DUBLIN CITY REPORT PLAN

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DUBLIN CITY REPORT

Background

Dublin, which is the capital city of Ireland, forms the basis for the Irish contribution to the APHEIS project. As presented in the APHEIS year 2 report, Dublin benefited from an intervention in 1990, which produced a significant reduction in ambient particulate pollution levels (Clancy et al 2002).

The data in this report is presented for the year 2000. The PM10 data available for 2000 is at the developmental stage of the monitoring network, and we have not had sufficient data to compare with the long established BS monitoring network. It was decided to continue with the BS data for this study, as we have significant experience of this network, and have used this same network for all our other pollution and health based studies.

We also present hospital admission data for Dublin for the first time (HIPE data provided by the ESRI), unfortunately it has to be noted that the geographical area covered for the morbidity data is different to that for the mortality data. Both the mortality and admission data is presented for total non-accidental, Cardiovascular and Pulmonary groups.

Sources

Principal sources of air pollution were described in detail in the previous Apheis city report last year (www.apheis.org). This is an update of the main sources of air pollution:

- Road/ heating/industry/others

Table 1. Main sources of air pollution

Source (year)	Road (%)	Heating (%)	Industry (%)	Other sources (specify)
2000	85	7	7	1

Since the coal ban in 1990 (Clancy et al 2002), the predominant source of BS in Dublin has been due to diesel road traffic. Domestic sources of BS have fallen dramatically, and Dublin is not a very industrialised city, so there are no major heavy industries contributing to BS levels.

