Maternal Exposure to Particulate Air Pollution and Risk of Congenital Heart Defects

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Study Aim

Evaluate whether maternal exposures to particulate air pollutants during the first three months of pregnancy was associated with an increased risk of congenital heart defects (CHD).

Maternal exposures

$PM_{2.5}$

PM_{10}

Association

Air Pollution in Wuhan

Construction sites were more than10,000 in 2013 in Wuhan

Vehicle ownership was 1,320,800 in 2013 in Wuhan

The use of coal for industrial processes

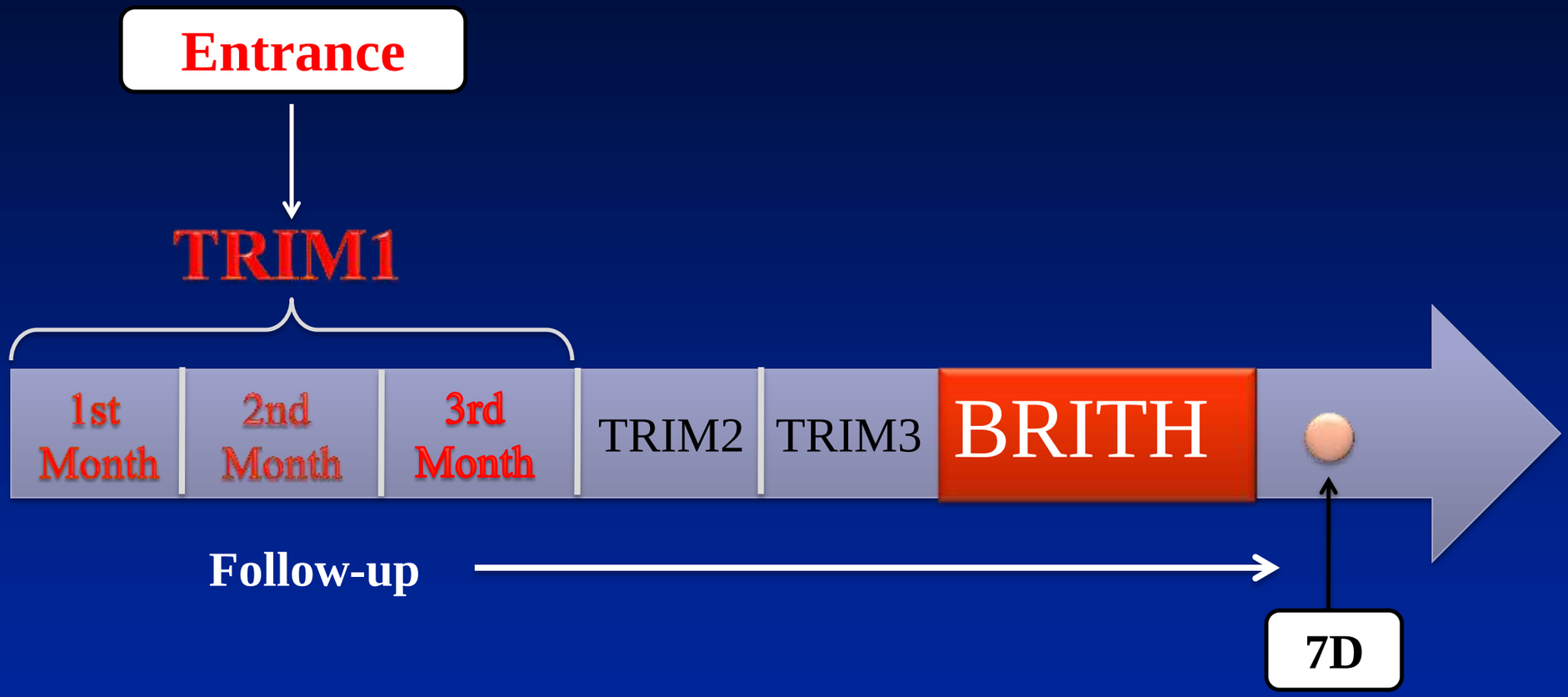
Study population

- June 2011- June 2013
- Pregnant women living in the seven inner-city districts in Wuhan
- Resident population of living >1 year
- Total women: 108,167

