

**Table S1 The rank result of the 23 types of common birth defects**

<b>Number</b>	<b>Birth defect</b>	<b>N</b>
21	Conjoined twins	0
13	Bladder valgus	1
1	Anencephaly	2
3	Encephalocele	3
20	Gastroschisis	3
8	Small ears (including no ears)	6
10	Esophageal atresia or stenosis	8
2	Spina bifida	12
18	Congenital diaphragmatic hernia	13
19	Omphalocele	18
12	Hypospadias	27
11	Rectoanal atresia or stricture (including anorectal atresia)	30
14	Equinovarus	41
4	Congenital hydrocephalus	45
22	Down's syndrome	79
9	Other malformations of the external ear (except for small ears and no ears)	86
5, 6, 7	Orofacial clefts	119
15, 16, 17	Limb defects	210
23	Congenital heart defects	265

**Table S2 Adjusted odds ratios and 95% confidence interval of ambient air pollutants for each interquartile increase during the 2<sup>ed</sup> trimester and birth defects in Wuhan, China**

Birth defects <sup>a</sup>	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>2</sub>	SO <sub>2</sub>
	OR (95%CI)	OR (95%CI)	OR (95%CI)	OR (95%CI)
Total				
Birth defects	1.01(0.93,1.09)	0.95(0.89,1.02)	0.99(0.93,1.06)	<b>0.88(0.80,0.97)</b>
CHDs	0.98(0.79,1.22)	0.86(0.72,1.04)	0.94(0.79,1.11)	<b>0.75(0.58,0.97)</b>
Limb defects	1.03(0.87,1.22)	0.95(0.82,1.11)	1.05(0.92,1.21)	1.01(0.83,1.25)
Orofacial clefts	1.27(0.86,1.87)	<b>1.42(1.01,1.99)</b>	1.27(0.93,1.74)	1.38(0.85,2.25)
Male fetus				
Birth defects	1.01(0.91,1.12)	0.95(0.87,1.04)	0.95(0.87,1.03)	0.90(0.79,1.02)
CHDs	0.82(0.61,1.10)	<b>0.69(0.52,0.91)</b>	<b>0.69(0.53,0.88)</b>	<b>0.58(0.41,0.83)</b>
Limb defects	1.12(0.90,1.38)	1.00(0.84,1.20)	1.09(0.92,1.29)	1.09(0.84,1.41)
Orofacial clefts	1.11(0.69,1.81)	1.20(0.79,1.82)	1.25(0.83,1.87)	1.19(0.67,2.12)
Female fetus				
Birth defects	1.01(0.89,1.14)	0.96(0.86,1.07)	1.06(0.96,1.17)	0.87(0.75,1.00)
CHDs	1.21(0.88,1.66)	1.07(0.82,1.39)	1.28(0.99,1.65)	1.00(0.69,1.44)
Limb defects	0.90(0.69,1.18)	0.87(0.68,1.12)	0.99(0.79,1.25)	0.89(0.63,1.25)
Orofacial clefts	1.64(0.80,3.36)	<b>2.02(1.06,3.86)</b>	1.31(0.79,2.18)	2.01(0.75,5.39)
Summer/Spring				
Birth defects	1.04(0.93,1.17)	0.91(0.82,1.01)	1.03(0.94,1.13)	0.92(0.79,1.06)
CHDs	0.99(0.73,1.33)	0.79(0.60,1.04)	1.01(0.78,1.29)	<b>0.64(0.44,0.94)</b>
Limb defects	1.10(0.86,1.41)	0.88(0.69,1.11)	1.06(0.87,1.29)	0.92(0.67,1.25)
Orofacial clefts	1.20(0.64,2.25)	1.47(0.81,2.67)	1.07(0.66,1.76)	1.71(0.74,3.97)
Autumn/Winter				
Birth defects	0.96(0.86,1.08)	1.00(0.91,1.10)	0.97(0.89,1.07)	0.87(0.75,1.00)
CHDs	1.02(0.74,1.40)	1.00(0.76,1.30)	0.93(0.72,1.19)	1.00(0.68,1.47)
Limb defects	0.94(0.74,1.18)	0.99(0.82,1.21)	1.05(0.87,1.28)	1.05(0.77,1.43)
Orofacial clefts	1.30(0.78,2.17)	1.34(0.88,2.03)	1.38(0.90,2.12)	1.08(0.58,2.03)

Bold values represent statistical significance (two-sided P<0.05).

