Supplementary material

Table S1. Overview of the models used to calculate air pollution exposures.

Air pollutant	Study center	Model-year and source	
		2007	2010
NO_2	Umea, Uppsala, Gothenburg	-	de Hoogh et al 2016 (1)
	Bergen	-	de Hoogh et al 2016 (1)
$PM_{2.5}$	Umea, Uppsala, Gothenburg	-	de Hoogh et al 2016 (1)
	Bergen	-	de Hoogh et al 2016 (1)
PM_{10}	Umea, Uppsala, Gothenburg	Vienneau et al 2013 (2)	-
	Bergen	Vienneau et al 2013 (2)	-
BC	Umea, Uppsala, Gothenburg	-	de Hoogh et al 2018 (3)
	Bergen	-	de Hoogh et al 2018 (3)
O_3	Umea, Uppsala, Gothenburg	-	de Hoogh et al 2018 (3)
	Bergen	-	de Hoogh et al 2018 (3)

Abbreviations: BC, black carbon; NDVI, normalized difference vegetation index; NO_2, nitrogen dioxide; O_3, ozone; $PM_{2.5}$, particulate matter with an aerodynamic diameter lower than 2.5 µm; PM_{10}, particulate matter with an aerodynamic diameter lower than 10 µm.

Table S2. Landsat images used for NDVI calculations.

	Bergen, 201/18	Gothenburg, 195/20	Gothenburg, 196/19	Umea, 193/15	Umea, 193/16	Uppsala, 193/18	Uppsala, 193/19
2014	18/06/201, 8OLI	27/08/2014, 8OLI	21/08/2015, 8OLI	12/07/2014, 8OLI	25/07/2013, 8OLI	10/06/2014, 8OLI	10/06/2014, 8OLI
2009	03/07/2008, 5TM	26/06/2009, 5TM	01/06/2009, 5TM	28/06/2009, 5TM	28/06/2009, 5TM	28/06/2009, 5TM	28/06/2009, 5TM
2004	06/07/2003, 5TM	07/06/2002, 5TM	14/06/2002, 5TM	17/06/2005, 5TM	03/07/2005, 5TM	14/07/2003, 5TM	14/07/2003, 5TM
1999	03/06/1997, 5TM	17/06/2000, 5TM	08/06/2000, 5TM	20/07/1997, 5TM (194/15)	13/07/1997, 5TM	17/06/1999, 5TM	17/06/1999, 5TM
1994	29/07/1994, 5TM	30/06/1993, 5TM	24/06/1994, 5TM	05/07/1994, 5TM	05/07/1994, 5TM	05/07/1994, 5TM	05/07/1994, 5TM
1989	13/06/1989, 5TM	05/07/1989, 5TM	29/08/1989, 5TM	21/06/1989, 5TM	21/06/1989, 5TM	07/07/1989, 5TM	07/07/1989, 5TM
1984	18/06/1985, 5TM	27/06/1986, 5TM	02/06/1986, 5TM	26/06/1985, 5TM	26/06/1985, 5TM	09/07/1984, 5TM	09/07/1984, 5TM

Abbreviations: NDVI, normalized difference vegetation index; OLI, operational land imager; TM, thematic mapper.

Table S3. NDVI assignment to addresses.

NDVI map	Address year
1984	1975 to 1986

1989	1987 to 1991
1994	1992 to 1996
1999	1997 to 2001
2004	2002 to 2006
2009	2007 to 2011
2014	2012 to 2015

Abbreviations: NDVI, normalized difference vegetation index.

Table S4. Mean annual average exposure (range) for NDVI buffer zones per center for parental exposure (0-18 years) and offspring's exposure (0-10 years).

Average exposure (range)	Umea		Uppsala		Gothenburg		Bergen	
	Parent (0-18 years)	Offspring (0-10 years)	Parent (0-18 years)	Offspring (0-10 years)	Parent (0-18 years)	Offspring (0-10 years)	Parent (0-18 years)	Offspring (0-10 years)
NDVI 100m	0.565 (0.224-0.787)	0.514 (0.077-0.841)	0.581 (0.260-0.786)	0.574 (0.106-0.892)	0.532 (0.271-0.781)	0.608 (-0.056-0.862)	0.541 (0.097-0.747)	0.532 (0.107-0.771)
NDVI 300m	0.561 (0.276-0.777)	0.515 (0.154-0.815)	0.585 (0.376-0.768)	0.581 (0.216-0.846)	0.542 (0.236-0.710)	0.615 (0.170-0.833)	0.548 (0.188-0.773)	0.545 (0.096-0.788)
NDVI 500m	0.562 (0.296-0.780)	0.515 (0.169-0.823)	0.593 (0.391-0.758)	0.589 (0.212-0.871)	0.554 (0.211-0.723)	0.623 (0.150-0.838)	0.537 (0.157-0.751)	0.541 (0.116-0.762)
NDVI 1000m	0.564 (0.311-0.737)	0.518 (0.221-0.807)	0.611 (0.378-0.748)	0.599 (0.281-0.857)	0.561 (0.224-0.729)	0.620 (0.154-0.825)	0.527 (0.169-0.731)	0.523 (0.116-0.743)

