



SUPPLEMENTARY APPENDIX

Research Report 219

Birth Cohort Studies of Long-Term Exposure to Ambient Air Pollution in Early Life and Development of Asthma in Children and Adolescents from Denmark

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Appendix A: Supplementary Figures and Tables

This Appendix was reviewed solely for spelling, grammar, and cross-references to the main text. It has not been formatted or fully edited by HEI. This document was reviewed by the HEI Review Committee.

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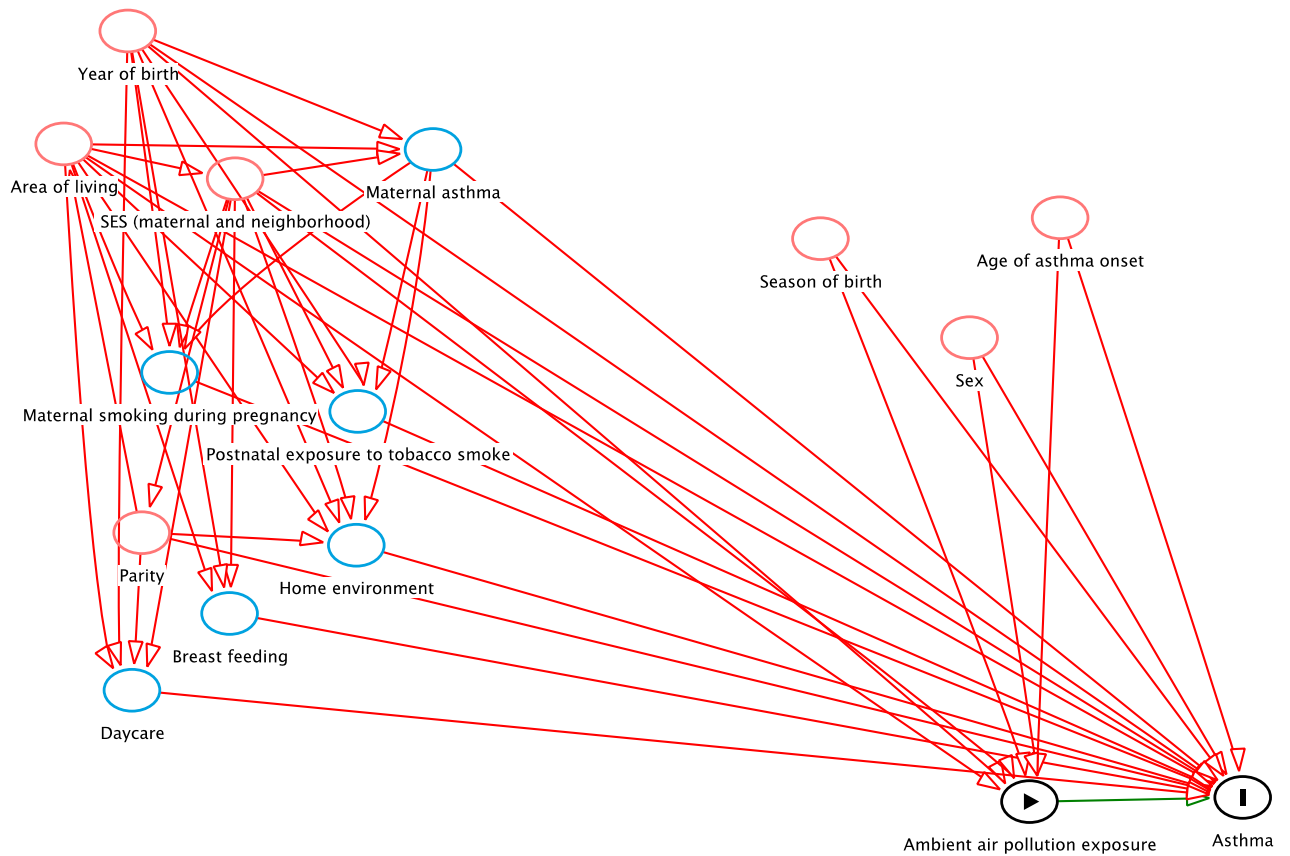


Figure A1. Directed Acyclic Graph (DAG) of the relationship between air pollution and asthma. The minimum set of covariates that should be controlled for are those marked with red. However, because some of the variables available may not perfectly capture the underlying factors that we aim to control for, we tested different levels of adjustment and potential effect modification whenever possible. Please note that the DAG is simplified. There are many more plausible arrows. For instance, maternal asthma may influence area of living; ambient air pollution may also determinate maternal asthma. Asthma refers to all asthma outcomes investigated. Year and season of birth refer to the child. Home environment refers to indoor home environment (e.g., mold, gas cooking, wood stoves). Although some of these could be determinants of the modeled ambient air pollution (e.g., wood stoves) others are not (e.g., mold and dampness). Furthermore, grouping all of the air pollutants together in one DAG makes confounding of a specific pollutant–asthma association by copollutants difficult to specify on the DAG. Ideally, each specific pollutant–outcome association would have its own DAG.

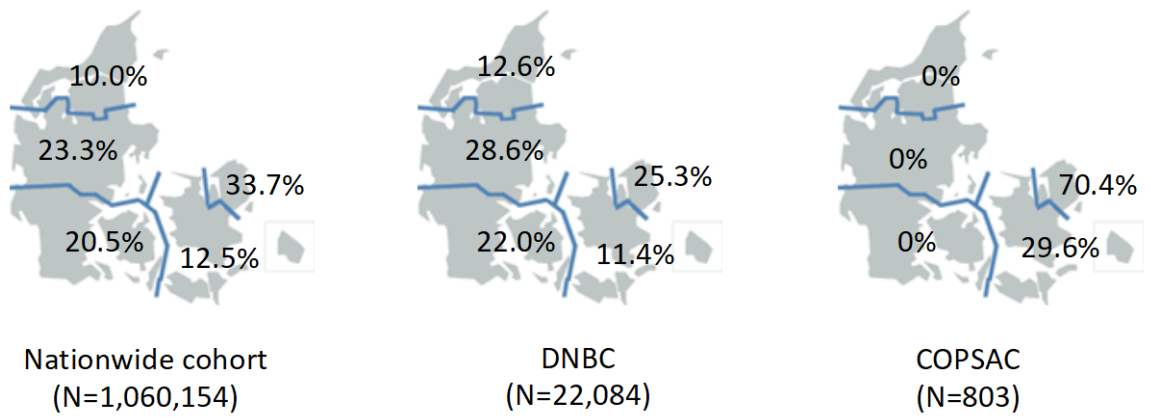


Figure A2. Geographical locations of the home residences of the included children participating in the Birth Cohort Studies of Long-Term Exposure to Ambient Air Pollution in Early Life and Development of Asthma in Children and Adolescents Born in Denmark.

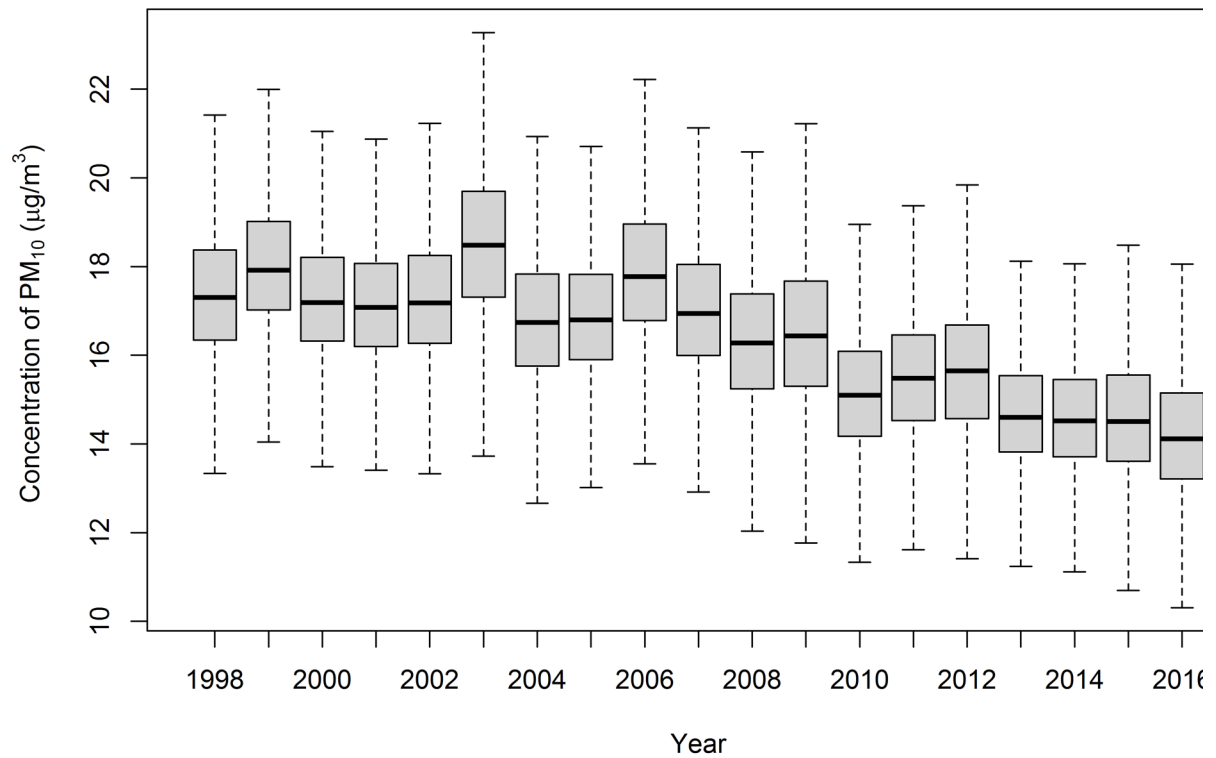
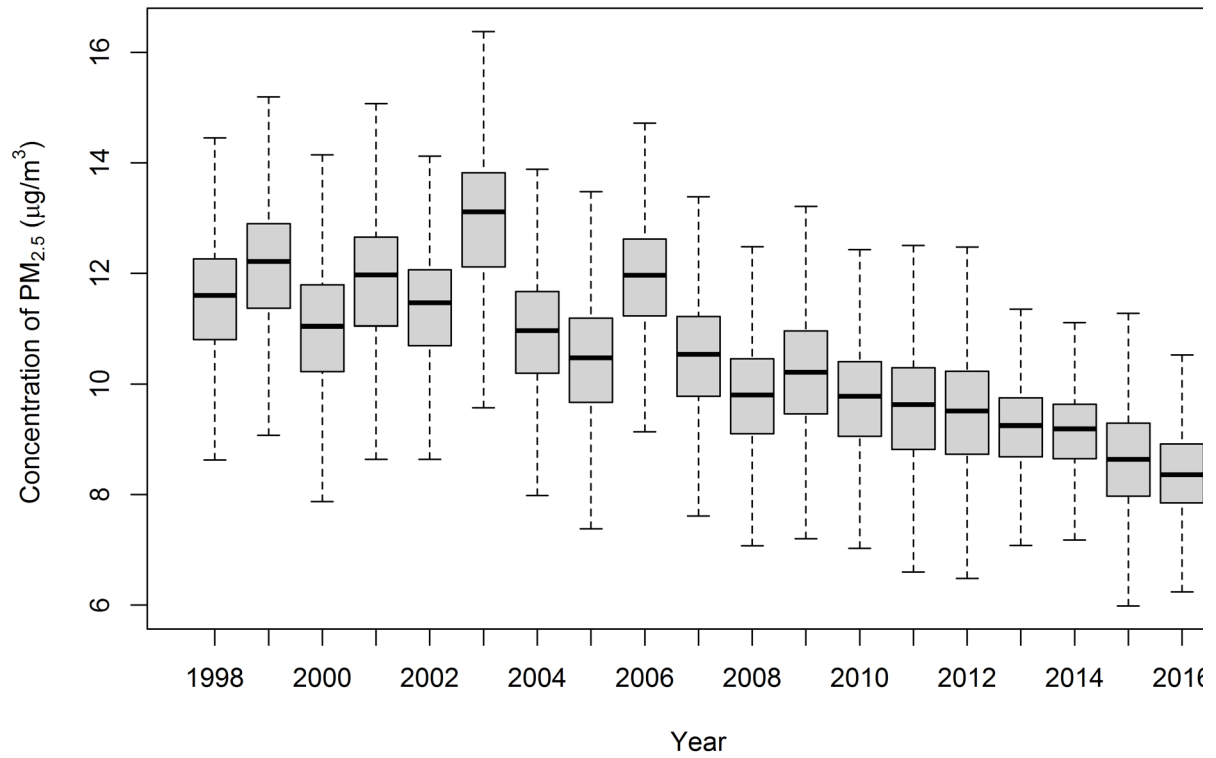


Figure A3. Annual ambient air pollution exposure concentration (µg/m³) distribution over time in the nationwide cohort of 1,060,154 children born in Denmark, 1998–2016. *Figure continues next 5 pages.*