Abbreviations: CHDs, congenital heart defects; CI, confidence interval; NO<sub>2</sub>, nitrogen dioxide; OR, odds ratio; PM<sub>10</sub>, particulate matter ≤10 µm diameter; PM<sub>2.5</sub>, particulate matter <2.5 µm diameter; SO<sub>2</sub>, sulfur dioxide.

<sup>a</sup> Adjusted for year of conception, maternal age, gravidity, urban/rural, per capita area of roads, per capita of medication beds, unemployment, and per capita of cars.

**Table S3 Adjusted odds ratios and 95% confidence interval of ambient air pollutants for each interquartile increase during the 3<sup>rd</sup> trimester and birth defects in Wuhan, China**

Birth defects <sup>a</sup>	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>2</sub>	SO <sub>2</sub>
	OR (95%CI)	OR (95%CI)	OR (95%CI)	OR (95%CI)
Total				
Birth defects	<b>0.86(0.81,0.92)</b>	<b>0.89(0.84,0.94)</b>	<b>0.90(0.85,0.95)</b>	<b>0.92(0.86,0.98)</b>
CHDs	0.90(0.79,1.03)	<b>0.87(0.77,0.98)</b>	<b>0.89(0.79,1.00)</b>	0.88(0.76,1.01)
Limb defects	0.96(0.83,1.12)	0.90(0.79,1.04)	0.97(0.85,1.10)	1.00(0.85,1.17)
Orofacial clefts	<b>0.78(0.64,0.95)</b>	0.97(0.81,1.16)	0.90(0.76,1.07)	0.89(0.72,1.10)
Male fetus				
Birth defects	<b>0.87(0.80,0.94)</b>	<b>0.88(0.81,0.94)</b>	<b>0.91(0.85,0.97)</b>	0.96(0.88,1.05)
CHDs	0.85(0.72,1.01)	0.88(0.74,1.05)	0.88(0.76,1.03)	<b>0.81(0.67,0.98)</b>
Limb defects	0.93(0.77,1.11)	0.89(0.75,1.05)	0.92(0.79,1.08)	1.03(0.85,1.25)
Orofacial clefts	<b>0.78(0.60,1.00)</b>	0.94(0.75,1.19)	0.93(0.75,1.16)	0.95(0.72,1.25)
Female fetus				
Birth defects	<b>0.86(0.78,0.94)</b>	<b>0.91(0.84,0.99)</b>	<b>0.89(0.83,0.96)</b>	<b>0.86(0.78,0.95)</b>
CHDs	0.93(0.77,1.14)	0.92(0.76,1.10)	0.91(0.77,1.07)	0.98(0.79,1.21)
Limb defects	1.01(0.79,1.30)	0.94(0.74,1.19)	1.05(0.85,1.31)	0.93(0.72,1.21)
Orofacial clefts	0.78(0.57,1.08)	0.99(0.74,1.32)	0.85(0.66,1.10)	0.79(0.56,1.11)
Summer/Spring				
Birth defects	1.04(0.94,1.16)	<b>1.18(1.07,1.31)</b>	1.06(0.98,1.16)	0.96(0.87,1.06)
CHDs	1.07(0.84,1.36)	1.16(0.91,1.46)	1.13(0.94,1.37)	0.84(0.68,1.05)
Limb defects	1.06(0.82,1.37)	0.89(0.66,1.19)	0.97(0.78,1.21)	0.94(0.74,1.19)
Orofacial clefts	0.96(0.66,1.39)	1.37(0.98,1.91)	1.22(0.91,1.64)	0.93(0.67,1.30)
Autumn/Winter				
Birth defects	<b>0.64(0.56,0.73)</b>	<b>0.78(0.70,0.87)</b>	<b>0.74(0.66,0.82)</b>	0.86(0.73,1.00)
CHDs	<b>0.74(0.55,0.99)</b>	<b>0.73(0.57,0.94)</b>	<b>0.65(0.52,0.82)</b>	0.82(0.58,1.15)
Limb defects	0.78(0.57,1.08)	0.82(0.62,1.08)	1.05(0.78,1.41)	1.07(0.73,1.58)
Orofacial clefts	0.78(0.55,1.10)	<b>0.40(0.27,0.60)</b>	<b>0.52(0.38,0.70)</b>	<b>0.62(0.39,0.99)</b>

Bold values represent statistical significance (two-sided P<0.05).