Abbreviations: NDVI, normalized difference vegetation index.

Table S5. Low, medium and high exposure categories for air pollutants for the time windows: parents 0-18 years, offspring 0-10 years.

Range for exposure categories (based on tertiles)		Low	Medium	High	EU limit values	WHO guideline values
NO_2	**Parents 0-18 years**	<18.975	18.975-26.281	>26.281	40	40
	Offspring 0-10 years	<12.209	12.209-17.466	>17.466	40	40
$PM_{2.5}$	**Parents 0-18 years**	<13.655	13.655-16.859	>16.859	25	10
	Offspring 0-10 years	<8.208	8.208-10.102	>10.102	25	10
PM_{10}	**Parents 0-18 years**	<18.644	18.644-22.238	>22.238	40	20
	Offspring 0-10 years	<12.151	12.151-13.980	>13.980	40	20
BC	**Parents 0-18 years**	<0.443	0.443-0.903	>0.903	-	-
	Offspring 0-10 years	<0.297	0.297-0.558	>0.558	-	-
O_3	**Parents 0-18 years**	<63.700	63.700-67.144	>67.144	-	-
	Offspring 0-10 years	<64.289	64.289-67.823	>67.823	-	-
NDVI (100m)	**Parents 0-18 years**	<0.513	0.513-0.600	>0.600	-	-
	Offspring 0-10 years	<0.509	0.509-0.610	>0.610	-	-

NDVI (300m)	**Parents 0-18 years**	<0.520	0.520-0.597	>0.597	-	-
	Offspring 0-10 years	<0.522	0.522-0.612	>0.612	-	-
NDVI (500m)	**Parents 0-18 years**	<0.527	0.527-0.597	>0.597	-	-
	Offspring 0-10 years	<0.521	0.521-0.610	>0.610	-	-
NDVI (1000m)	**Parents 0-18 years**	<0.527	0.527-0.605	>0.605	-	-
	Offspring 0-10 years	<0.510	0.510-0.608	>0.608	-	-

Abbreviations: BC, black carbon; EU, European Union; NDVI, normalized difference vegetation index; NO_2, nitrogen dioxide; O_3, ozone; OR, odds ratio; $PM_{2.5}$, particulate matter with an aerodynamic diameter lower than 2.5 µm; PM_{10}, particulate matter with an aerodynamic diameter lower than 10 µm; WHO, World Health Organization.

Table S6. Associations of paternal (N = 400) and maternal (N = 706) exposure to additional buffer zones of NDVI with offspring (N = 1949) early onset asthma (table S8a) and hay fever (table S8b) in the RHINESSA generation study.

S6a. Early onset asthma

Exposure	Exposure level	Univariable Fathers (OR, 95% CI)	p[2]	Multivariable[1] Fathers (OR, 95% CI)	p[2]	Univariable Mothers (OR, 95% CI)	p[2]	Multivariable[1] Mothers (OR, 95% CI)	p[2]
NDVI (100m)	Medium	0.60 (0.28-1.27)	0.180	0.53 (0.26-1.08)	0.080	1.19 (0.75-1.87)	0.465	1.23 (0.78-1.96)	0.374
	High	0.76 (0.39-1.49)	0.421	0.69 (0.33-1.45)	0.325	0.76 (0.46-1.25)	0.273	0.94 (0.55-1.60)	0.820
NDVI (500m)	Medium	0.55 (0.26-1.20)	0.132	0.55 (0.24-1.25)	0.156	0.97 (0.62-1.52)	0.881	1.00 (0.63-1.59)	0.999
	High	0.67 (0.34-1.31)	0.238	0.62 (0.30-1.28)	0.194	0.61 (0.37-1.01)	0.055	0.75 (0.44-1.29)	0.303
NDVI (1000m)	Medium	**0.36 (0.15-0.83)**	**0.018**	**0.33 (0.14-0.79)**	**0.012**	0.97 (0.62-1.53)	0.904	1.05 (0.65-1.68)	0.844
	High	0.62 (0.32-1.18)	0.143	0.49 (0.23-1.07)	0.086	**0.59 (0.36-0.96)**	**0.034**	0.68 (0.41-1.15)	0.152