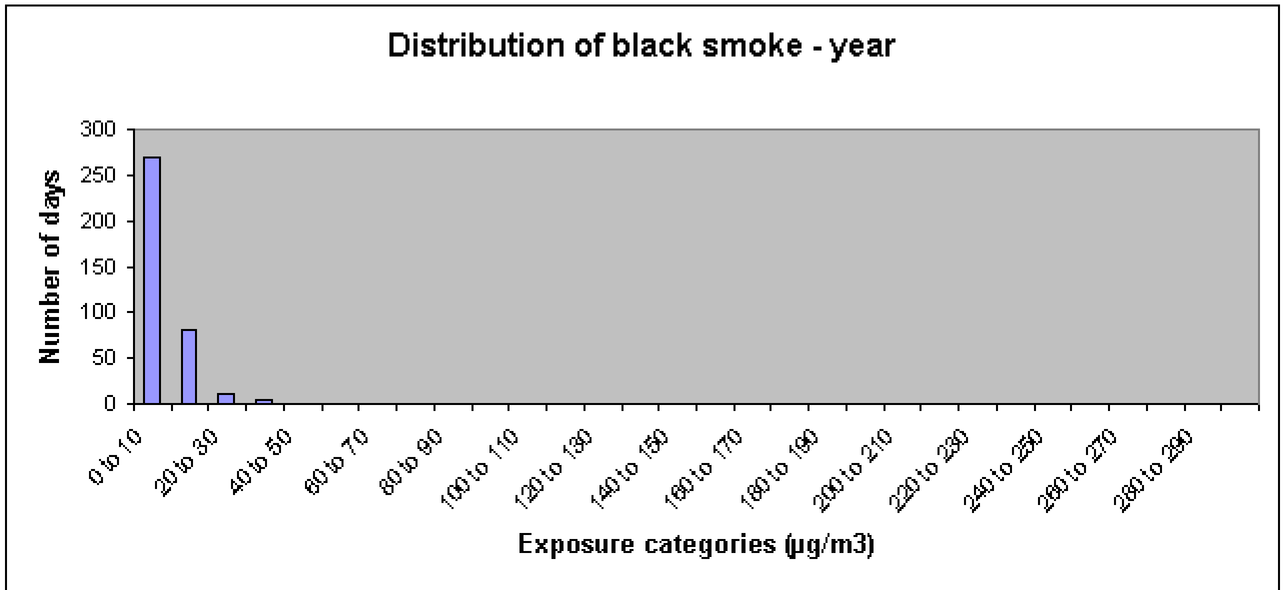
Exposure data

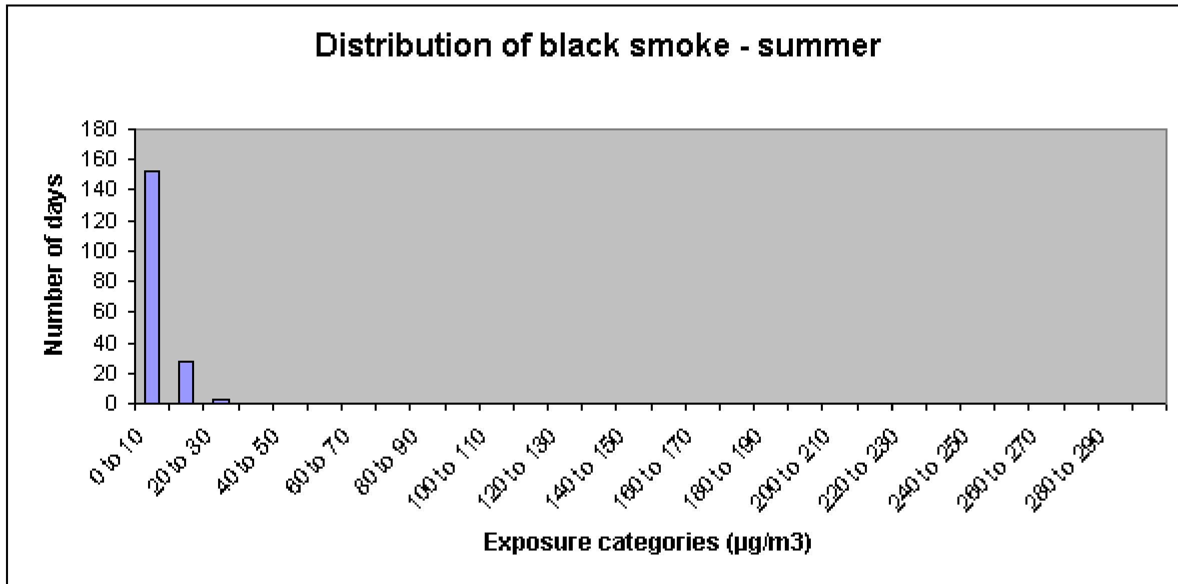
The same monitoring stations and meteorological stations were used for the year 2000 data as described for APHEIS 1 and APHEIS 2 reports.

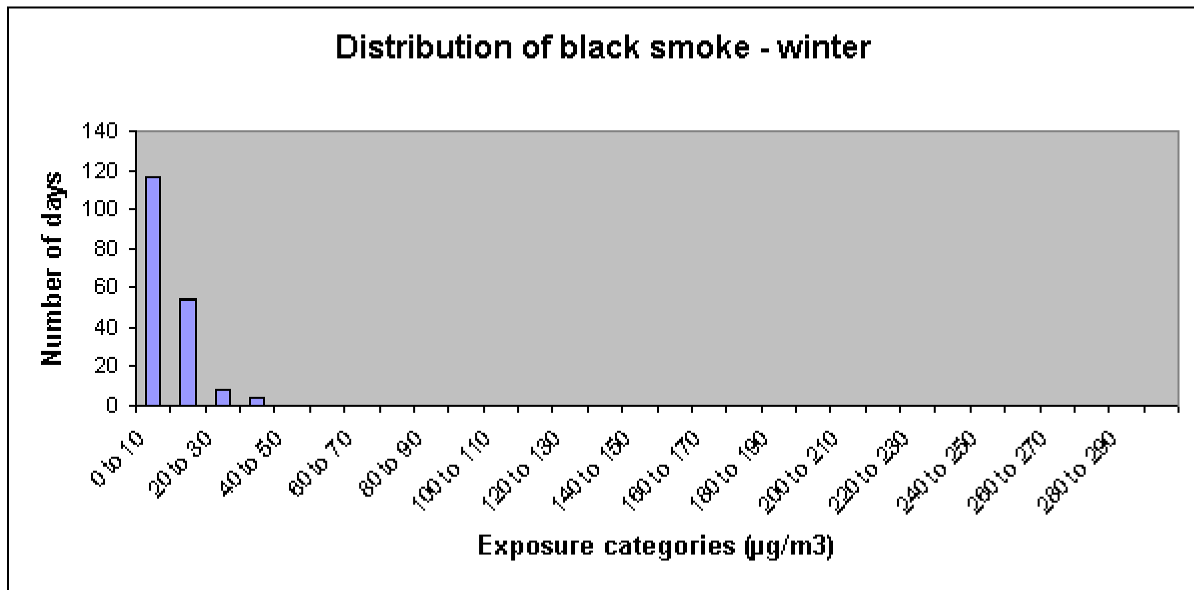
- Year of air pollution data was 2000
- Daily mean levels of BS were used, where the annual mean levels of BS was 9µg/m^3.
- P5 and P95: The levels of BS reached during the 366 days with the lowest (5th percentile) and the highest (95th percentile) levels were respectively 3 µg/m^3 and 18 µg/m^3.