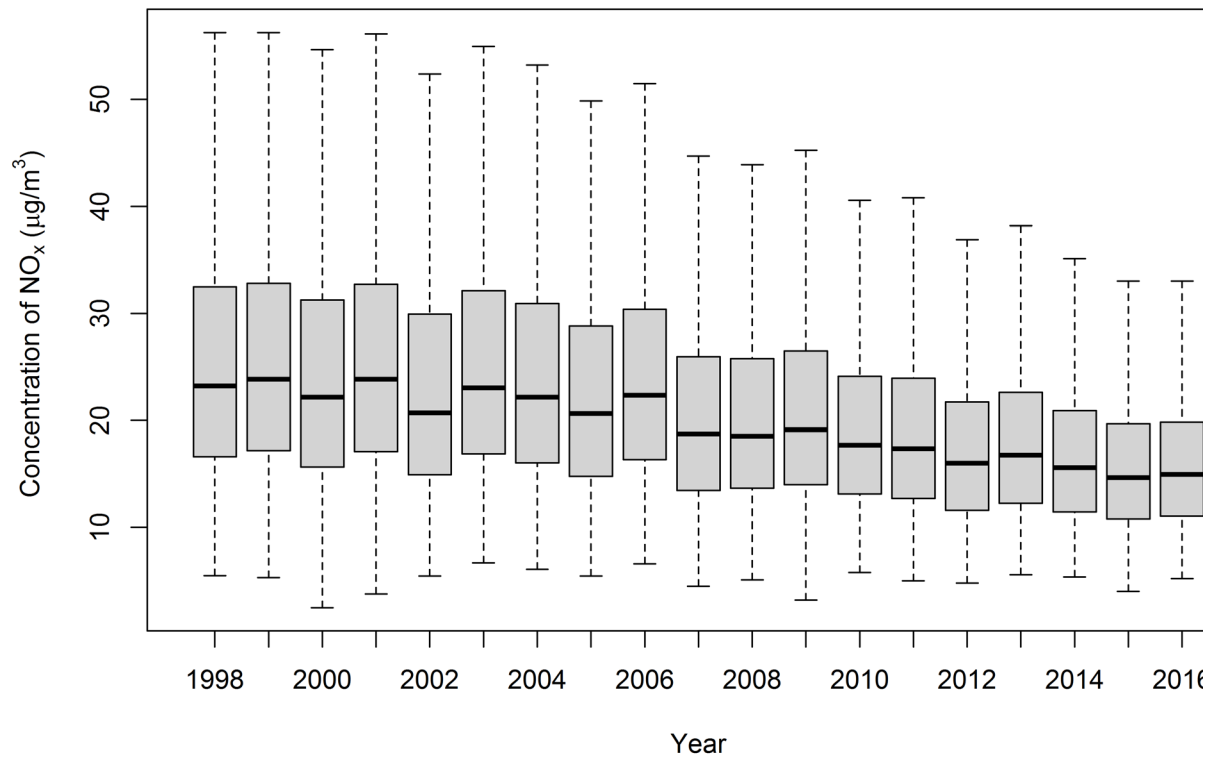
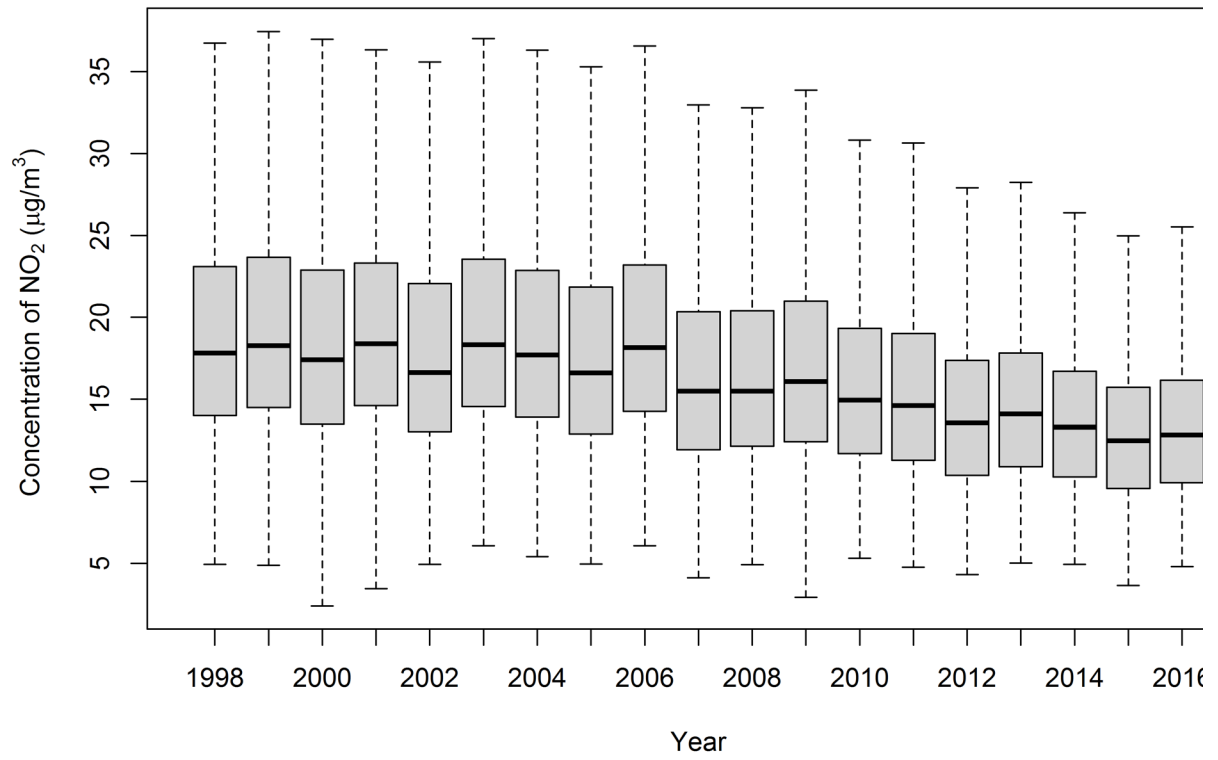


Figure A3. (Continued).

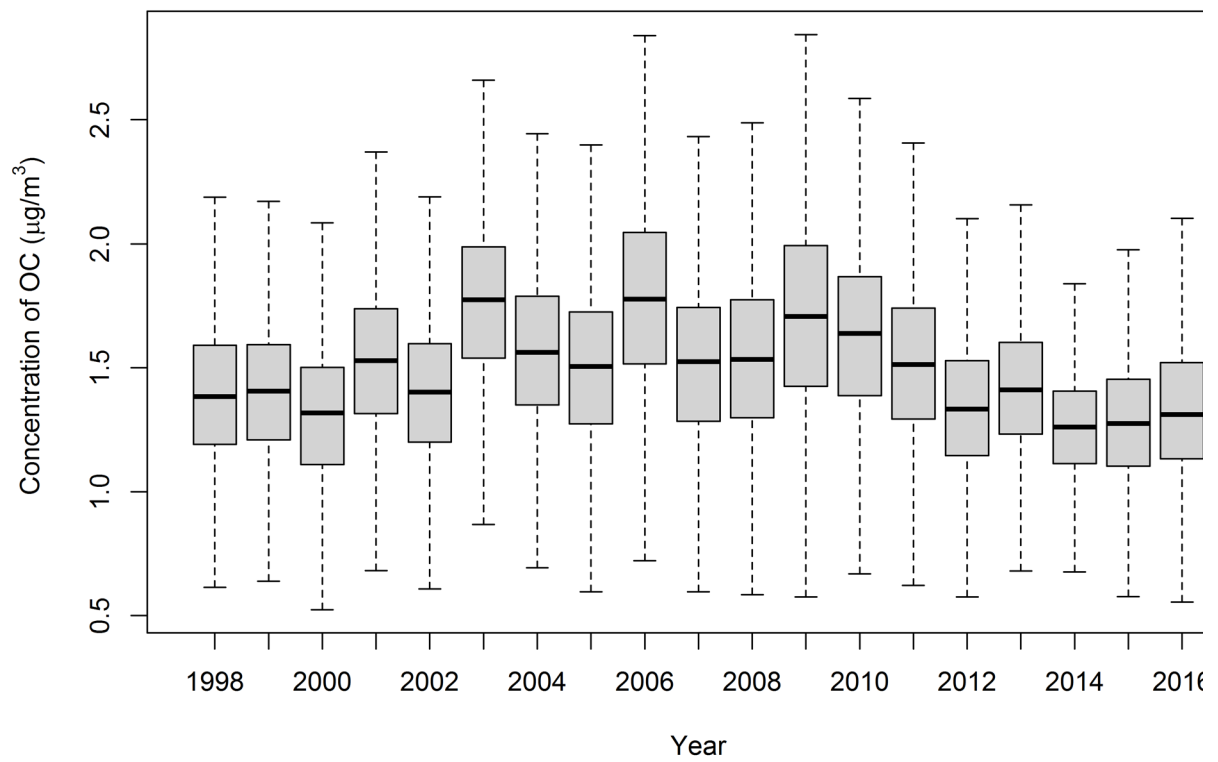
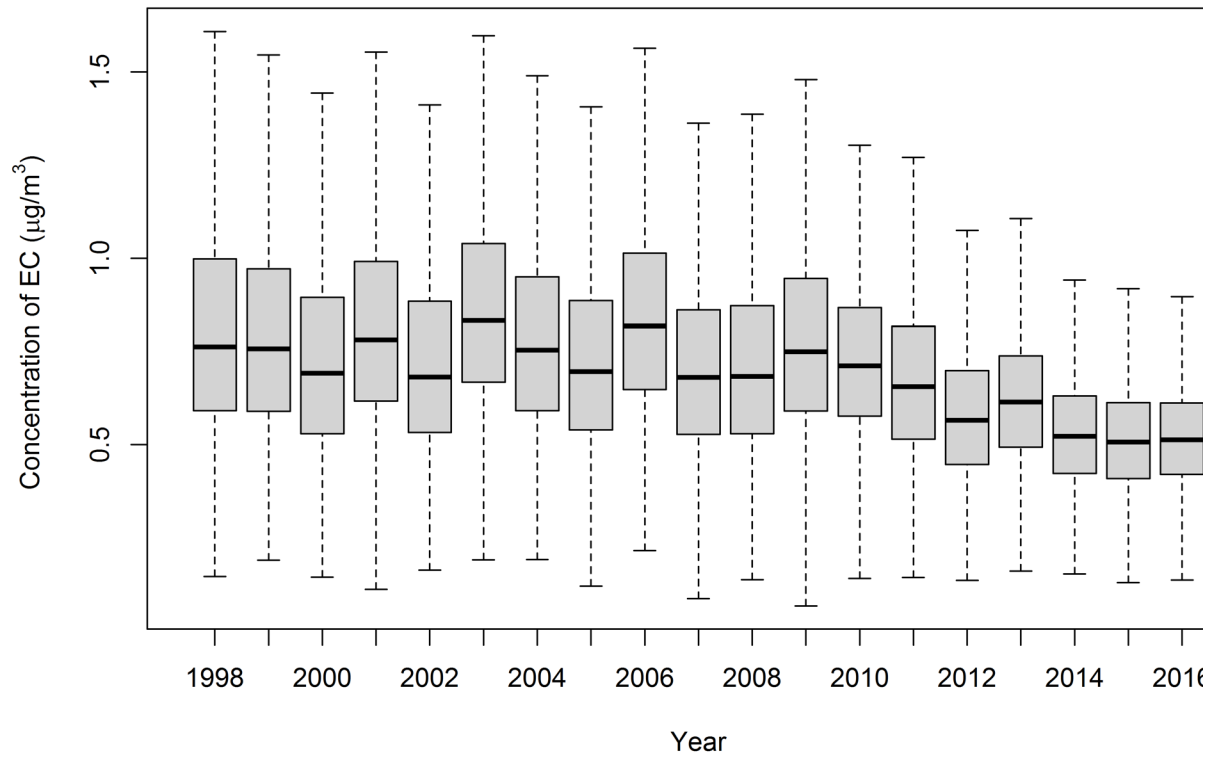


