m^3	0	0
	to 20 µg/m^3	0	0
	to 40 µg/m^3	NA	NA
SIDS	by 5 µg/m^3	0.55(0.33-0.77)	3.77(2.23-5.28)
	to 20 µg/m^3	0.77(0.45-1.08)	5.25 (3.09-7.39)
	to 40 µg/m^3	NA	NA
MORBIDITY	*Measured daily levels*		
Cough <18 y	by 5 µg/m^3	not available	not available
	to 20 µg/m^3	not available	not available

	to 50 µg/m^3		
LRS <18 y	by 5 µg/m^3	not available	not available
	to 20 µg/m^3	not available	not available
	to 50 µg/m^3		
Hospital respiratory admissions <15 y	by 5 µg/m^3	16.89(0-35.37)	7.13(0-14.9)
	to 20 µg/m^3	15.77(0-33.42)	6.66 (0-14.1)
	to 50 µg/m^3	NA	NA

* PM_{10} reference papers for HIA on postneonatal mortality use gravimetric methods to measure PM_{10}. In France, the automatic methods (TEOM) was used, and a correction factor is required to compensate for loss of volatile compounds: a local polynomial correction factor elaborated by the Ecole des Mines de Douai ? was used for each French city.

*NA: Not applicable if air pollution levels are lower than the scenario level

Regarding short-term effects of O_3. each reduction by 10 µg/m^3 of daily maximum 8-hour moving average concentrations would delay 11.52 (95%CI: 6.3219.33) deaths all causes per year in the study area, among those 4.98 (95%CI 2.38-7.90) from cardiovascular diseases, and 3.06 (95%CI: 00-4.08) from respiratory causes.

Each reduction by 10 µg/m^3 of daily maximum 8-hour moving average concentrations would delay 1.40 (95%CI :0-16.8) respiratory hospital admissions of people aged between 15 and 64, and 6.89 ((95%CI:0-16.53) respiratory hospital admissions of people aged 65 and more.

Table 6. Potential benefits of reducing ozone daily levels. Absolute numbers and rates (per 100 000 inhabitants) (95% confidence limits) attributable to the health effects of ozone.

	OZONE reduction	**Number of attributable cases per year**	**Annual rates (per 100.000)**
Emergency room visits for asthma <18 y	by 10 µg/m^3	not available	
	to 180 µg/m^3	not available	
MORTALITY	**Daily 8-h max**		
MORBIDITY	**Daily 8-h max**		
Total excluding external causes	by 10 µg/m^3	11.52(6.3219.33)	1.06 (0.58 – 1.77)
	to 120 µg/m^3	1.11(0.61-1.86)	0.1 (0.06-0.17)
Cardiovascular	by 10 µg/m^3	4.98 (2.38-7.90)	0.46 (0.22 – 0.72)
	to 120 µg/m^3	0.49 (0.23-0.77)	0.04 (0.02 – 0.07)
Respiratory	by 10 µg/m^3	3.06 (2.00-4.08)	0.28 (0.18 – 0.37)
	to 120 µg/m^3	0.32 (0.21-0.43)	0.03(0.02-0.04)
MORBIDITY	**Daily 1-h max**		
Hospital respiratory admissions 15-64 y	by 10 µg/m^3	1.40 (0-16.8)	0.19 (0 –2.23)
	to 120 µg/m^3	0.13 (0 –1.59)	0.02 (0-0.22)
Hospital respiratory admissions > 64 y	by 10 µg/m^3	6.89 (0-16.53)	5.01 (0-12.04)
	to 120 µg/m^3	0.68 (0-1.63)	0.49 (0-1.2)

NA: Not applicable if air pollution levels are lower than the scenario level

Discussion

This air pollution health impact assessment performed in the Lille study area, results in the following information:

-for the PM_{10} ,the two different scenarios of the PM_{10} air pollutant reduction on the long-term effects of the postneonatal mortality appear roughly similar :the annual rate per 100,000 of total postneonatal deaths attributable to the PM_{10} annual mean value higher than 20 ?g/m^3 is of 4.89 (95% CI: 2.25-7.62) which is not very different of the 3.49 (95% CI :1.61-5.42) avoided deaths expected by an annual mean reduction by 5 µg/m^3 of the PM_{10}. . The same observations could be done for the long-term effects of PM_{10} on the SIDS mortality as well for the short-term HIA of PM_{10} on respiratory hospital admissions of children aged less than 15.

-in one another hand, if the daily ozone 8-h max levels reduction above 120 µg/m^3 would'nt induce any significant short-term health benefits for the population in terms of mortality (total mortality : 0.1 annual rates per 100.000 ; 95% CI: 0.06-0.17), as well in terms of respiratory hospital admissions, the 10 µg/m^3 reduction of daily 8-h max levels of ozone induces an interesting decrease of the annual rate of total mortality (1.06 per 100.000 ; 95% CI: 0.58 – 1.77), as well in terms of respiratory hospital admissions in 15-64 years people and in > 64 years old persons.

Its worth to note that hospital admission data include both emergency hospital admissions and scheduled hospital admissions that are certainly not temporally linked with the levels of air pollution. Hence, the numbers of attributable hospital admissions are certainly over-estimated.

Since January 2001, and according to regulatory aspects, the regional Atmospheric Protection Plan (PPA) developed in the Lille-Metropole area a policy for urban transports: the "Plan de Déplacements Urbains" (PDU). This PDU has the following objectives:

- to reduce the harmful effects related to the road traffic,
- to improve quality of space to living,
- to support alternatives for displacements with the car,
- to propose a new urban traffic plan,
- to improve the attractivity of the system of public transport,
- to reduce the risk on health and the harmful effects related to the road traffic,
- to make evolve in synergy the city and the road transport,
- to have an integrated and coherent approach in the long run of the road systems of transport,
- to sensitize and mobilize the public.

Conclusion

This ENHIS study would contribute to assess the pollution health impact of the Plan de Déplacements Urbains (PDU) in the metropolitan area of Lille. Its results would help promoting measures aiming at reducing air pollutant emissions, especially traffic linked emissions, as health benefits are a powerful way of motivating changes in individuals comportments

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