Exposure assessment

- **Air pollution data have been collected by the WEMC**
  - 9 monitoring stations for PM10, and 2 monitoring stations for PM2.5
  - Collection 24 hours-a-day and 365 days-a-year, without interruption
- **Concentrations was assigned to each women by a nearest monitor approach**

Disease


Entrance
TRIM1
1st Month
2nd Month
3rd Month
TRIM2
TRIM3
BRITH
Follow-up
7D

Methods — Statistical analysis

- **Logistic regression** analyses were used to calculate odds ratios (OR) and 95% confidence intervals (CI).
- **Potential confounding factors:** maternal age, education, occupation, newborns sex, parity, season of conception

Association between risk of CHD and $PM_{2.5}$ & PM_{10} during the first 3 months

		All congenital heart defects（Q20-Q28） (N=188)	Ventricular septal defect (Q21.0) (N=63)	Tetralogy of Fallot (Q21.3) (N=29)
		aOR [95% CI]	aOR [95% CI]	aOR [95% CI]
$PM_{2.5}$	1st Mb	1.01 (0.93 -1.09)	1.11 (0.98 -1.25)	1.05 (0.89 -1.26)
	2nd Mc	1.10 (1.03 -1.18)	1.16 (1.03 -1.30)	1.13 (0.96 -1.32)
	3rd Md	1.08 (1.01 -1.16)	1.21 (1.08 -1.36)	1.03 (0.87 -1.22)
PM_{10}	1st Mb	0.94 (0.89 -1.01)	0.97 (0.87 -1.09)	0.84 (0.71 -1.01)
	2nd Mc	0.99 (0.92 -1.05)	0.96 (0.86 -1.07)	0.99 (0.84 -1.17)
	3rd Md	0.98 (0.93 -1.05)	0.99 (0.90 -1.10)	1.00 (0.85 -1.17)

a. Adjusted for maternal age, education, parity, infant sex, season of conception
b.1st M=The first month exposure; c. 2nd M=The second month exposure; d. 3rd M=The third month exposure;

Association between risk of VSD and $PM_{2.5}$ during the first 12 weeks

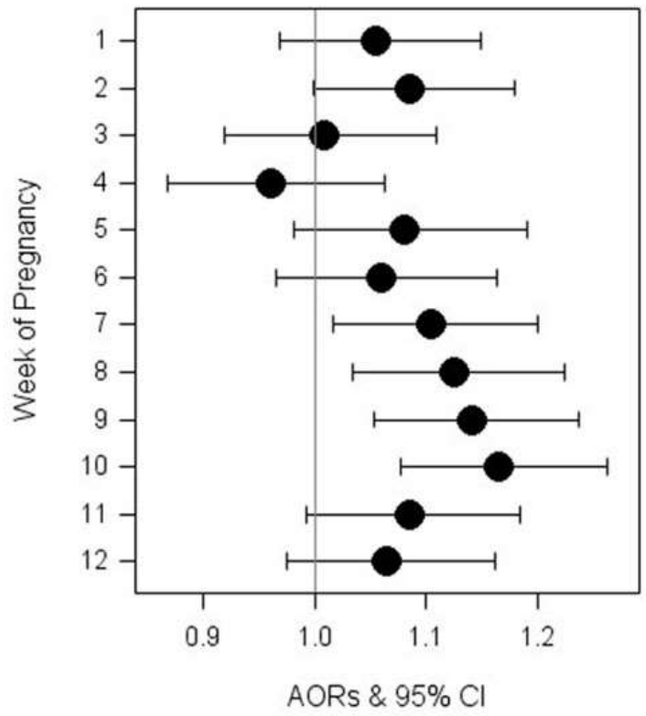


Figure.2 Estimated adjusted ORs and 95% CIs of Ventricular septal defect for continuous measures of 1 week averages of daily measures of PM2.5, plotted for weeks 1-12 pregnancy.

Conclusion

- Our results showed an increased risk of CHDs in relation to maternal exposure to PM2.5, but showed no association between PM10 exposure and CHDs.
- This study contributes to the small body of knowledge regarding the association between in utero exposure to air pollution and CHDs, but confirmation of these associations will be needed in future studies.

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