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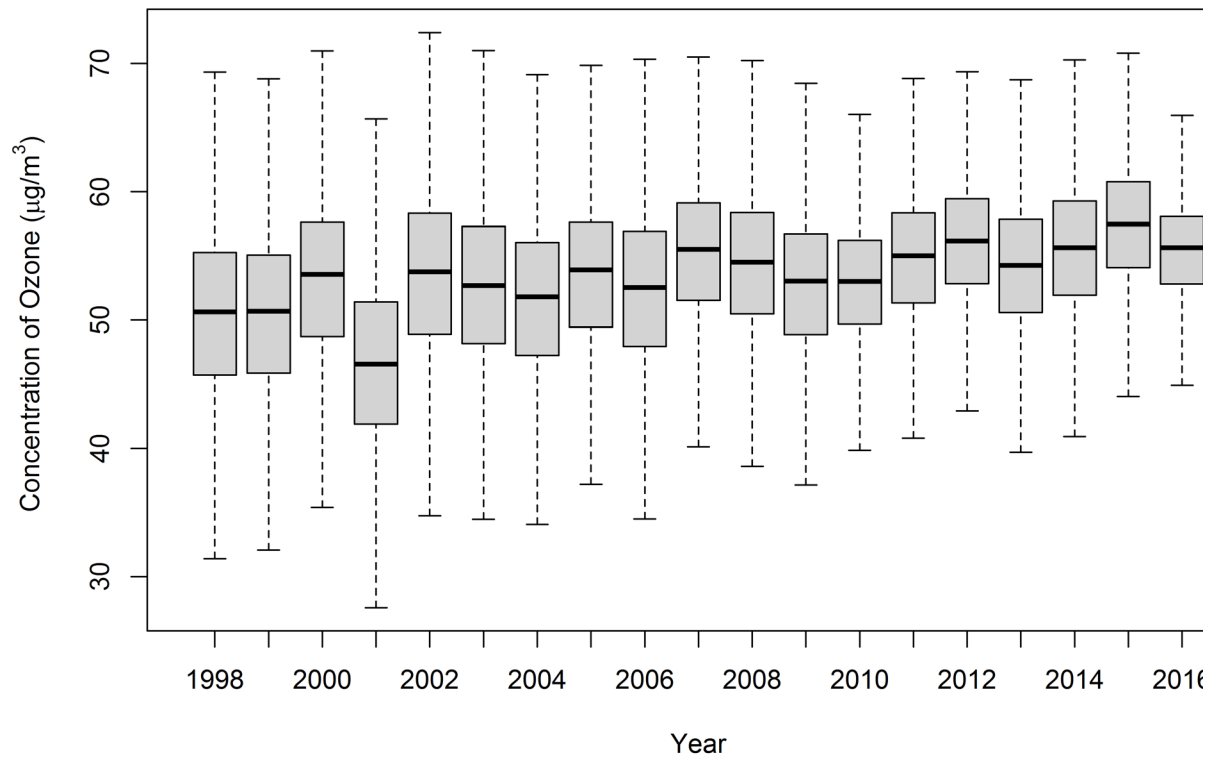
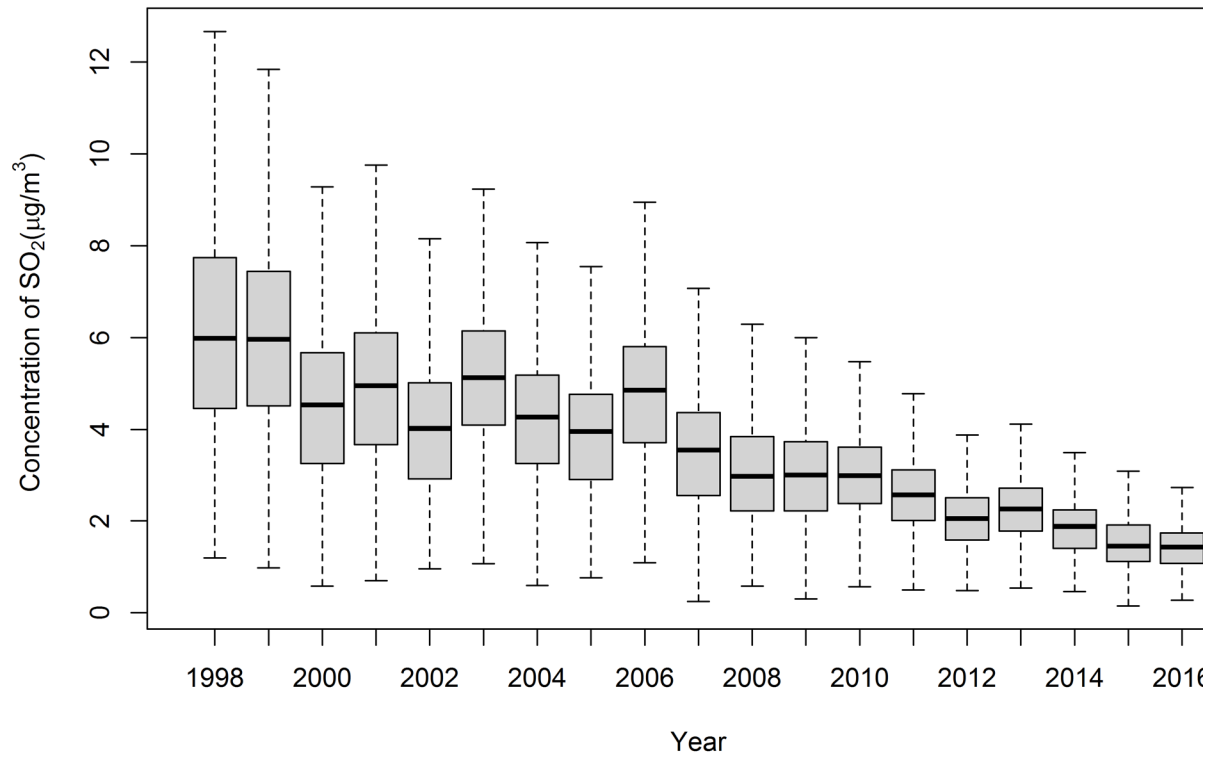


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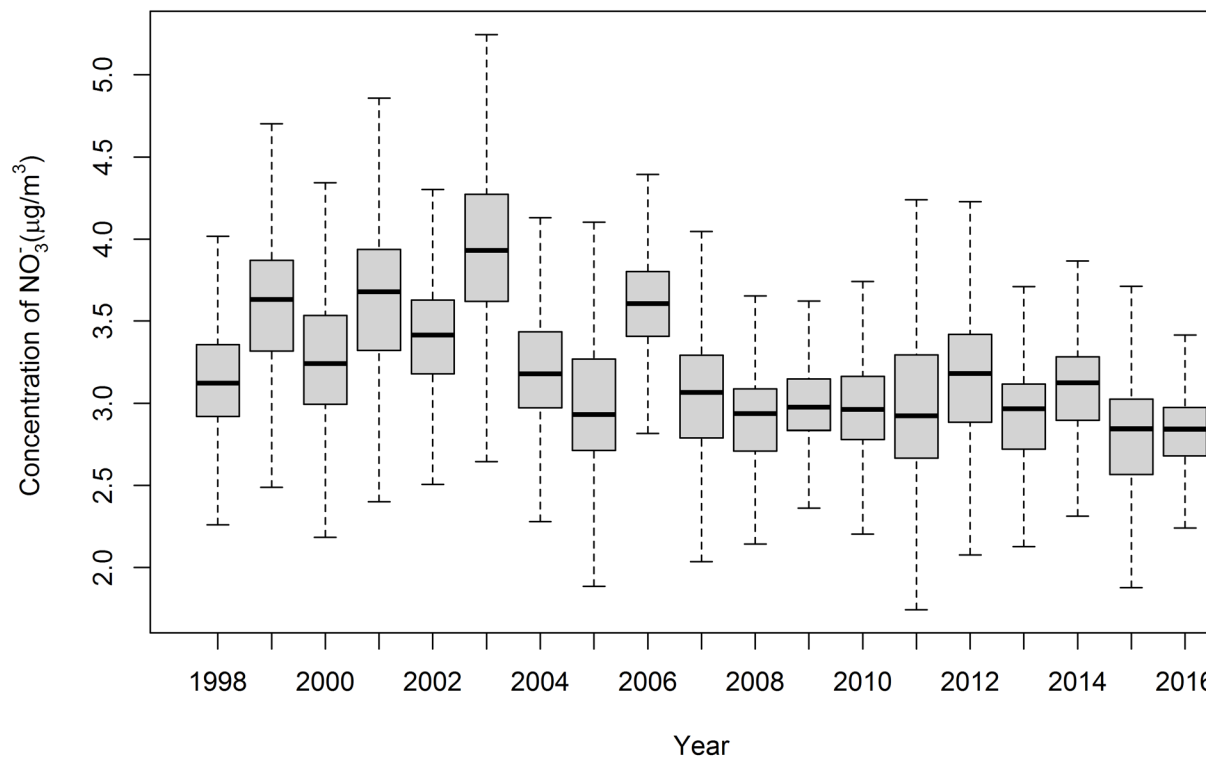
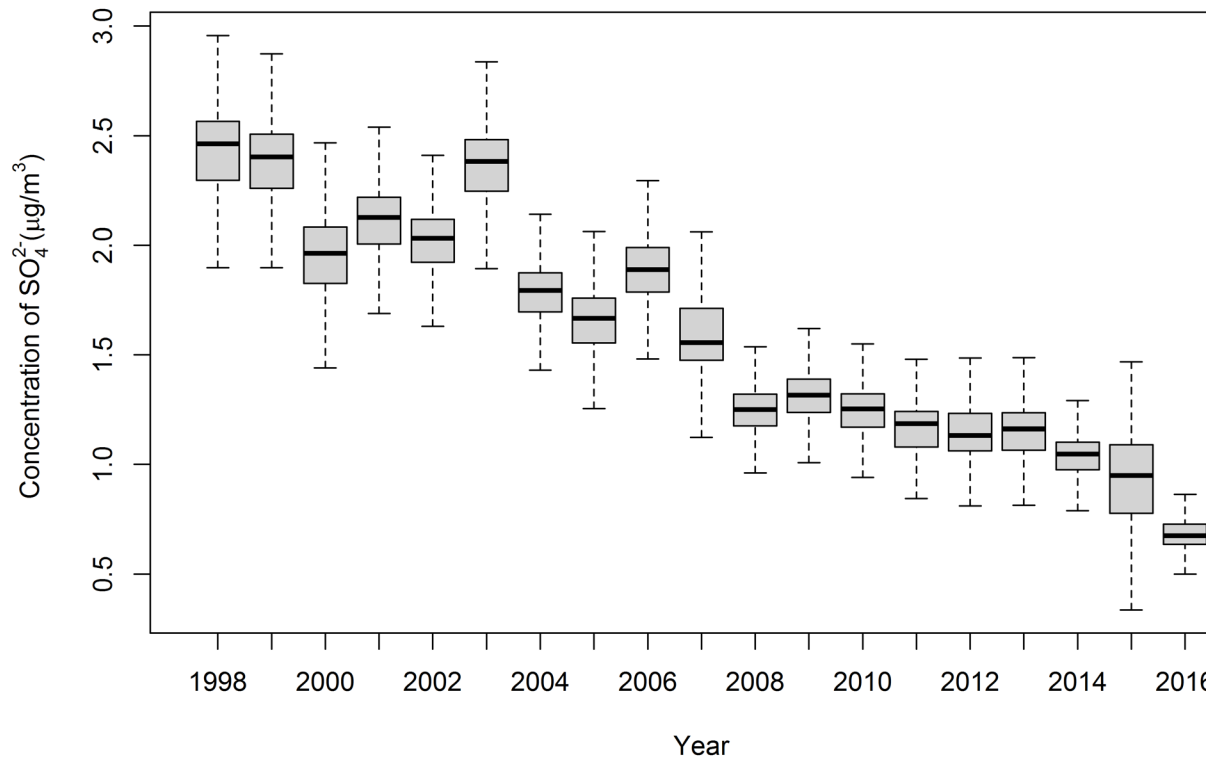