Table 2 .Number of days when air pollutants exceeded limit levels

	Short term		Long term	
Air pollutant	**PM_{10}/BS**	**$PM_{2.5}$**	**PM_{10}**	**$PM_{2.5}$**
Number of days above	20 μg/m^3	14 μg/m^3	20 μg/m^3	15 μg/m^3
	15			
Number of days above	50 μg/m^3	35 μg/m^3	40 μg/m^3	20 μg/m^3







The BS levels in Dublin are seen to be extremely low, and never exceed 50µgm^{-3}. It can be seen from the previous graphs that most of the levels are predominantly in the lowest category. There is some evidence that levels are a little higher in winter than in summer, which is the classic cold weather type pollution common in northern European cities.

Health data

Mortality data for Dublin is compiled from data supplied by the Central Statistics Office (CSO). Morbidity data is provided in aggregated form by the Economic and Social Research Institute (ESRI).

- Age-standardised mortality rate (per 100 000 inhabitants). Total European population (both sexes combined): 727 304 (in thousands) for year 2000 [1]

Table 3. Daily mean number and annual rate per 100 000 of deaths and hospital admissions

Health outcome	ICD9	ICD10	Daily mean number (SD)	Number of cases per 100 000
Short term HIA				
All causes mortality*	< 800	A00-Q99	12.27	911
Cardiovascular mortality	390-459	I00-I99	5.1	378.6
Respiratory mortality	460-519	J00-J99	1.8	133.7
Cardiac mortality	390-429	I00-I52	na	
Cardiovascular hospital admissions	390-429	I00-I52	26.6	1974.8
Respiratory hospital admissions	460-519	J00-J99	25.24	1873.8
Long term HIA				
Total mortality	0-999	A00-T98	**Na**	
Cardiopulmonary mortality	401-440 460-519	I10-I70 J00-J99	Na	
Lung cancer mortality	162	C33-C34	na	

* For short and long term scenarios

[1] UNITED NATIONS. Population Division Department of Economic and Social Affairs. World Population Prospects: The 2000 Revision.

Health impact assessment

Different scenarios were used to evaluate the short and long term exposure to particulate pollution.

1. Short term HIA for BS

- for a reduction of BS levels on all days above 24-hour value of 20 µg/m³ to 20 µg/m³
- for a reduction of BS levels on all days above 24-hour value of 50 µg/m³ to 50 µg/m³
  This senario is not applicable in Dublin where the 50 µg/m³ level was not exceeded.
- for a reduction by 5 µg/m³ in the annual mean value of BS

Tables 1, 2, 3 present the attributable number of all causes, cardiovascular and respiratory deaths expressed as absolute numbers and as rates per 100 000 inhabitants. Table 4 presents the results for cardiovascular and respiratory hospital admissions.

Table 1. Deaths all causes (ICD9 < 800). Potential benefits of reducing daily BS levels above 20 to 20 µg/m³, above 50 to 50 µg/m³ and all days by 5 µg/m³. Absolute number and number per 100 000 inhabitants (95% confidence limits) attributable to the acute effects of BS

		Attributable cases per year					
Scenarios	Number of days per year exceeding 20 and 50 µg/m³	N° of deaths central	N° of deaths lower	N° of deaths upper	N° of deaths per 100 000 central	N° of deaths per 100 000 lower	N° of deaths per 100 000 upper
20 µg/m³		0.74	0.50	1.12	0.15	0.1	0.227
50 µg/m³		NA	NA	NA	NA	NA	NA
By 5 µg/m³		13.42	8.95	20.12	2.72	1.82	4.1

Table 2. Cardiovascular deaths (ICD9 390-459). Potential benefits of reducing daily BS levels above 20 to 20 µg/m³, above 50 to 50 µg/m³ and all days by 5 µg/m³. Absolute number and number per 100 000 inhabitants (95% confidence limits) attributable to the acute effect of BS