Abbreviations: CI, confidence interval; NDVI, normalized difference vegetation index; OR, odds ratio. [1] Performed for all significant results from the univariable analyses. All models were adjusted for O_3 and NO_2, and in addition adjusted for grandparental education and grandparental asthma.[2] All p-values < 0.05 = significant and marked bold.

S6b. Hay fever

Exposure	Exposure level	Univariable Fathers (OR, 95% CI)	p[2]	Multivariable[1] Fathers (OR, 95% CI)	p[2]	Univariable Mothers (OR, 95% CI)	p[2]	Multivariable[1] Mothers (OR, 95% CI)	p[2]
NDVI (100m)	Medium	0.76 (0.26-2.23)	0.620	0.69 (0.26-1.84)	0.460	1.66 (0.85-3.24)	0.141	1.92 (0.94-3.90)	0.072
	High	1.68 (0.62-4.58)	0.308	2.04 (0.62-6.73)	0.240	1.45 (0.72-2.91)	0.296	1.92 (0.83-4.46)	0.129
NDVI (500m)	Medium	0.88 (0.30-2.61)	0.818	0.87 (0.30-2.54)	0.799	1.75 (0.91-3.37)	0.096	1.89 (0.96-3.73)	0.065
	High	1.27 (0.50-3.26)	0.613	1.24 (0.43-3.62)	0.691	1.18 (0.57-2.47)	0.657	1.45 (0.63-3.34)	0.381
NDVI (1000m)	Medium	1.55 (0.51-4.72)	0.441	1.45 (0.50-4.23)	0.495	1.33 (0.66-2.66)	0.420	1.34 (0.66-2.72)	0.415
	High	2.08 (0.73-5.92)	0.170	1.80 (0.58-5.58)	0.310	1.39 (0.69-2.82)	0.360	1.69 (0.79-3.63)	0.180

Abbreviations: CI, confidence interval; NDVI, normalized difference vegetation index; OR, odds ratio. [1] Performed for all significant results from the univariable analyses. All models were adjusted for O_3 and NO_2, and in addition adjusted for grandparental education and grandparental asthma.[2] All p-values < 0.05 = significant and marked bold.

Table S7. Correlation coefficients for the exposure time windows: parent (0-10 years) and parent (10-18 years).

S7a. NO_2

	Parents (0-10 years)	**Parents (10-18 years)**
Parents (0-10 years)	1.0	0.876
Parents (10-18 years)	0.876	1.0

Abbreviations: NO_2, nitrogen dioxide.

S7b. $PM_{2.5}$

	Parents (0-10 years)	**Parents (10-18 years)**
Parents (0-10 years)	1.0	0.909
Parents (10-18 years)	0.909	1.0

Abbreviations: $PM_{2.5}$, particulate matter with an aerodynamic diameter lower than 2.5 µm.

S7c. PM_{10}

	Parents (0-10 years)	**Parents (10-18 years)**
Parents (0-10 years)	1.0	0.879
Parents (10-18 years)	0.879	1.0

Abbreviations: PM_{10}, particulate matter with an aerodynamic diameter lower than 10 µm.

S7d. BC

	Parents (0-10 years)	**Parents (10-18 years)**
Parents (0-10 years)	1.0	0.922
Parents (10-18 years)	0.922	1.0

Abbreviations: BC, black carbon.

S7e. O_3

	Parents (0-10 years)	**Parents (10-18 years)**

Parents (0-10 years)	1.0	0.903
Parents (10-18 years)	0.903	1.0

Abbreviations: O_3, ozone.

S7f. NDVI

	Parents (0-10 years)	**Parents (10-18 years)**
Parents (0-10 years)	1.0	0.728
Parents (10-18 years)	0.728	1.0

Abbreviations: NDVI, normalized difference vegetation index.

Table S8. Analyses stratified per country (Swedish centers versus Bergen): Associations between paternal (N = 400) and maternal (N = 706) exposure to air pollution and NDVI (300m) and offspring (N = 1949) early onset asthma (table S8a) and hay fever (table S8b) in the RHINESSA generation study.