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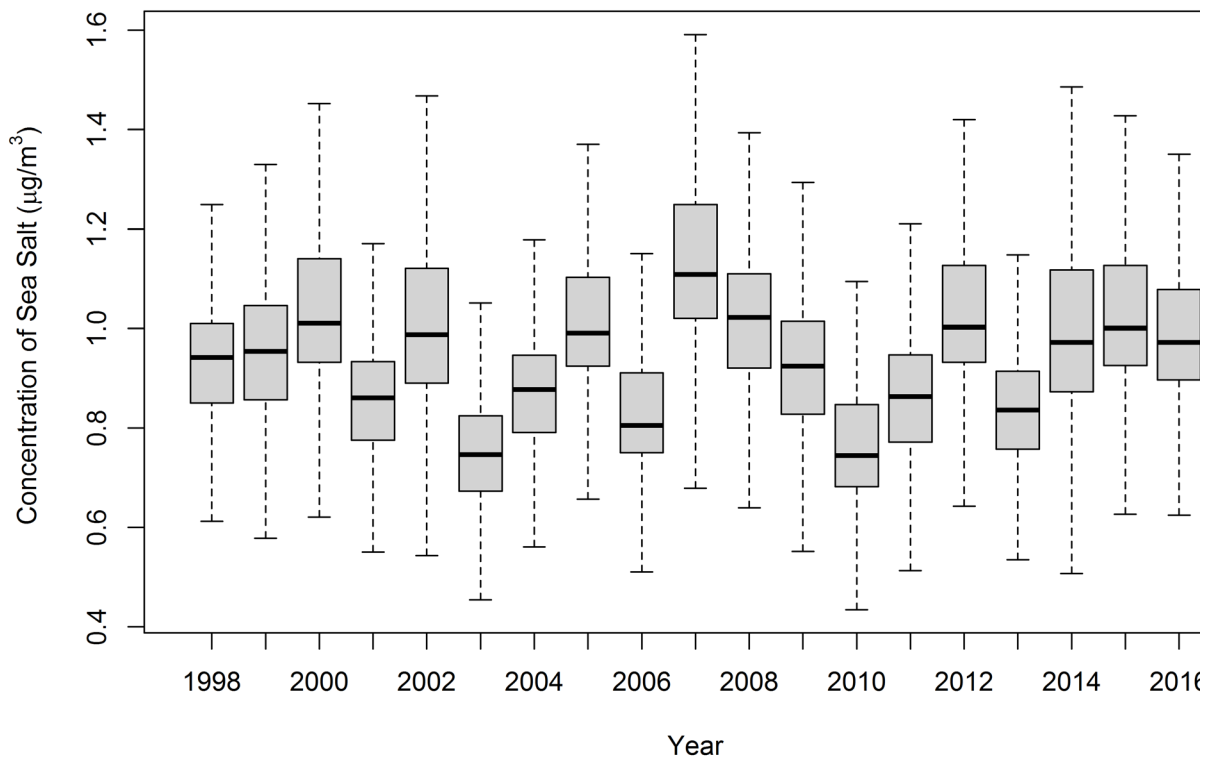
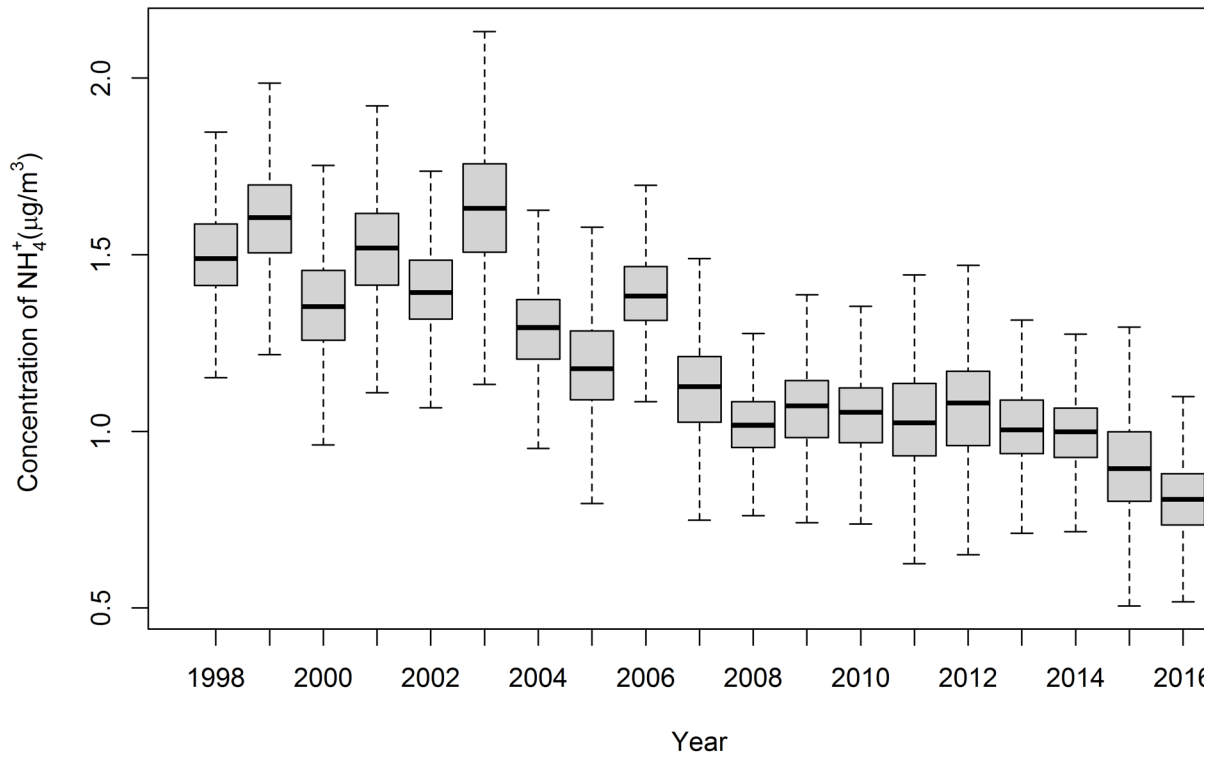
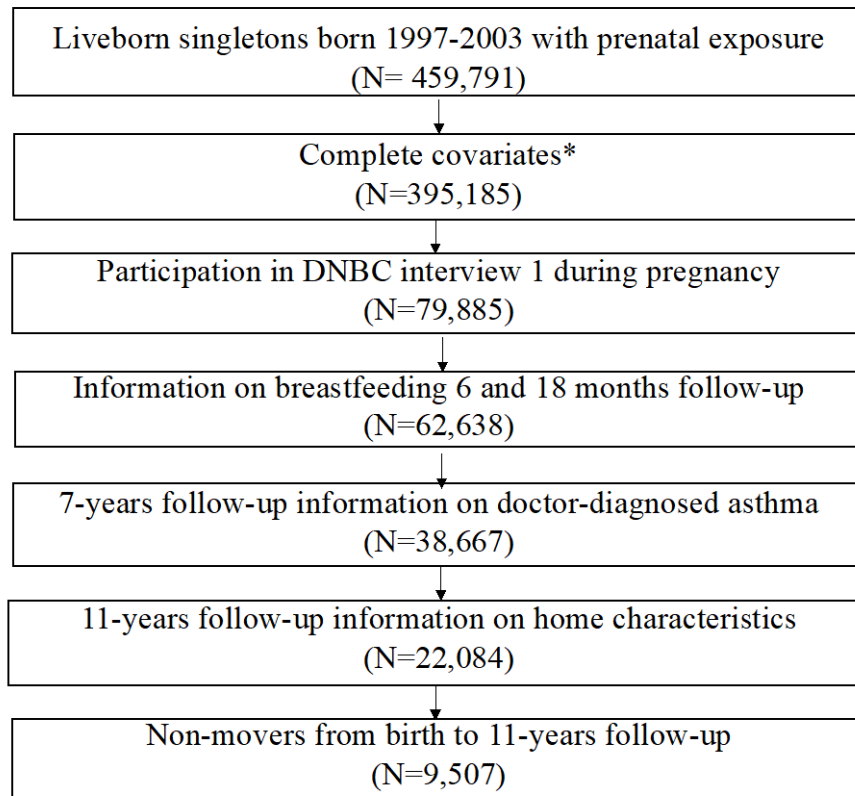


Figure A3. (Continued).

DNBC study population flow-chart



* Maternal smoking, education, and income.

Figure A4. Study population flow-chart of the Danish National Birth Cohort (DNBC).

Table A1. Correlation Coefficients between Modeled and Measured Pollutants in Ambient Air in Denmark ^a

Pollutant	Yearly <i>R</i> -Pearson (<i>N</i>)	Monthly <i>R</i> -Pearson (<i>N</i>)
PM _{2.5} (LVS)	0.92 (47)	0.89 (514)
PM ₁₀ (LVS)	0.88 (33)	0.77 (361)
NO ₂	0.94 (294)	0.91 (3,400)
NO _x	0.96 (294)	0.93 (3,404)
EC	0.99 (27)	0.89 (302)
OC		0.62 (202)
O ₃	0.93 (185)	0.93 (2,105)
SO ₄ ²⁻		0.80 (760) ^b
NO ₃ ⁻		0.67 (158) ^b
NH ₄ ⁺		0.74 (482) ^b
Sea salt		0.88 (674) ^b

LVS stands for Low Volume Sampler and refers to the method used for these PM measurements in the Danish Air Quality Monitoring Programme. The LVS method is considered to be in accordance with the current EU-reference standard for PM measurements.

^a For all available measurements from the Danish monitoring stations

^b Measurements from EMEP stations within the DEHM domain covering Denmark and nearest surroundings for the period 2006–2015.

Table A2. Study Population Characteristics of the Participants of the Birth Cohort Studies of Long-term Exposure to Ambient Air Pollution in Early Life and Development of Asthma in Children and Adolescents Born in Denmark, 1998–2016

		Nationwide cohort (<i>N</i> = 1,060,154) <i>n</i> (%)	DNBC (<i>N</i> = 22,084) <i>n</i> (%)	COPSAC (<i>N</i> = 803) <i>n</i> (%)
Sex	Boy	544,044 (51.3)	11,028 (49.9)	389 (48.4)
	Girl	516,110 (48.7)	11,056 (50.1)	414 (51.6)
Season of birth	Winter (Jan, Feb, Dec)	264,511 (25.0)	5,434 (24.6)	223 (27.8)
	Spring (March, April, May)	285,516 (26.9)	6,389 (28.9)	200 (24.9)
	Summer (June, July, August)	268,332 (25.3)	5,452 (24.7)	190 (23.7)
	Fall (Sept, Oct, Nov)	241,795 (22.8)	4,809 (21.8)	190 (23.7)
Year of birth	1998–2002	281,150 (26.5)	21,564 (97.6)	272 (33.9)
	2003–2008	352,394 (33.2)	520 (2.4)	0
	2009–2016	370,414 (34.9)	0	531 (66.1)
Maternal education	Low	216,145 (20.4)	1,878 (8.5)	61 (7.6)
	Middle	439,372 (41.4)	10,619 (48.1)	296 (36.9)
	High	404,637 (38.2)	9,587 (43.4)	446 (55.5)
Household income	Low	333,308 (31.4)	2,991 (13.5)	108 (13.4)
	Middle	407,931 (38.5)	9,211 (41.7)	271 (33.7)
	High	318,915 (30.1)	9,882 (44.7)	424 (52.8)
Older siblings	No	482,150 (45.2)	10,059 (45.5)	372 (46.3)
	Yes	583,152 (54.8)	12,025 (54.5)	431 (53.7)
Maternal smoking during early pregnancy	No	912,930 (86.1)	17,852 (80.8)	711 (88.5)
	Yes	147,224 (13.9)	4,232 (19.2)	92 (11.5)
Maternal asthma	No	915,292 (86.3)	20,283 (91.8)	427 (53.2)
	Yes	144,862 (13.7)	1,801 (8.2)	376 (46.8)
Child asthma (ICD-10)	No	995,011 (93.9)	20,609 (93.3)	597 (74.3)
	Yes	65,143 (6.1)	1,475 (6.7)	206 (25.7)
Pets in the home	No	NA	12,932 (58.6)	7 (0.9)
	Yes		9,152 (41.4)	796 (99.1)
Breast feeding	No	NA	5,706 (25.8)	6 (0.7)
	Yes		16,378 (74.2)	797 (99.3)
Daycare attendance	No	NA	19,525 (88.4)	NA
	Yes		2,559 (11.6)	
Postnatal exposure to ETS	No	NA	18,306 (82.9)	99 (12.3)
	Yes		3,778 (17.1)	704 (87.7)
Mold or dampness in the home	No	NA	9,116 (41.3)	NA
	Yes		12,968 (58.7)	
Gas stove in the home	No	NA	20,434 (92.5)	424 (52.8)
	Yes		1,650 (7.5)	177 (22.0)
Wood stove in the home	No	NA	12,597 (57.0)	394 (49.1)
	Yes		9,487 (43.0)	409 (50.9)

NA refers to not available. ETS refers to environmental tobacco smoke.

Table A3. Prenatal Exposure to Ambient Air Pollution Concentrations ($\mu\text{g}/\text{m}^3$) of the Children Born in Denmark, 1998–2016^a

Pollutant	Nationwide Cohort (<i>N</i> = 1,060,154)	DNBC (<i>N</i> = 22,084)	COPSAC (<i>N</i> = 803)
PM _{2.5}	10.5 ± 1.8	11.5 ± 1.4	10.8 ± 1.5
PM ₁₀	16.6 ± 2.2	17.6 ± 1.8	16.0 ± 2.1
NO ₂	17.5 ± 7.4	18.6 ± 7.3	20.4 ± 6.9
NO _x	24.1 ± 17.3	26.9 ± 19.4	28.2 ± 16.9
EC	0.7 ± 0.3	0.8 ± 0.4	0.9 ± 0.3
OC	1.5 ± 0.3	1.4 ± 0.3	1.7 ± 0.3
SO ₂	3.8 ± 2.3	5.0 ± 2.3	3.9 ± 1.5
O ₃	53.1 ± 6.7	51.1 ± 7.2	49.9 ± 6.6
SO ₄ ²⁻	1.6 ± 0.5	2.1 ± 0.2	1.6 ± 0.4
NO ₃ ⁻	3.2 ± 0.5	3.4 ± 0.5	3.2 ± 0.4
NH ₄ ⁺	1.2 ± 0.3	1.8 ± 0.9	1.2 ± 0.3
SOA	0.3 ± 0.1	0.3 ± 0.1	0.3 ± 0.1
Sea salt	0.9 ± 0.2	1.0 ± 0.2	0.8 ± 0.1

^a Values are mean ± standard deviation.