		Attributable cases per year					
Scenarios	Number of days per year exceeding 20 and 50 µg/m³	N° of deaths central	N° of deaths lower	N° of deaths upper	N° of deaths per 100 000 central	N° of deaths per 100 000 lower	N° of deaths per 100 000 upper
20 µg/m³		0.21	0.10	0.36	0.043	0.020	0.073
50 µg/m³		NA	NA	NA	NA	NA	NA
By 5 µg/m³		3.72	1.86	6.51	0.755	0.0377	1.32

Table 3. Respiratory deaths (ICD9 460-519). Potential benefits of reducing daily BS levels above 20 to 20 µg/m^3, above 50 to 50 µg/m^3 and all days by 5 µg/m^3. Absolute number and number per 100 000 inhabitants (95% confidence limits) attributable to the acute effects of BS

		Attributable cases per year					
Scenarios	Number of days per year exceeding 20 and 50 µg/m^3	N° of deaths central	N° of deaths lower	N° of deaths upper	N° of deaths per 100 000 central	N° of deaths per 100 000 lower	N° of deaths per 100 000 upper
20 µg/m^3		0.11	-0.04	0.27	0.023	-0.008	0.055
50 µg/m^3		NA	NA	NA	NA	NA	NA
By 5 µg/m^3		1.97	-0.66	4.91	0.4	-0.134	1.0

Table 4. Cardiac (ICD9 390-429) and respiratory (ICD9 460-519) hospital admissions. Potential benefits of reducing daily BS levels above 20 to 20 µg/m^3, above 50 to 50 µg/m^3 and all days by 5 µg/m^3. Absolute number (95% confidence limits) attributable to the acute effects of BS

		Attributable cases per year		
Scenarios	Number of days per year exceeding 20 and 50 µg/m^3	N° of admissions central	N° of admissions lower	N° of admissions upper
Hospital admissions for cardiovascular diseases (all ages)				
20 µg/m^3		2.98	1.35	4.87
50 µg/m^3		NA	NA	NA
By 5 µg/m^3		53.19	24.21	86.89
Hospital admissions for respiratory diseases (all ages)				
20 µg/m^3		0.76	-0.38	1.91
50 µg/m^3		NA	NA	NA
By 5 µg/m^3		13.83	-6.92	34.54

Long term exposure

We have shown (Clancy et al 2002), that when long term BS exposure is substantially reduced, there is a significant reduction in mortality. We have also shown (Goodman et al 2003) that when exposure to BS over periods approaching 40 days are considered, the effect estimates approach those from long term exposure studies.

Interpretation of findings

The findings from Dublin are rather vague, this is because the BS levels are extremely low, and are quite different to most other cities in the study. We in Dublin have already benefited from a significant reduction in our BS levels (Clancy et al 2002). We are at the point where further reductions become very difficult to achieve. Based on the relatively small population, and the fact that the pollution levels are so low, little benefit is seen from further reductions in levels. The tables 1-4 all show that there are small but measurable reductions in mortality and or hospital admissions associated with the further reduction in BS levels, as in scenario 3 where the levels fall by 5μg/m^3. In the scenario 1 where levels above 20μg/m^3, fall to 20μg/m^3, we do not see any real benefit, as there are few days with levels above 20μg/m^3.

The only benefits to be seen in Dublin are from the reduction of levels by 5μg/m^3, but when one considers that average levels are currently only 9μg/m^3, its difficult to see how such a reduction can be achieved, as current levels are already so low.

The data from Dublin, we believe should act as an example to other centres. It has been shown (Clancy et al 2002) and the APHEIS year 2 report, that reducing particulate pollution levels can provide a significant health benefit, but eventually one will reach a stage where further reduction of particulate pollution levels becomes very difficult.

General comments

Our experience from APHEIS is that the structure in place in the various EU member states are quite different, and so the implementation of APHEIS in some countries is significantly more difficult than in others.

In the case of Dublin, we felt that although we could not implement things as well as in France or Spain, we believe that our experience in having an intervention which gave rise to a sudden and dramatic fall in BS levels, served as a good case study for the various scenarios involved in the APHEIS project. Our experience in this regard (Clancy et al 2002) also showed that substantial health benefits could accrue from reducing particulate pollution levels.

References

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The Lancet 2002; 360 October 19: 1210-1214.

Goodman, P. Dockery, DW. And Clancy L. 2003. Cause specific mortality and the extended effects of particulate pollution and temperature exposure. In Press. DOI number: 10.1289/ehp.6451.