S8a. Early onset asthma

Exposure[1]	**Centre**	**Exposure level**	**Univariable Fathers (OR, 95% CI)**	**p[3]**	**Multivariable[2] Fathers (OR, 95% CI)**	**p[3]**	**Univariable Mothers (OR, 95% CI)**	**p[3]**	**Multivariable[2] Mothers (OR, 95% CI)**	**p[3]**
NO_2	Swedish	Medium	2.14 (0.84-5.48)	0.113	1.77 (0.93-3.37)	0.081	1.53 (0.78-3.00)	0.213	**2.04 (1.07-3.87)**	**0.030**
		High	1.09 (0.44-2.75)	0.848	1.80 (0.80-4.05)	0.158	1.77 (0.94-3.36)	0.078	2.20 (1.00-4.84)	0.051
	Bergen	Medium	0.44 (0.17-1.18)	0.104	0.61 (0.15-2.41)	0.478	1.38 (0.69-2.78)	0.368	1.03 (0.43-2.47)	0.941
		High	**0.26 (0.08-0.86)**	**0.027**	0.43 (0.09-2.08)	0.295	1.28 (0.63-2.62)	0.497	0.91 (0.33-2.49)	0.857
$PM_{2.5}$	Swedish	Medium	1.12 (0.32-3.84)	0.862	1.19 (0.59-2.36)	0.629	1.36 (0.64-2.87)	0.422	1.39 (0.68-2.86)	0.368
		High	1.14 (0.46-2.84)	0.775	1.40 (0.70-2.82)	0.339	1.52 (0.81-2.85)	0.194	1.56 (0.77-3.15)	0.215
	Bergen	Medium	**0.28 (0.12-0.68)**	**0.005**	**0.23 (0.08-0.69)**	**0.009**	**2.45 (1.26-4.75)**	**0.008**	**2.69 (1.25-5.80)**	**0.011**
		High	-	-	-	-	1.76 (0.73-4.26)	0.207	2.13 (0.83-5.44)	0.115
PM_{10}	Swedish	Medium	0.65 (0.17-2.43)	0.524	1.02 (0.49-2.11)	0.954	1.46 (0.68-2.16)	0.330	1.26 (0.61-2.59)	0.536
		High	1.07 (0.43-2.62)	0.886	1.35 (0.72-2.52)	0.348	1.49 (0.81-2.74)	0.205	1.53 (0.82-2.87)	0.181
	Bergen	Medium	**0.33 (0.13-0.84)**	**0.020**	0.37 (0.13-1.07)	0.068	**2.22 (1.18-4.19)**	**0.014**	**2.31 (1.17-4.55)**	**0.016**
		High	0.56 (0.13-2.41)	0.433	0.80 (0.14-4.37)	0.792	1.04 (0.31-3.55)	0.948	0.98 (0.28-3.41)	0.974
BC	Swedish	Medium	1.21 (0.53-2.75)	0.644	1.23 (0.69-2.21)	0.483	1.46 (0.78-2.72)	0.233	1.27 (0.71-2.25)	0.421
		High	0.48 (0.16-1.45)	0.193	**0.34 (0.12-0.96)**	**0.043**	1.16 (0.58-2.30)	0.679	0.86 (0.38-1.98)	0.727
	Bergen	Medium	1.15 (0.28-4.67)	0.844	1.76 (0.41-7.59)	0.448	1.82 (0.70-4.75)	0.222	1.38 (0.49-3.92)	0.545
		High	0.42 (0.10-1.77)	0.236	0.94 (0.16-5.71)	0.950	1.95 (0.78-5-02)	0.166	1.51 (0.48-4.69)	0.480