Table A4. Spearman Correlation Coefficients between Ambient Air Pollutant Concentrations During the Prenatal Periods for the Children Born in Denmark, 1998–2016

Nationwide cohort (N = 1,060,154)													
Pollutant	PM _{2.5}	PM ₁₀	NO ₂	NO _x	OC	EC	SO ₂	O ₃	SO ₄ ²⁻	NO ₃ ⁻	NH ₄ ⁺	SOA	
PM ₁₀	0.82	1.00											
NO ₂	0.71	0.59	1.00										
NO _x	0.69	0.60	0.98	1.00									
EC	0.74	0.68	0.91	0.90	1.00								
OC	0.58	0.49	0.63	0.58	0.77	1.00							
SO ₂	0.79	0.67	0.66	0.63	0.69	0.52	1.00						
O ₃	-0.59	-0.54	-0.81	-0.79	-0.82	-0.64	-0.59	1.00					
SO ₄ ²⁻	0.83	0.63	0.41	0.40	0.42	0.23	0.77	-0.32	1.00				
NO ₃ ⁻	0.72	0.44	0.29	0.27	0.24	0.19	0.41	-0.17	0.63	1.00			
NH ₄ ⁺	0.83	0.64	0.31	0.30	0.34	0.24	0.66	-0.27	0.91	0.81	1.00		
SOA	0.17	-0.05	0.22	0.19	0.07	-0.07	0.09	0.14	0.18	0.27	0.04	1.00	
Sea salt	-0.34	0.07	-0.44	-0.39	-0.40	-0.42	-0.27	0.28	-0.23	-0.32	-0.17	-0.38	1.00
DNBC (N = 22,084)													
Pollutant	PM _{2.5}	PM ₁₀	NO ₂	NO _x	OC	EC	SO ₂	O ₃	SO ₄ ²⁻	NO ₃ ⁻	NH ₄ ⁺	SOA	
PM ₁₀	0.78	1.00											
NO ₂	0.84	0.74	1.00										
NO _x	0.80	0.81	0.93	1.00									
OC	0.67	0.43	0.64	0.46	1.00								
EC	0.82	0.82	0.94	0.97	0.57	1.00							
SO ₂	0.50	0.46	0.52	0.39	0.56	0.46	1.00						
O ₃	-0.72	-0.60	-0.83	-0.74	-0.75	-0.80	-0.54	1.00					
SO ₄ ²⁻	0.62	0.28	0.36	0.25	0.35	0.28	0.42	-0.30	1.00				
NO ₃ ⁻	0.62	0.24	0.21	0.12	0.27	0.11	0.14	-0.16	0.55	1.00			
NH ₄ ⁺	0.61	0.29	0.15	0.08	0.32	0.11	0.24	-0.21	0.72	0.87	1.00		
SOA	0.13	-0.08	0.15	0.09	-0.13	0.02	-0.07	0.23	0.12	0.24	-0.08	1.00	
Sea salt	-0.49	0.08	-0.42	-0.28	-0.51	-0.31	-0.22	0.38	-0.51	-0.45	0.41	-0.39	1.00
COPSAC (N = 803)													
Pollutant	PM _{2.5}	PM ₁₀	NO ₂	NO _x	OC	EC	SO ₂	O ₃	SO ₄ ²⁻	NO ₃ ⁻	NH ₄ ⁺	SOA	
PM ₁₀	0.94	1.00											
NO ₂	0.62	0.71	1.00										
NO _x	0.63	0.72	0.98	1.00									
EC	0.67	0.78	0.92	0.91	1.00								
OC	0.38	0.47	0.29	0.25	0.57	1.00							
SO ₂	0.77	0.71	0.55	0.53	0.51	0.22	1.00						
O ₃	-0.63	-0.70	-0.80	-0.77	-0.85	-0.48	-0.57	1.00					
SO ₄ ²⁻	0.85	0.69	0.32	0.32	0.31	0.14	0.77	-0.34	1.00				
NO ₃ ⁻	0.64	0.44	0.03	0.06	0.01	-0.07	0.50	-0.07	0.79	1.00			
NH ₄ ⁺	0.80	0.63	0.15	0.17	0.18	0.12	0.68	-0.28	0.91	0.89	1.00		
SOA	-0.24	-0.25	0.09	0.09	-0.11	-0.52	-0.16	0.31	-0.20	-0.15	-0.38	1.00	
Sea salt	0.39	0.44	0.01	0.02	0.01	-0.02	0.33	-0.10	0.49	0.29	0.47	-0.21	1.00

Table A5. Spearman Correlation Coefficients between Prenatal and Postnatal Exposure Concentrations for the Children Born in Denmark, 1998–2016

Nationwide cohort (N = 1,060,154)													
Prenatal exposure	Postnatal exposure as annual mean concentration during the first year of life												
	PM _{2.5}	PM ₁₀	NO ₂	NO _x	EC	OC	SO ₂	O ₃	SO ₄ ²⁻	NO ₃ ⁻	NH ₄ ⁺	SOA	Sea salt
PM _{2.5}	0.76	0.62	0.63	0.61	0.59	0.34	0.68	-0.50	0.74	0.46	0.65	0.15	-0.22
PM ₁₀	0.63	0.73	0.50	0.51	0.51	0.24	0.61	-0.40	0.59	0.30	0.52	0.08	0.03
NO ₂	0.64	0.51	0.91	0.89	0.81	0.54	0.62	-0.69	0.41	0.25	0.28	0.24	-0.37
NO _x	0.62	0.52	0.90	0.90	0.80	0.50	0.60	-0.68	0.39	0.24	0.27	0.22	-0.34
EC	0.63	0.56	0.83	0.81	0.83	0.57	0.60	-0.64	0.42	0.28	0.24	0.23	-0.29
OC	0.45	0.35	0.61	0.56	0.61	0.62	0.45	-0.45	0.24	0.12	0.13	0.27	-0.28
SO ₂	0.70	0.59	0.61	0.58	0.59	0.38	0.90	-0.48	0.74	0.35	0.60	0.15	-0.16
O ₃	-0.46	-0.39	-0.76	-0.73	-0.67	-0.5	-0.54	0.62	-0.23	-0.13	-0.2	-0.22	0.26
SO ₄ ²⁻	0.70	0.55	0.39	0.38	0.37	0.14	0.71	-0.32	0.89	0.49	0.79	0.11	-0.11
NO ₃ ⁻	0.49	0.31	0.26	0.25	0.20	0.08	0.39	-0.20	0.51	0.53	0.57	0.03	-0.16
NH ₄ ⁺	0.62	0.49	0.27	0.27	0.26	0.08	0.59	-0.24	0.80	0.52	0.78	0.04	-0.07
SOA	0.28	0.13	0.34	0.32	0.28	0.23	0.26	-0.28	0.25	0.16	0.16	0.09	-0.17
Sea salt	-0.23	0.00	-0.39	-0.36	-0.33	-0.30	-0.18	0.28	-0.14	-0.13	-0.05	-0.16	0.32
DNBC (N = 22,084)													
Prenatal exposure	Postnatal exposure as annual mean concentration during the first year of life												
	PM _{2.5}	PM ₁₀	NO ₂	NO _x	EC	OC	SO ₂	O ₃	SO ₄ ²⁻	NO ₃ ⁻	NH ₄ ⁺	SOA	Sea salt
PM _{2.5}	0.61	0.53	0.65	0.61	0.46	0.61	0.25	-0.43	0.18	0.25	-0.38	0.25	-0.24
PM ₁₀	0.61	0.76	0.62	0.67	0.32	0.67	0.32	-0.44	0.19	0.14	-0.17	0.12	0.00
NO ₂	0.74	0.65	0.91	0.84	0.57	0.84	0.46	-0.71	0.30	0.14	-0.54	0.19	-0.37
NO _x	0.70	0.71	0.85	0.90	0.41	0.87	0.34	-0.64	0.21	0.08	-0.40	0.13	-0.26
EC	0.40	0.24	0.50	0.35	0.62	0.39	0.27	-0.35	0.02	0.12	-0.43	0.32	-0.34
OC	0.69	0.69	0.85	0.85	0.47	0.87	0.37	-0.63	0.17	0.07	-0.43	0.17	-0.27
SO ₂	0.37	0.36	0.47	0.35	0.44	0.39	0.79	-0.37	0.21	0.03	-0.42	0.09	-0.16
O ₃	-0.55	-0.52	-0.79	-0.71	-0.49	-0.71	-0.40	0.60	-0.07	-0.03	0.43	-0.14	0.24
SO ₄ ²⁻	0.24	0.13	0.24	0.17	0.25	0.17	0.09	-0.11	0.20	0.12	-0.35	0.10	-0.12
NO ₃ ⁻	0.25	0.11	0.11	0.06	0.13	0.04	-0.03	0.03	0.11	0.42	-0.12	0.27	-0.10
NH ₄ ⁺	0.13	0.07	0.01	-0.01	0.05	0.03	-0.07	0.10	0.02	0.26	0.05	0.17	0.16
SOA	0.23	0.07	0.22	0.16	0.28	0.18	0.09	-0.18	0.20	0.11	-0.30	0.01	-0.21
Sea salt	-0.17	0.06	-0.31	-0.21	-0.32	-0.20	0.00	0.12	0.10	-0.05	0.44	-0.34	0.31
DNBC (N = 22,084)													
Prenatal exposure	Postnatal exposure as the mean concentration during the first seven years of life												
	PM _{2.5}	PM ₁₀	NO ₂	NO _x	EC	OC	SO ₂	O ₃	SO ₄ ²⁻	NO ₃ ⁻	NH ₄ ⁺	SOA	Sea salt
PM _{2.5}	0.74	0.57	0.68	0.58	0.57	0.60	0.45	-0.57	0.44	0.46	-0.42	0.09	-0.31
PM ₁₀	0.50	0.70	0.49	0.50	0.29	0.52	0.35	-0.39	0.15	0.18	-0.07	-0.02	0.11
NO ₂	0.68	0.53	0.82	0.70	0.60	0.72	0.47	-0.67	0.35	0.20	-0.54	0.16	-0.41
NO _x	0.65	0.58	0.77	0.75	0.45	0.74	0.37	-0.60	0.27	0.13	-0.43	0.12	-0.30
EC	0.53	0.29	0.58	0.40	0.76	0.46	0.42	-0.52	0.21	0.24	-0.48	0.20	-0.46
OC	0.66	0.58	0.78	0.71	0.57	0.76	0.44	-0.63	0.26	0.14	-0.47	0.15	-0.35
SO ₂	0.39	0.35	0.46	0.33	0.45	0.38	0.76	-0.40	0.25	0.11	-0.41	0.05	-0.20
O ₃	-0.64	-0.49	-0.79	-0.65	-0.63	-0.68	-0.50	0.66	-0.33	-0.16	0.48	-0.15	0.39
SO ₄ ²⁻	0.41	0.29	0.33	0.22	0.21	0.24	0.38	-0.28	0.58	0.34	-0.36	-0.12	-0.11
NO ₃ ⁻	0.43	0.23	0.17	0.10	0.16	0.09	0.15	-0.13	0.41	0.66	-0.09	0.04	-0.11
NH ₄ ⁺	0.31	0.23	0.06	0.02	0.05	0.02	0.02	-0.07	0.39	0.51	0.12	0.59	-0.11
SOA	0.47	0.08	0.55	0.38	0.57	0.40	0.26	-0.47	0.28	0.31	-0.68	0.19	-0.63
Sea salt	-0.46	-0.02	-0.51	-0.34	-0.56	-0.36	-0.30	0.42	-0.38	-0.28	0.63	-0.23	0.66

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Table A5 (continued). Spearman Correlation Coefficients between Prenatal and Postnatal Exposure Concentrations for the Children Born in Denmark, 1998–2016

COPSAC (N = 803)		Postnatal exposure as the mean concentration during the first six years of life												
Prenatal exposure	PM _{2.5}	PM ₁₀	NO ₂	NO _x	EC	OC	SO ₂	O ₃	SO ₄ ²⁻	NO ₃ ⁻	NH ₄ ⁺	SOA	Sea salt	
PM _{2.5}	0.79	0.75	0.61	0.61	0.68	0.63	0.71	-0.58	0.72	0.40	0.60	0.71	-0.50	
PM ₁₀	0.75	0.75	0.64	0.65	0.70	0.61	0.64	-0.61	0.64	0.27	0.46	0.6	-0.47	
NO ₂	0.63	0.65	0.85	0.85	0.83	0.59	0.5	-0.83	0.31	-0.10	0.06	0.59	-0.40	
NO _x	0.64	0.67	0.84	0.85	0.81	0.57	0.49	-0.8	0.31	-0.06	0.09	0.57	-0.37	
EC	0.54	0.57	0.74	0.74	0.75	0.55	0.39	-0.71	0.23	-0.17	-0.01	0.52	-0.34	
OC	0.05	0.07	0.16	0.15	0.20	0.24	0.00	-0.14	-0.07	-0.33	-0.22	0.15	-0.10	
SO ₂	0.71	0.68	0.61	0.58	0.63	0.61	0.88	-0.59	0.71	0.33	0.52	0.69	-0.45	
O ₃	-0.52	-0.53	-0.66	-0.65	-0.66	-0.49	-0.44	0.62	-0.33	0.04	-0.11	-0.54	0.31	
SO ₄ ²⁻	0.69	0.6	0.42	0.39	0.47	0.51	0.74	-0.4	0.85	0.57	0.75	0.66	-0.52	
NO ₃ ⁻	0.49	0.43	0.14	0.13	0.19	0.25	0.51	-0.13	0.64	0.77	0.80	0.40	-0.20	
NH ₄ ⁺	0.62	0.53	0.27	0.25	0.33	0.41	0.65	-0.24	0.79	0.71	0.84	0.58	-0.4	
SOA	0.04	0.07	0.13	0.13	0.12	0.11	0.02	-0.18	-0.1	-0.14	-0.13	-0.07	-0.02	
Sea salt	0.41	0.33	0.11	0.10	0.17	0.24	0.46	-0.11	0.73	0.43	0.58	0.18	-0.51	
COPSAC (N = 803)		Postnatal exposure as the annual mean concentration during the year before lung function measurement												
Prenatal exposure	PM _{2.5}	PM ₁₀	NO ₂	NO _x	EC	OC	SO ₂	O ₃	SO ₄ ²⁻	NO ₃ ⁻	NH ₄ ⁺	SOA	Sea salt	
PM _{2.5}	0.74	0.69	0.49	0.51	0.41	0.01	0.66	-0.42	0.71	0.51	0.64	0.00	0.50	
PM ₁₀	0.67	0.65	0.52	0.54	0.42	-0.03	0.64	-0.42	0.60	0.45	0.54	0.11	0.41	
NO ₂	0.55	0.55	0.69	0.68	0.58	0.09	0.58	-0.52	0.42	0.17	0.29	0.13	0.13	
NO _x	0.53	0.54	0.67	0.67	0.57	0.09	0.54	-0.50	0.40	0.15	0.27	0.13	0.13	
EC	0.61	0.59	0.68	0.67	0.57	0.07	0.61	-0.53	0.49	0.23	0.37	0.13	0.20	
OC	0.50	0.46	0.52	0.52	0.41	0.01	0.54	-0.40	0.43	0.20	0.34	0.17	0.17	
SO ₂	0.68	0.60	0.50	0.49	0.39	0.00	0.77	-0.42	0.70	0.47	0.61	0.01	0.39	
O ₃	-0.30	-0.29	-0.59	-0.56	-0.42	0.08	-0.36	0.29	-0.20	-0.06	-0.06	-0.34	0.12	
SO ₄ ²⁻	0.70	0.62	0.27	0.28	0.21	-0.06	0.64	-0.30	0.80	0.63	0.77	-0.11	0.73	
NO ₃ ⁻	0.42	0.31	-0.06	-0.04	-0.1	-0.17	0.32	0.03	0.55	0.69	0.66	-0.19	0.42	
NH ₄ ⁺	0.64	0.53	0.13	0.15	0.07	-0.14	0.56	-0.17	0.78	0.73	0.81	-0.13	0.67	
SOA	0.61	0.52	0.31	0.30	0.34	0.3	0.48	-0.35	0.57	0.47	0.62	-0.42	0.20	
Sea salt	-0.05	-0.08	-0.07	-0.06	-0.05	-0.04	-0.01	-0.03	-0.06	0.09	-0.04	0.17	-0.12	