Abbreviations: CHDs, congenital heart defects; CI, confidence interval; NO<sub>2</sub>, nitrogen dioxide; OR, odds ratio; PM<sub>10</sub>, particulate matter ≤10 µm diameter; PM<sub>2.5</sub>, particulate matter <2.5 µm diameter; SO<sub>2</sub>, sulfur dioxide.

<sup>a</sup> Adjusted for year of conception, maternal age, gravidity, urban/rural, per capita area of roads, per capita of medication beds, unemployment, and per capita of cars.

**Table S4 Adjusted odds ratios and 95% confidence interval of ambient air pollutants for each interquartile increase during the entire pregnancy and birth defects in Wuhan, China**

Birth defects <sup>a</sup>	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>2</sub>	SO <sub>2</sub>
	OR (95%CI)	OR (95%CI)	OR (95%CI)	OR (95%CI)
Total				
Birth defects	<b>0.85(0.74,0.97)</b>	0.95(0.83,1.09)	1.04(0.95,1.13)	<b>0.84(0.72,0.98)</b>
CHDs	0.91(0.64,1.29)	0.86(0.60,1.23)	1.01(0.80,1.27)	<b>0.60(0.41,0.89)</b>
Limb defects	0.91(0.69,1.21)	0.85(0.64,1.13)	1.14(0.95,1.37)	0.97(0.71,1.34)
Orofacial clefts	0.68(0.36,1.26)	1.16(0.62,2.17)	1.34(0.89,2.04)	1.45(0.70,2.98)
Male fetus				
Birth defects	<b>0.81(0.68,0.97)</b>	0.89(0.75,1.06)	0.99(0.89,1.11)	0.83(0.68,1.02)
CHDs	0.81(0.50,1.31)	0.72(0.44,1.17)	<b>0.69(0.50,0.94)</b>	<b>0.52(0.31,0.89)</b>
Limb defects	0.94(0.66,1.33)	0.75(0.53,1.07)	1.22(0.97,1.53)	0.90(0.61,1.33)
Orofacial clefts	0.69(0.32,1.48)	1.36(0.64,2.87)	1.48(0.86,2.53)	1.08(0.46,2.53)
Female fetus				
Birth defects	0.92(0.75,1.13)	1.06(0.86,1.30)	1.11(0.97,1.27)	0.86(0.68,1.09)
CHDs	1.06(0.62,1.82)	1.05(0.63,1.76)	<b>1.59(1.11,2.28)</b>	0.71(0.40,1.28)
Limb defects	0.86(0.54,1.38)	1.09(0.67,1.79)	1.01(0.75,1.37)	1.12(0.64,1.97)
Orofacial clefts	0.64(0.22,1.84)	0.84(0.28,2.54)	1.16(0.61,2.21)	2.99(0.77,11.70)
Autumn/Winter				
Birth defects	0.92(0.76,1.12)	1.07(0.89,1.28)	1.04(0.93,1.17)	0.98(0.79,1.22)
CHDs	0.94(0.57,1.55)	1.02(0.65,1.60)	1.22(0.91,1.63)	0.65(0.38,1.10)
Limb defects	0.97(0.65,1.45)	0.85(0.57,1.27)	1.06(0.84,1.35)	0.82(0.52,1.29)
Orofacial clefts	0.91(0.34,2.43)	1.54(0.55,4.28)	1.10(0.61,1.98)	<b>3.91(1.17,13.04)</b>
Summer/Spring				
Birth defects	<b>0.74(0.60,0.90)</b>	<b>0.80(0.65,0.97)</b>	1.02(0.89,1.17)	<b>0.73(0.58,0.92)</b>
CHDs	0.76(0.44,1.30)	0.76(0.44,1.32)	0.75(0.52,1.08)	0.61(0.33,1.13)
Limb defects	0.82(0.55,1.23)	0.83(0.55,1.26)	1.26(0.95,1.67)	1.12(0.71,1.77)
Orofacial clefts	0.56(0.24,1.30)	0.99(0.43,2.24)	1.62(0.89,2.95)	0.74(0.29,1.91)

Bold values represent statistical significance (two-sided P<0.05).

Abbreviations: CHDs, congenital heart defects; CI, confidence interval; NO<sub>2</sub>, nitrogen dioxide; OR, odds ratio; PM<sub>10</sub>, particulate matter ≤10 µm diameter; PM<sub>2.5</sub>, particulate matter <2.5 µm diameter; SO<sub>2</sub>, sulfur dioxide.

