

# CHOICE OF OUTCOME DATA IN A STUDY OF ASSOCIATIONS BETWEEN MUNICIPAL WASTE INCINERATOR EMISSIONS IN THE UK AND BIRTH AND INFANT HEALTH OUTCOMES

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## Background

This national epidemiological study will investigate the associations between adverse reproductive and infant health outcomes and modelled ground level concentrations of incinerator emissions in 2003-10, with the following specific research questions:

- Are the emissions from incinerators required to operate under the standards set by the EU Waste Incineration Directive (WID) (2000/76/EC) linked with adverse reproductive and infant health outcomes?
- Is living near a municipal waste incinerator linked with adverse reproductive and infant health outcomes?

## Methods

Dispersion modelling using data on daily particulate emissions from the 22 MWIs in operation from 2003 (when the EU Waste Incineration Directive (WID) was implemented) to 2010 was conducted to provide an estimate of PM<sub>10</sub> exposure during pregnancy within a 10km radius around each incinerator<sup>1</sup>.

Health outcomes considered include measures of fetal growth (birth weight, small for gestational age, preterm delivery), mortality (stillbirths, infant deaths) as well as sex-ratio at birth, multiple births and congenital anomalies.

## Datasets

A comparison of the main available routine birth datasets has been undertaken, these are:

- ONS Births (2003-2010) - complete but clinically limited record of all births
- ONS NN4B - complete with additional information but only available for 2006-2010
- HES deliveries (2003-2010) - hospital maternity admissions (HSCIC-HES), less complete but contain additional clinical data

Table 1: Availability of data by birth dataset

Fields of information	HES deliveries	ONS births	NN4B
Mothers date of birth	✓	*	*
Residential postcode	✓	✓	✓
Ethnicity of mother	✓		
Ethnicity of baby			✓
Previous pregnancies	✓		
Previous children		✓	✓
Birth status	✓	✓	✓
Birth weight	✓	✓	✓
Delivery method	✓		
Delivery place	✓		
Gestational age (live)	✓		✓
Gestational age (still)	✓	✓	✓
Sex of baby	✓	✓	✓

## Study area



Figure 1. a) Example 10km buffer around an incinerator  
b) Map of incinerator location in Great Britain with location of SELCHP incinerator

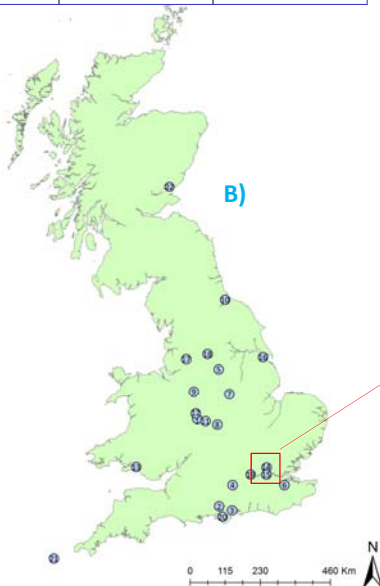


Table 2: Comparison of birth outcomes in ONS England and Wales vs. ONS, HES and NN4B incinerator study area 2003-2010

	Outcomes (n)	ONS England & Wales (%)	ONS Incinerators (%)	HES (%)	NN4B* (%)
Total births with any record		5,431,007	1,331,712	1,269,828	861,360
Multiple births (% of total births)		165,689 (3.05)	39,769 (2.99)	21,381 (0.96)	26,355 (3.06)
Stillbirths (% of total births)		28,847 (0.53)	7,995 (0.6)	9,229 (1.00)	4,884 (0.57)
Sex ratio (all live births)		105.16	105.13	96.81	105.14
Total live singleton births		5,238,653	1,284,498	888,409	830,437
Sex ratio		105.31	105.31	96.92	105.34
Birthweight (grams) (mean)		3356.81	3307.24	3299.168	3313.41
(median IQR)		3380 (3040-3720)	3330 (2995-3674)	3325 (2988-3665)	3340 (300-3680)
Low birth weight		304,016 (5.8)	84,763 (6.60)	60,197 (6.79)	53,751 (6.51)
Very low birth weight		48,242 (0.92)	13,934 (1.08)	10,662 (1.20)	8,931 (1.08)
Term low birthweight				24,053 (3.27)	22,462 (2.97)
Term very low birthweight		-	-	1,597 (0.22)	733 (0.10)
Small for Gestational Age (SGA)		-	-	77,551 (10.6)	80,295 (10.6)
Preterm delivery		-	-	51,075 (6.45)	50,596 (6.1)
Very preterm delivery		-	-	11,546 (1.46)	11,354 (1.4)
Ethnic categories					
1 (White)				700,129 (61.84)	489,278 (60.0)
2 (Mixed)				24,745 (2.19)	44,800 (5.5)
3 (Asian)				206,400 (18.23)	143,014 (17.6)
4 (Black)				138,543 (12.24)	99,625 (12.2)
5 (Other)				62,262 (5.5)	38,082 (4.7)

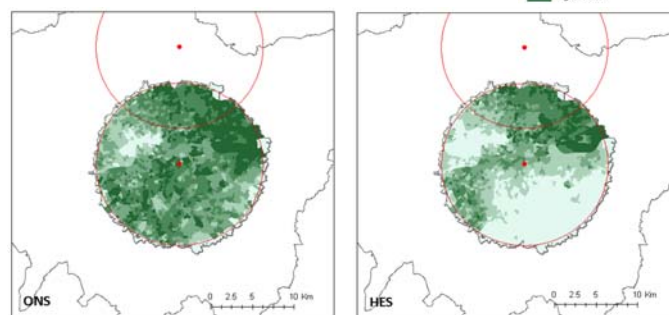
\*NN4B 2006-2010

\$ Incinerator study area including England and Wales, HES is England only<sup>1</sup>

## Results

During 2003-10, 25% (1.3million) of all births in England & Wales occurred within 10km of an incinerator. Birth outcomes were generally comparable across datasets (Table 2), but only 70% of live singleton births registered in England (and in ONS births dataset) were captured by hospital datasets and 'missing' births were spatially clustered (Figure 2) in some areas.

Figure 2. Live birth rate at Super Output Area (SOA) in ONS births and HES maternity (2003-2010) 10km around SELCHP incinerator London.



## Conclusions

- Health outcomes not requiring gestational age can make use of the births registration data, which covers the entire study period 2003-10.
- Fetal growth outcomes requiring gestational age (e.g. term low birthweight) can only be investigated in the hospital and NN4B data, but dataset only starts in 2006
- Hospital data cannot be used alone for this study due to missing information, but potential to combine with ONS births data is being explored (pending appropriate permissions)

## References

- Ashworth, D.C., Fuller, G.W., Toledano, M.B., Font, A., Elliott, P., Hansell, A.L., and de Hoogh, K. (2013) Comparative assessment of particulate air pollution exposure from municipal solid waste incinerator emissions. Journal of Environmental and Public Health. Vol. 2013.