Table A6. Associations between Prenatal Exposure to Ambient Air Pollution and Asthma Incidence After Age 4 in the Nationwide Cohort of Children Born in Denmark, 1998–2016^a

Pollutant	Asthma at any age	Asthma after 4 years of age
	Same study population as the right column HR (95% CI)	HR (95% CI)
PM _{2.5}	1.05 (1.03–1.07)	1.03 (1.00–1.05)
PM ₁₀	1.05 (1.03–1.06)	1.03 (1.01–1.05)
NO ₂	1.04 (1.02–1.05)	1.02 (1.00–1.04)
NO _x	1.01 (1.01–1.02)	1.01 (1.00–1.02)
EC	1.02 (1.01–1.03)	1.02 (1.00–1.03)
OC	1.08 (1.06–1.09)	1.05 (1.02–1.08)
SO ₂	1.02 (1.01–1.03)	1.02 (1.00–1.04)
O ₃	0.98 (0.96–0.99)	0.98 (0.95–1.00)
SO ₄ ²⁻	1.03 (1.00–1.07)	0.99 (0.94–1.04)
NO ₃ ⁻	1.01 (1.00–1.03)	1.00 (0.98–1.03)
NH ₄ ⁺	1.01 (0.98–1.03)	0.99 (0.96–1.02)
SOA	1.02 (1.01–1.04)	1.03 (1.01–1.05)
Sea salt	0.99 (0.97–1.00)	1.00 (0.98–1.03)

^a Restricted to infants born between 1998 and 2012.

Hazard ratio (HR) and 95% confidence intervals (CI) from Cox regression models per fixed increments of the interquartile range ($\mu\text{g}/\text{m}^3$) of the time-weighted average exposures to ambient air pollutants for the full prenatal period of 2.4 for PM_{2.5}, 2.7 for PM₁₀, 8.7 for NO₂, 13.4 for NO_x, 0.3 for EC, 0.5 for OC, 2.7 for SO₂, 8.5 for O₃, 0.9 for SO₄²⁻, 0.6 for NO₃⁻, 0.4 for NH₄⁺, 0.1 for SOA and 0.2 for sea salt with age as the time dimension adjusted for year, sex, household income, maternal education, parity, season of birth, smoking during pregnancy and municipality.

The total number of children is 829,851 and the number of asthma cases is 25,739.

Table A7. Sensitivity Analyses of Associations between Air Pollution and Asthma Incidence in the Nationwide Cohort of Children Born in Denmark, 1998–2016^a

Pollutant	Restricted to infants born in Greater Copenhagen	Additional adjustment for area-level SES	Additional adjustment for population density (strata)
	HR (95% CI)	HR (95% CI)	HR (95% CI)
PM _{2.5}	1.08 (1.04–1.12)	1.05 (1.03–1.07)	1.06 (1.04–1.07)
PM ₁₀	1.05 (1.03–1.07)	1.05 (1.03–1.06)	1.05 (1.03–1.06)
NO ₂	1.03 (1.01–1.06)	1.04 (1.02–1.05)	1.04 (1.02–1.05)
NO _x	1.01 (1.00–1.02)	1.01 (1.01–1.02)	1.01 (1.01–1.02)
EC	1.03 (1.01–1.04)	1.02 (1.01–1.03)	1.02 (1.02–1.03)
OC	1.14 (1.09–1.18)	1.08 (1.06–1.10)	1.08 (1.06–1.10)
SO ₂	1.03 (1.00–1.06)	1.02 (1.01–1.03)	1.02 (1.01–1.03)
O ₃	0.95 (0.93–0.98)	0.98 (0.96–0.99)	0.98 (0.96–1.00)
SO ₄ ²⁻	1.18 (1.09–1.28)	1.03 (1.00–1.07)	1.04 (1.01–1.08)
NO ₃ ⁻	1.03 (1.00–1.07)	1.01 (1.00–1.03)	1.02 (1.00–1.03)
NH ₄ ⁺	1.07 (1.02–1.13)	1.01 (0.98–1.03)	1.01 (0.99–1.03)
SOA	1.02 (0.99–1.05)	1.02 (1.01–1.04)	1.02 (1.01–1.04)
Sea salt	0.96 (0.92–1.00)	0.99 (0.97–1.00)	0.99 (0.97–1.00)

^a Hazard ratio (HR) and 95% confidence intervals (CI) from Cox regression models per fixed increments of the interquartile range ($\mu\text{g}/\text{m}^3$) of the time-weighted average exposures to ambient air pollutants for the full prenatal period of 2.4 for PM_{2.5}, 2.7 for PM₁₀, 8.7 for NO₂, 13.4 for NO_x, 0.3 for EC, 0.5 for OC, 2.7 for SO₂, 8.5 for O₃, 0.9 for SO₄²⁻, 0.6 for NO₃⁻, 0.4 for NH₄⁺, 0.1 for SOA, and 0.2 for sea salt with age as the time dimension adjusted for year, sex, household income, maternal education, parity, season of birth, smoking during pregnancy and municipality.

The total number of children is 276,773 and the number of asthma cases is 12,270 in models restricted to Greater Copenhagen. Greater Copenhagen refers to municipality of Copenhagen, Frederiksberg, Dragør, Tårnby, Albertslund, Ballerup, Brøndby, Gentofte, Gladsaxe, Glostrup, Herlev, Hvidovre, Høje-Taastrup, Ishøj, Lyngby-Taarbæk, Rødovre, and Vallensbæk.

The total number of children is 985,760 and the number of asthma cases is 65,143 in models with additional adjustment for area-level SES.

The total number of children is 1,059,987 and the number of asthma cases is 65,143 in models with additional adjustment for population density.

Table A8. Associations between Prenatal Exposure to Air Pollution and Asthma Incidence by Sex in the Nationwide Cohort of Children Born in Denmark, 1998–2016^a

Pollutant	Boys	Girls	P value
	(N = 554,044; n = 40,861) HR (95% CI)	(N = 516,110; n = 24,282) HR (95% CI)	
PM _{2.5}	1.04 (1.02–1.06)	1.08 (1.06–1.11)	<0.001
PM ₁₀	1.04 (1.02–1.05)	1.07 (1.05–1.09)	0.01
NO ₂	1.03 (1.01–1.05)	1.05 (1.03–1.07)	0.12
NO _x	1.01 (1.00–1.02)	1.02 (1.01–1.03)	0.06
EC	1.02 (1.01–1.03)	1.03 (1.02–1.04)	0.17
OC	1.09 (1.07–1.10)	1.07 (1.05–1.10)	0.35
SO ₂	1.01 (1.00–1.02)	1.04 (1.02–1.05)	0.001
O ₃	0.98 (0.97–1.00)	0.97 (0.95–0.98)	0.09
SO ₄ ²⁻	1.01 (0.98–1.05)	1.09 (1.05–1.13)	<0.001
NO ₃ ⁻	1.01 (0.99–1.02)	1.03 (1.01–1.05)	0.03
NH ₄ ⁺	0.99 (0.97–1.01)	1.04 (1.02–1.07)	<0.001
SOA	1.02 (1.01–1.04)	1.03 (1.01–1.05)	0.66
Sea salt	0.99 (0.97–1.00)	0.99 (0.97–1.01)	0.59

^a Hazard ratio (HR) and 95% confidence intervals (CI) from Cox regression models per fixed increments of the interquartile range ($\mu\text{g}/\text{m}^3$) of the time-weighted average exposures to ambient air pollutants for the full prenatal period of 2.4 for PM_{2.5}, 2.7 for PM₁₀, 8.7 for NO₂, 13.4 for NO_x, 0.3 for EC, 0.5 for OC, 2.7 for SO₂, 8.5 for O₃, 0.9 for SO₄²⁻, 0.6 for NO₃⁻, 0.4 for NH₄⁺, 0.1 for SOA, and 0.2 for sea salt with age as the time dimension adjusted for year, household income, maternal education, parity, season of birth, smoking during pregnancy and municipality.

Table A9. Study Population Characteristics of Excluded vs. Included and Nonmovers vs. Movers of the Danish National Birth Cohort (DNBC)