<sup>a</sup> Adjusted for year of conception, maternal age, gravidity, urban/rural, per capita area of roads, per capita of medication beds, unemployment, and per capita of cars.

**Table S5 Adjusted odds ratios and 95% confidence interval of ambient air pollutants for the duration of peak level exposure during the 1<sup>st</sup> trimester and birth defects in Wuhan, China**

<b>Birth defects<sup>a</sup></b>	<b>PM10 OR (95%CI)</b>	<b>PM2.5 OR (95%CI)</b>	<b>NO2 OR (95%CI)</b>	<b>SO2 OR (95%CI)</b>
Total				
Birth defects	1.03(0.90,1.17)	1.10(0.94,1.28)	<b>1.40(1.26,1.57)</b>	1.04(0.86,1.27)
CHDs	0.91(0.67,1.23)	1.05(0.74,1.49)	<b>1.39(1.08,1.77)</b>	1.18(0.75,1.85)
Limb defects	1.02(0.74,1.41)	1.24(0.87,1.77)	<b>1.37(1.04,1.81)</b>	1.00(0.64,1.58)
Orofacial clefts	0.67(0.42,1.06)	0.92(0.54,1.54)	1.31(0.91,1.89)	0.90(0.47,1.73)
Male fetus				
Birth defects	1.08(0.90,1.29)	1.04(0.85,1.28)	<b>1.33(1.15,1.54)</b>	0.98(0.75,1.27)
CHDs	1.01(0.67,1.52)	1.03(0.64,1.65)	1.19(0.85,1.67)	1.11(0.59,2.11)
Limb defects	1.07(0.71,1.61)	1.18(0.75,1.85)	<b>1.48(1.05,2.08)</b>	0.85(0.47,1.52)
Orofacial clefts	0.67(0.37,1.22)	0.83(0.41,1.65)	1.17(0.73,1.87)	0.99(0.96,1.02)
Female fetus				
Birth defects	0.99(0.80,1.21)	1.17(0.93,1.47)	<b>1.52(1.29,1.80)</b>	1.08(0.81,1.44)
CHDs	0.78(0.50,1.23)	1.00(0.60,1.65)	<b>1.57(1.10,2.25)</b>	1.09(0.59,2.03)
Limb defects	0.96(0.56,1.63)	1.31(0.74,2.34)	1.21(0.76,1.95)	1.24(0.60,2.56)
Orofacial clefts	0.71(0.35,1.45)	1.01(0.46,2.23)	1.62(0.90,2.91)	1.01(0.39,2.61)
Autumn/Winter				
Birth defects	1.00(0.81,1.23)	1.24(0.99,1.55)	1.18(0.99,1.40)	1.12(0.78,1.61)
CHDs	1.25(0.75,2.08)	1.02(0.63,1.64)	1.46(0.97,2.19)	1.29(0.54,3.08)
Limb defects	1.01(0.59,1.70)	1.46(0.85,2.53)	1.22(0.77,1.94)	1.00(0.46,2.18)
Orofacial clefts	0.77(0.39,1.55)	0.99(0.48,2.03)	<b>2.31(1.15,4.66)</b>	1.48(0.50,4.41)
Summer/Spring				
Birth defects	1.03(0.78,1.36)	1.00(0.61,1.65)	1.23(1.00,1.52)	1.07(0.76,1.51)
CHDs	0.71(0.37,1.39)	0.66(0.16,2.83)	0.77(0.45,1.32)	1.52(0.69,3.37)
Limb defects	1.58(0.81,3.08)	2.17(0.92,5.08)	<b>1.61(1.01,2.57)</b>	0.92(0.42,2.02)
Orofacial clefts	0.35(0.12,1.04)	0.64(0.08,4.94)	0.59(0.25,1.39)	0.68(0.19,2.48)

Bold values represent statistical significance (two-sided P<0.05).

Abbreviations: CHDs, congenital heart defects; CI, confidence interval; NO<sub>2</sub>, nitrogen dioxide; OR, odds ratio; PM<sub>10</sub>, particulate matter ≤10 μm diameter; PM<sub>2.5</sub>, particulate matter <2.5 μm diameter; SO<sub>2</sub>, sulfur dioxide.

<sup>a</sup> Adjusted for year of conception, maternal age, gravidity, urban/rural, per capita area of roads, per capita of medication beds, unemployment, and per capita of cars.