		% Excluded (N = 57,084)	% Included (N = 22,084)	P value ^a	% Nonmovers (N = 9,507)	% Movers (N = 12, 577)	P value ^b																																																																																																																																																																																																																																																							
Sex	Boy	51.8	49.9	<0.001	50.4	49.6	0.25																																																																																																																																																																																																																																																							
	Girl	48.2	50.1		49.6	50.4		Season of delivery	Winter (Jan, Feb, Dec)	25.9	24.6	<0.001	24.6	24.6	0.06	Spring (March, April, May)	25.1	28.9	29.8	28.2	Summer (June, July, August)	25.8	24.7	24.4	24.9	Fall (Sept, Oct, Nov)	23.1	21.8	21.2	22.2	Year of delivery	1998–2002	94.9	97.6	<0.001	97.9	97.4	0.09	2003–2008	5.1	2.4	2.1	2.6	Maternal education	Low	16.6	8.5	<0.001	7.3	9.4	<0.001	Middle	51.2	48.1	46.8	49.1	High	32.2	43.4	45.9	41.5	Household income	Low	20.3	13.5	<0.001	8.5	17.4	<0.001	Middle	41.6	41.7	43.4	40.4	High	38.1	44.7	48.1	42.2	Older siblings	No	47.0	45.5	<0.001	32.5	55.4	<0.001	Yes	53.0	54.5	67.5	44.6	Maternal smoking during pregnancy	No	71.7	80.8	<0.001	83.9	78.5	<0.001	Yes	28.2	19.2	16.1	21.5	Maternal asthma	No	91.0	91.8	<0.001	92.2	91.6	0.08	Yes	9.0	8.2	7.8	8.4	Child asthma (ICD-10)	No	91.6	93.3	<0.001	93.4	93.2	0.51	Yes	8.4	6.7	6.6	6.8	Pets in the home	No	54.9	58.6	<0.001	52.1	63.4	<0.001	Yes	45.0	41.4	47.9	36.6	Missing	0.1				Breast fed	No	18.7	25.8	0.16	23.8	27.4	<0.001	Yes	52.3	74.2	76.2	72.6	Missing	29.0				Daycare	No	62.1	88.4	<0.001	87.4	89.2	<0.001	Yes	8.7	11.6	12.6	10.8	Missing	29.2				Postnatal exposure to ETS	No	24.4	82.9	<0.001	83.8	82.2	0.003	Yes	6.6	17.1	16.2	17.8	Missing	69.0				Mold or dampness in the home	No	12.9	41.3	<0.001	38.9	43.1	<0.001	Yes	16.8	58.7	61.1	56.9	Missing	70.3				Gas stove in the home	No	27.7	92.5	<0.001	92.9	92.2	0.05	Yes	3.1	7.5	7.1	7.8	Missing	69.2				Wood stove in the home	No	18.3	57.0	<0.001	53.2	60.0	<0.001	Yes	12.5	43.0	46.8	40.0	Missing	69.2
Season of delivery	Winter (Jan, Feb, Dec)	25.9	24.6	<0.001	24.6	24.6	0.06																																																																																																																																																																																																																																																							
	Spring (March, April, May)	25.1	28.9		29.8	28.2																																																																																																																																																																																																																																																								
	Summer (June, July, August)	25.8	24.7		24.4	24.9																																																																																																																																																																																																																																																								
	Fall (Sept, Oct, Nov)	23.1	21.8		21.2	22.2		Year of delivery	1998–2002	94.9	97.6	<0.001	97.9	97.4	0.09	2003–2008	5.1	2.4	2.1	2.6	Maternal education	Low	16.6	8.5	<0.001	7.3	9.4	<0.001	Middle	51.2	48.1	46.8	49.1	High	32.2	43.4	45.9	41.5	Household income	Low	20.3	13.5	<0.001	8.5	17.4	<0.001	Middle	41.6	41.7	43.4	40.4	High	38.1	44.7	48.1	42.2	Older siblings	No	47.0	45.5	<0.001	32.5	55.4	<0.001	Yes	53.0	54.5	67.5	44.6	Maternal smoking during pregnancy	No	71.7	80.8	<0.001	83.9	78.5	<0.001	Yes	28.2	19.2	16.1	21.5	Maternal asthma	No	91.0	91.8	<0.001	92.2	91.6	0.08	Yes	9.0	8.2	7.8	8.4	Child asthma (ICD-10)	No	91.6	93.3	<0.001	93.4	93.2	0.51	Yes	8.4	6.7	6.6	6.8	Pets in the home	No	54.9	58.6	<0.001	52.1	63.4	<0.001	Yes	45.0	41.4	47.9	36.6	Missing	0.1				Breast fed	No	18.7	25.8	0.16	23.8	27.4	<0.001	Yes	52.3	74.2	76.2	72.6	Missing	29.0				Daycare	No	62.1	88.4	<0.001	87.4	89.2	<0.001	Yes	8.7	11.6	12.6	10.8	Missing	29.2				Postnatal exposure to ETS	No	24.4	82.9	<0.001	83.8	82.2	0.003	Yes	6.6	17.1	16.2	17.8	Missing	69.0				Mold or dampness in the home	No	12.9	41.3	<0.001	38.9	43.1	<0.001	Yes	16.8	58.7	61.1	56.9	Missing	70.3				Gas stove in the home	No	27.7	92.5	<0.001	92.9	92.2	0.05	Yes	3.1	7.5	7.1	7.8	Missing	69.2				Wood stove in the home	No	18.3	57.0	<0.001	53.2	60.0	<0.001	Yes	12.5	43.0	46.8	40.0	Missing	69.2																							
Year of delivery	1998–2002	94.9	97.6	<0.001	97.9	97.4	0.09																																																																																																																																																																																																																																																							
	2003–2008	5.1	2.4		2.1	2.6		Maternal education	Low	16.6	8.5	<0.001	7.3	9.4	<0.001	Middle	51.2	48.1	46.8	49.1		High	32.2	43.4		45.9	41.5		Household income	Low	20.3	13.5	<0.001	8.5	17.4	<0.001	Middle	41.6		41.7	43.4	40.4		High	38.1		44.7	48.1	42.2	Older siblings	No	47.0	45.5	<0.001	32.5	55.4	<0.001	Yes	53.0	54.5	67.5	44.6	Maternal smoking during pregnancy	No	71.7	80.8	<0.001	83.9	78.5	<0.001	Yes	28.2	19.2	16.1	21.5	Maternal asthma	No	91.0	91.8	<0.001	92.2	91.6	0.08	Yes	9.0	8.2	7.8	8.4	Child asthma (ICD-10)	No	91.6	93.3	<0.001	93.4	93.2	0.51	Yes	8.4	6.7	6.6	6.8	Pets in the home	No	54.9	58.6	<0.001	52.1	63.4		<0.001	Yes	45.0		41.4	47.9		36.6	Missing	0.1				Breast fed	No	18.7	25.8		0.16	23.8	27.4		<0.001	Yes		52.3	74.2	76.2	72.6	Missing	29.0				Daycare		No	62.1	88.4		<0.001	87.4		89.2	<0.001	Yes	8.7	11.6	12.6	10.8	Missing	29.2					Postnatal exposure to ETS		No	24.4		82.9	<0.001	83.8	82.2	0.003	Yes	6.6	17.1	16.2	17.8		Missing	69.0						Mold or dampness in the home	No	12.9	41.3	<0.001	38.9	43.1	<0.001	Yes	16.8		58.7	61.1	56.9		Missing	70.3					Gas stove in the home	No	27.7	92.5	<0.001	92.9	92.2		0.05	Yes	3.1		7.5	7.1		7.8	Missing	69.2				Wood stove in the home	No	18.3	57.0	<0.001	53.2	60.0	<0.001	Yes	12.5	43.0	46.8	40.0	Missing	69.2									
Maternal education	Low	16.6	8.5	<0.001	7.3	9.4	<0.001																																																																																																																																																																																																																																																							
	Middle	51.2	48.1		46.8	49.1																																																																																																																																																																																																																																																								
	High	32.2	43.4		45.9	41.5		Household income	Low	20.3	13.5	<0.001	8.5	17.4	<0.001	Middle	41.6	41.7	43.4	40.4	High	38.1	44.7	48.1	42.2	Older siblings	No	47.0	45.5	<0.001	32.5	55.4	<0.001	Yes	53.0	54.5	67.5	44.6	Maternal smoking during pregnancy	No	71.7	80.8	<0.001	83.9	78.5	<0.001	Yes	28.2	19.2	16.1	21.5	Maternal asthma	No	91.0	91.8	<0.001	92.2	91.6	0.08	Yes	9.0	8.2	7.8	8.4	Child asthma (ICD-10)	No	91.6	93.3	<0.001	93.4	93.2	0.51	Yes	8.4	6.7	6.6	6.8	Pets in the home	No	54.9	58.6	<0.001	52.1	63.4	<0.001	Yes	45.0	41.4	47.9	36.6	Missing	0.1				Breast fed	No	18.7	25.8	0.16	23.8	27.4	<0.001	Yes	52.3	74.2	76.2	72.6	Missing	29.0				Daycare	No	62.1	88.4	<0.001	87.4	89.2	<0.001	Yes	8.7	11.6	12.6	10.8	Missing	29.2				Postnatal exposure to ETS	No	24.4	82.9	<0.001	83.8	82.2	0.003	Yes	6.6	17.1	16.2	17.8	Missing	69.0				Mold or dampness in the home	No	12.9	41.3	<0.001	38.9	43.1	<0.001	Yes	16.8	58.7	61.1	56.9	Missing	70.3				Gas stove in the home	No	27.7	92.5	<0.001	92.9	92.2	0.05	Yes	3.1	7.5	7.1	7.8	Missing	69.2				Wood stove in the home	No	18.3	57.0	<0.001	53.2	60.0	<0.001	Yes	12.5	43.0	46.8	40.0	Missing	69.2																																																						
Household income	Low	20.3	13.5	<0.001	8.5	17.4	<0.001																																																																																																																																																																																																																																																							
	Middle	41.6	41.7		43.4	40.4																																																																																																																																																																																																																																																								
	High	38.1	44.7		48.1	42.2		Older siblings	No	47.0	45.5	<0.001	32.5	55.4	<0.001	Yes	53.0	54.5	67.5	44.6	Maternal smoking during pregnancy	No	71.7	80.8	<0.001	83.9	78.5	<0.001	Yes	28.2	19.2	16.1	21.5	Maternal asthma	No	91.0	91.8	<0.001	92.2	91.6	0.08	Yes	9.0	8.2	7.8	8.4	Child asthma (ICD-10)	No	91.6	93.3	<0.001	93.4	93.2	0.51	Yes	8.4	6.7	6.6	6.8	Pets in the home	No	54.9	58.6	<0.001	52.1	63.4	<0.001	Yes	45.0	41.4	47.9	36.6	Missing	0.1				Breast fed	No	18.7	25.8	0.16	23.8	27.4	<0.001	Yes	52.3	74.2	76.2	72.6	Missing	29.0				Daycare	No	62.1	88.4	<0.001	87.4	89.2	<0.001	Yes	8.7	11.6	12.6	10.8	Missing	29.2				Postnatal exposure to ETS	No	24.4	82.9	<0.001	83.8	82.2	0.003	Yes	6.6	17.1	16.2	17.8	Missing	69.0				Mold or dampness in the home	No	12.9	41.3	<0.001	38.9	43.1	<0.001	Yes	16.8	58.7	61.1	56.9	Missing	70.3				Gas stove in the home	No	27.7	92.5	<0.001	92.9	92.2	0.05	Yes	3.1	7.5	7.1	7.8	Missing	69.2				Wood stove in the home	No	18.3	57.0	<0.001	53.2	60.0	<0.001	Yes	12.5	43.0	46.8	40.0	Missing	69.2																																																																								
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	Yes	53.0	54.5		67.5	44.6		Maternal smoking during pregnancy	No	71.7	80.8	<0.001	83.9	78.5	<0.001	Yes	28.2	19.2	16.1	21.5	Maternal asthma	No	91.0	91.8	<0.001	92.2	91.6	0.08	Yes	9.0	8.2	7.8	8.4	Child asthma (ICD-10)	No	91.6	93.3	<0.001	93.4	93.2	0.51	Yes	8.4	6.7	6.6	6.8	Pets in the home	No	54.9	58.6	<0.001	52.1	63.4	<0.001	Yes	45.0	41.4	47.9	36.6		Missing	0.1						Breast fed	No	18.7	25.8	0.16	23.8	27.4	<0.001	Yes	52.3		74.2	76.2	72.6		Missing	29.0					Daycare	No	62.1	88.4	<0.001	87.4	89.2		<0.001	Yes	8.7		11.6	12.6		10.8	Missing	29.2				Postnatal exposure to ETS	No	24.4	82.9		<0.001	83.8	82.2		0.003	Yes		6.6	17.1	16.2	17.8	Missing	69.0				Mold or dampness in the home		No	12.9	41.3		<0.001	38.9		43.1	<0.001	Yes	16.8	58.7	61.1	56.9	Missing	70.3					Gas stove in the home		No	27.7		92.5	<0.001	92.9	92.2	0.05	Yes	3.1	7.5	7.1	7.8		Missing	69.2						Wood stove in the home	No	18.3	57.0	<0.001	53.2	60.0	<0.001	Yes	12.5	43.0	46.8	40.0	Missing	69.2																																																																
Maternal smoking during pregnancy	No	71.7	80.8	<0.001	83.9	78.5	<0.001																																																																																																																																																																																																																																																							
	Yes	28.2	19.2		16.1	21.5		Maternal asthma	No	91.0	91.8	<0.001	92.2	91.6	0.08	Yes	9.0	8.2	7.8	8.4	Child asthma (ICD-10)	No	91.6	93.3	<0.001	93.4	93.2	0.51	Yes	8.4	6.7	6.6	6.8	Pets in the home	No	54.9	58.6	<0.001	52.1	63.4	<0.001	Yes	45.0	41.4	47.9	36.6		Missing	0.1						Breast fed	No	18.7	25.8	0.16	23.8	27.4	<0.001	Yes	52.3	74.2	76.2	72.6		Missing	29.0						Daycare	No	62.1	88.4	<0.001	87.4	89.2	<0.001	Yes	8.7	11.6	12.6	10.8		Missing	29.2					Postnatal exposure to ETS		No	24.4	82.9	<0.001	83.8	82.2	0.003	Yes	6.6	17.1	16.2	17.8		Missing	69.0					Mold or dampness in the home	No		12.9	41.3	<0.001	38.9	43.1	<0.001	Yes	16.8	58.7	61.1	56.9		Missing	70.3					Gas stove in the home	No	27.7		92.5	<0.001	92.9	92.2	0.05	Yes	3.1	7.5	7.1	7.8	Missing		69.2				Wood stove in the home		No	18.3		57.0	<0.001	53.2	60.0	<0.001	Yes	12.5	43.0	46.8	40.0	Missing	69.2																																																																																
Maternal asthma	No	91.0	91.8	<0.001	92.2	91.6	0.08																																																																																																																																																																																																																																																							
	Yes	9.0	8.2		7.8	8.4		Child asthma (ICD-10)	No	91.6	93.3	<0.001	93.4	93.2	0.51	Yes	8.4	6.7	6.6	6.8	Pets in the home	No	54.9	58.6	<0.001	52.1	63.4	<0.001	Yes	45.0	41.4	47.9	36.6		Missing	0.1						Breast fed	No	18.7	25.8	0.16	23.8	27.4	<0.001	Yes	52.3	74.2	76.2	72.6		Missing	29.0						Daycare	No	62.1	88.4	<0.001	87.4	89.2	<0.001	Yes	8.7	11.6	12.6	10.8		Missing	29.2						Postnatal exposure to ETS	No	24.4	82.9	<0.001	83.8	82.2	0.003	Yes	6.6	17.1	16.2		17.8	Missing	69.0						Mold or dampness in the home	No	12.9	41.3	<0.001	38.9	43.1	<0.001	Yes	16.8	58.7	61.1		56.9	Missing	70.3						Gas stove in the home	No	27.7	92.5	<0.001	92.9	92.2	0.05	Yes	3.1	7.5	7.1		7.8	Missing	69.2						Wood stove in the home	No	18.3	57.0	<0.001	53.2	60.0	<0.001	Yes	12.5	43.0		46.8	40.0	Missing	69.2																																																																																												
Child asthma (ICD-10)	No	91.6	93.3	<0.001	93.4	93.2	0.51																																																																																																																																																																																																																																																							
	Yes	8.4	6.7		6.6	6.8		Pets in the home	No	54.9	58.6	<0.001	52.1	63.4	<0.001	Yes	45.0	41.4	47.9	36.6		Missing	0.1						Breast fed	No	18.7	25.8	0.16	23.8	27.4	<0.001	Yes	52.3	74.2	76.2	72.6		Missing	29.0						Daycare	No	62.1	88.4	<0.001	87.4	89.2	<0.001	Yes	8.7	11.6	12.6	10.8		Missing	29.2						Postnatal exposure to ETS	No	24.4	82.9	<0.001	83.8	82.2	0.003	Yes	6.6	17.1	16.2	17.8		Missing	69.0						Mold or dampness in the home	No	12.9	41.3	<0.001	38.9	43.1	<0.001	Yes	16.8	58.7	61.1	56.9		Missing	70.3						Gas stove in the home	No	27.7	92.5	<0.001	92.9	92.2	0.05	Yes	3.1	7.5	7.1	7.8		Missing	69.2						Wood stove in the home	No	18.3	57.0	<0.001	53.2	60.0	<0.001	Yes	12.5	43.0	46.8	40.0		Missing	69.2																																																																																																									
Pets in the home	No	54.9	58.6	<0.001	52.1	63.4	<0.001																																																																																																																																																																																																																																																							
	Yes	45.0	41.4		47.9	36.6																																																																																																																																																																																																																																																								
	Missing	0.1						Breast fed	No	18.7	25.8	0.16	23.8	27.4	<0.001	Yes	52.3	74.2	76.2	72.6	Missing	29.0				Daycare	No	62.1	88.4	<0.001	87.4	89.2	<0.001	Yes	8.7	11.6	12.6	10.8	Missing	29.2				Postnatal exposure to ETS	No	24.4	82.9	<0.001	83.8	82.2	0.003	Yes	6.6	17.1	16.2	17.8	Missing	69.0				Mold or dampness in the home	No	12.9	41.3	<0.001	38.9	43.1	<0.001	Yes	16.8	58.7	61.1	56.9	Missing	70.3				Gas stove in the home	No	27.7	92.5	<0.001	92.9	92.2	0.05	Yes	3.1	7.5	7.1	7.8	Missing	69.2				Wood stove in the home	No	18.3	57.0	<0.001	53.2	60.0	<0.001	Yes	12.5	43.0	46.8	40.0	Missing	69.2																																																																																																																																														
Breast fed	No	18.7	25.8	0.16	23.8	27.4	<0.001																																																																																																																																																																																																																																																							
	Yes	52.3	74.2		76.2	72.6																																																																																																																																																																																																																																																								
	Missing	29.0						Daycare	No	62.1	88.4	<0.001	87.4	89.2	<0.001	Yes	8.7	11.6	12.6	10.8	Missing	29.2				Postnatal exposure to ETS	No	24.4	82.9	<0.001	83.8	82.2	0.003	Yes	6.6	17.1	16.2	17.8	Missing	69.0				Mold or dampness in the home	No	12.9	41.3	<0.001	38.9	43.1	<0.001	Yes	16.8	58.7	61.1	56.9	Missing	70.3				Gas stove in the home	No	27.7	92.5	<0.001	92.9	92.2	0.05	Yes	3.1	7.5	7.1	7.8	Missing	69.2				Wood stove in the home	No	18.3	57.0	<0.001	53.2	60.0	<0.001	Yes	12.5	43.0	46.8	40.0	Missing	69.2																																																																																																																																																																
Daycare	No	62.1	88.4	<0.001	87.4	89.2	<0.001																																																																																																																																																																																																																																																							
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	Missing	29.2						Postnatal exposure to ETS	No	24.4	82.9	<0.001	83.8	82.2	0.003	Yes	6.6	17.1	16.2	17.8	Missing	69.0				Mold or dampness in the home	No	12.9	41.3	<0.001	38.9	43.1	<0.001	Yes	16.8	58.7	61.1	56.9	Missing	70.3				Gas stove in the home	No	27.7	92.5	<0.001	92.9	92.2	0.05	Yes	3.1	7.5	7.1	7.8	Missing	69.2				Wood stove in the home	No	18.3	57.0	<0.001	53.2	60.0	<0.001	Yes	12.5	43.0	46.8	40.0	Missing	69.2																																																																																																																																																																																		
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	Missing	69.0						Mold or dampness in the home	No	12.9	41.3	<0.001	38.9	43.1	<0.001	Yes	16.8	58.7	61.1	56.9	Missing	70.3				Gas stove in the home	No	27.7	92.5	<0.001	92.9	92.2	0.05	Yes	3.1	7.5	7.1	7.8	Missing	69.2				Wood stove in the home	No	18.3	57.0	<0.001	53.2	60.0	<0.001	Yes	12.5	43.0	46.8	40.0	Missing	69.2																																																																																																																																																																																																				
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	Yes	16.8	58.7		61.1	56.9																																																																																																																																																																																																																																																								
	Missing	70.3						Gas stove in the home	No	27.7	92.5	<0.001	92.9	92.2	0.05	Yes	3.1	7.5	7.1	7.8	Missing	69.2				Wood stove in the home	No	18.3	57.0	<0.001	53.2	60.0	<0.001	Yes	12.5	43.0	46.8	40.0	Missing	69.2																																																																																																																																																																																																																						
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	Yes	3.1	7.5		7.1	7.8																																																																																																																																																																																																																																																								
	Missing	69.2						Wood stove in the home	No	18.3	57.0	<0.001	53.2	60.0	<0.001	Yes	12.5	43.0	46.8	40.0	Missing	69.2																																																																																																																																																																																																																																								
Wood stove in the home	No	18.3	57.0	<0.001	53.2	60.0	<0.001																																																																																																																																																																																																																																																							
	Yes	12.5	43.0		46.8	40.0																																																																																																																																																																																																																																																								
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Continues next page

^a Comparing included vs. excluded study population.

^b Comparing nonmovers vs. movers.

ETS refers to environmental tobacco smoke

Table A9 (continued). Study Population Characteristics of Excluded vs. Included and Nonmovers vs. Movers of the Danish National Birth Cohort (DNBC)

Pollutant	% Excluded (N = 57,801)	% Included (N = 22,084)	P value ^a	% Nonmovers (N = 9,507)	% Movers (N = 12,577)	P value ^b
PM _{2.5}	11.5 ± 1.5	11.5 ± 1.4	0.004	11.2 ± 1.3	11.7 ± 1.5	<0.001
PM ₁₀	17.5 ± 1.9	17.6 ± 1.8	<0.001	17.2 ± 1.4	17.9 ± 2.0	<0.001
NO ₂	18.8 ± 7.5	18.6 ± 7.3	0.002	16.5 ± 5.4	20.3 ± 8.0	<0.001
NO _x	27.5 ± 20.3	26.9 ± 19.4	<0.001	21.9 ± 12.7	30.7 ± 22.5	<0.001
EC	0.8 ± 0.4	0.8 ± 0.4	0.54	0.7 ± 0.3	0.9 ± 0.4	<0.001
OC	1.4 ± 0.3	0.8 ± 0.4	<0.001	1.4 ± 0.3	1.4 ± 0.3	<0.001
SO ₂	5.0 ± 2.3	5.0 ± 2.3	0.08	4.6 ± 1.5	5.3 ± 2.4	<0.001
O ₃	51.0 ± 7.4	51.1 ± 7.2	<0.001	52.8 ± 6.3	49.8 ± 7.6	<0.001
SO ₄ ²⁻	2.1 ± 0.2	2.1 ± 0.2	<0.001	2.1 ± 0.2	2.1 ± 0.2	<0.001
NO ₃ ⁻	3.4 ± 0.5	3.4 ± 0.5	<0.001	3.4 ± 0.5	3.4 ± 0.5	0.02
NH ₄ ⁺	1.8 ± 0.9	1.8 ± 0.9	<0.001	2.0 ± 0.9	1.7 ± 0.8	<0.001
SOA	0.3 ± 0.1	0.3 ± 0.1	<0.001	0.3 ± 0.1	0.3 ± 0.1	<0.001
Sea salt	1.0 ± 0.2	1.0 ± 0.2	<0.001	1.0 ± 0.2	1.0 ± 0.2	<0.001

^a Comparing included vs. excluded study population.

^b Comparing nonmovers vs. movers.

Table A10. Sensitivity Analysis Restricted to Nonmovers of the Danish National Birth Cohort (DNBC)

Pollutant	Incidence ^a	Prevalence ^b	
	(ICD-10)	(Parental Recall)	
	Asthma Ever (<i>N</i> = 9,507; <i>n</i> = 623)	Asthma Ever (<i>N</i> = 9,507; <i>n</i> = 883)	Active Asthma (<i>N</i> = 9,507; <i>n</i> = 396)
	HR (95% CI)	OR (95% CI)	OR (95% CI)
PM _{2.5}	1.12 (0.89–1.41)	1.05 (0.74–1.49)	1.22 (0.73–2.02)
PM ₁₀	1.21 (1.01–1.45)	1.12 (0.66–1.89)	1.20 (0.56–2.58)
NO ₂	1.18 (0.98–1.44)	1.10 (0.93–1.29)	1.03 (0.80–1.31)
NO _x	1.08 (0.98–1.18)	1.07 (0.95–1.21)	0.98 (0.81–1.19)
EC	1.07 (0.95–1.21)	1.11 (0.83–1.49)	0.96 (0.62–1.48)
OC	0.97 (0.76–1.25)	1.05 (0.75–1.47)	1.14 (0.70–1.85)
SO ₂	1.07 (0.95–1.20)	0.99 (0.95–1.03)	0.92 (0.75–1.14)
O ₃	0.92 (0.79–1.08)	0.91 (0.79–1.06)	0.99 (0.94–1.05)
SO ₄ ²⁻	1.10 (0.71–1.71)	1.02 (0.67–1.57)	1.23 (0.66–2.31)
NO ₃ ⁻	0.99 (0.83–1.18)	0.73 (0.30–1.77)	1.84 (0.51–6.68)
NH ₄ ⁺	0.97 (0.74–1.26)	0.93 (0.59–1.45)	1.44 (0.75–2.76)
SOA	0.98 (0.85–1.13)	0.64 (0.24–1.69)	0.68 (0.17–2.72)
Sea salt	1.22 (1.01–1.47)	1.23 (0.68–2.22)	1.44 (0.61–3.40)

^a Hazard ratio (HR) and 95% confidence intervals (CI) from Cox regression models per fixed increments of the time-weighted average exposures to ambient air pollutants for the full prenatal period of 2.4 for PM_{2.5}, 2.7 for PM₁₀, 8.7 for NO₂, 13.4 for NO_x, 0.3 for EC, 0.5 for OC, 2.7 for SO₂, 8.5 for O₃, 0.9 for SO₄²⁻, 0.6 for NO₃⁻, 0.4 for NH₄⁺, 0.1 for SOA and 0.2 for sea salt with age as the time dimension adjusted for year, household income, maternal education, parity, season of birth, smoking during pregnancy, municipality, maternal and paternal asthma, pets during pregnancy, house size at birth, breastfeeding, daycare, mold, dampness, environmental tobacco smoke, presence of gas stove, presence of wood stove, and candlelight burning in the home at age 11.

^b Odds ratios (OR) and the 95% confidence intervals (CI) from logistic regression models with GEE for fixed increments (μg/m³) of the time-weighted average exposures to ambient air pollutants for the full prenatal period of 5 for PM_{2.5}, 10 for PM₁₀, 10 for NO₂, 20 for NO_x, 1 for EC, 1 for OC, 1 for SO₂, 10 for O₃, 1 for SO₄²⁻, 5 for NO₃⁻, 1 for NH₄⁺, 1 for SOA and 1 for sea salt with adjustment for sex, birth year, maternal education, income, parity, delivery season, maternal smoking during pregnancy, municipality, maternal and paternal asthma, pets during pregnancy, house size at birth, breastfeeding, daycare, mold, dampness, environmental tobacco smoke, presence of gas stove, presence of wood stove, and candlelight burning in the home at age 11.

Table A11. Sensitivity Analysis Estimating Relative Risks and their 95% Confidence Intervals for the Associations between Prenatal and Postnatal Exposure to Air Pollution and Asthma (Parental Recall) Prevalence in the Danish National Birth Cohort (DNBC)^a

Pollutants	Asthma ever from birth to 7 years of age (<i>n</i> = 2,188)			Active asthma at 7 years of age (<i>n</i> = 978)		
	Prenatal exposure	Postnatal exposure of the first year of life	Postnatal exposure from birth to age 7	Prenatal exposure	Postnatal exposure of the first year of life	Postnatal exposure from birth to age 7
	RR (95% CI)	RR (95% CI)	RR (95% CI)	RR (95% CI)	RR (95% CI)	RR (95% CI)
PM _{2.5}	0.87 (0.73–1.04)	1.05 (0.89–1.26)	0.89 (0.68–1.15)	0.93 (0.70–1.23)	1.03 (0.80–1.34)	0.90 (0.62–1.32)
NO ₂	0.95 (0.89–1.03)	0.95 (0.89–1.03)	0.95 (0.87–1.05)	0.97 (0.87–1.08)	0.94 (0.84–1.05)	0.86 (0.75–0.98)

^a Relative risks (RR) and the 95% confidence intervals (CI) from Poisson regression models with a robust error variance per 5- $\mu\text{g}/\text{m}^3$ increment for PM_{2.5} and 10- $\mu\text{g}/\text{m}^3$ increment for NO₂ with adjustment for year, sex, household income, maternal education, parity, season of birth, smoking during pregnancy, municipality, maternal and paternal asthma, pets during pregnancy, house size at birth, breastfeeding, daycare, mold, dampness, environmental tobacco smoke, presence of gas stove, presence of wood stove, and candlelight burning in the home at age 11.