O_3	Swedish	Medium	1.63 (0.41-6.41)	0.485	2.17 (0.60-7.86)	0.236	1.64 (0.59-4.53)	0.339	2.08 (0.74-5.86)	0.165
		High	1.09 (0.28-4.23)	0.901	2.30 (0.58-9.19)	0.237	1.31 (0.48-3.55)	0.600	2.16 (0.66-7.03)	0.201
	Bergen	Medium	2.21 (0.86-5.67)	0.098	1.81 (0.50-6.50)	0.362	0.72 (0.37-1.40)	0.337	0.75 (0.34-1.63)	0.467
		High	2.92 (0.52-16.4)	0.224	1.09 (0.09-12.6)	0.947	0.82 (0.30-2.24)	0.699	1.25 (0.33-4.64)	0.742
NDVI (300m)	Swedish	Medium	0.64 (0.22-1.84)	0.408	1.14 (0.64-2.05)	0.656	1.73 (0.86-3.48)	0.124	1.49 (0.84-2.64)	0.175
		High	0.54 (0.23-1.26)	0.153	0.93 (0.47-1.83)	0.841	1.02 (0.46-2.27)	0.966	1.08 (0.55-2.12)	0.814
	Bergen	Medium	0.68 (0.22-2.09)	0.507	0.63 (0.18-2.17)	0.463	0.81 (0.43-1.53)	0.516	0.80 (0.42-1.54)	0.509
		High	1.36 (0.47-3.93)	0.566	1.23 (0.43-3.49)	0.701	0.65 (0.33-1.28)	0.212	0.69 (0.32-1.49)	0.341

Abbreviations: BC, black carbon; CI, confidence interval; NDVI, normalized difference vegetation index; NO_2, nitrogen dioxide; O_3, ozone; OR, odds ratio; $PM_{2.5}$, particulate matter with an aerodynamic diameter lower than 2.5 µm; PM_{10}, particulate matter with an aerodynamic diameter lower than 10 µm. [1] All air pollutants exposures were back-extrapolated in time with the ratio method. [2] All models were adjusted for O_3 and NDVI (300m buffer), except for the O_3-model that was adjusted for NO_2 and NDVI (300m buffer) and the NDVI-model that was adjusted for O_3 and NO_2. All models were also adjusted for grandparental education and grandparental asthma. [3] All p-values < 0.05 = significant and marked bold. - = Too few observations.

S8b. Hay fever

Exposure[1]	Centre	Exposure level	Univariable Fathers (OR, 95% CI)	p[3]	Multivariable[2] Fathers (OR, 95% CI)	p[3]	Univariable Mothers (OR, 95% CI)	p[3]	Multivariable[2] Mothers (OR, 95% CI)	p[3]
NO_2	Swedish	Medium	**4.63 (1.34-16.01)**	**0.016**	**2.96 (1.28-6.89)**	**0.011**	2.24 (0.90-5.59)	0.083	**3.81 (1.60-9.14)**	**0.003**
		High	2.54 (0.72-9.02)	0.149	2.02 (0.57-7.11)	0.275	**3.10 (1.33-7.22)**	**0.009**	**3.80 (1.22-11.85)**	**0.021**
	Bergen	Medium	0.32 (0.07-1.43)	0.135	0.33 (0.04-3.05)	0.327	0.36 (0.11-1.21)	0.098	0.32 (0.05-2.21)	0.247
		High	0.18 (0.02-1.56)	0.119	0.52 (0.02-12.6)	0.688	0.80 (0.27-2.32)	0.676	0.76 (0.11-5.22)	0.778
$PM_{2.5}$	Swedish	Medium	1.95 (0.41-9.29)	0.402	1.05 (0.41-2.68)	0.915	1.15 (0.37-3.58)	0.804	1.32 (0.52-3.39)	0.561
		High	2.41 (0.62-9.41)	0.205	1.44 (0.58-3.54)	0.428	2.02 (0.93-4.39)	0.075	1.96 (0.84-4.60)	0.119
	Bergen	Medium	1.28 (0.26-6.23)	0.757	1.93 (0.32-11.6)	0.473	2.56 (0.84-7.85)	0.100	**3.02 (1.07-8.56)**	**0.037**
		High	-	-	-	-	0.51 (0.06-4.62)	0.553	-	-
PM_{10}	Swedish	Medium	1.34 (0.25-7.19)	0.736	1.04 (0.35-3.05)	0.947	1.31 (0.33-5.20)	0.699	1.46 (0.52-4.13)	0.471
		High	2.52 (0.66-9.66)	0.178	2.31 (0.94-5.69)	0.069	**2.83 (1.31-6.08)**	**0.008**	**2.94 (1.23-7.03)**	**0.016**
	Bergen	Medium	1.23 (0.25-6.11)	0.798	3.57 (0.33-39.1)	0.298	1.81 (0.64-5.07)	0.261	2.69 (0.83-8.77)	0.101
		High	-	-	-	-	-	-	-	-
BC	Swedish	Medium	2.38 (0.78-7.28)	0.128	1.87 (0.88-3.97)	0.104	**2.35 (1.05-5.26)**	**0.038**	**2.31 (1.08-4.96)**	**0.031**
		High	1.49 (0.42-5.29)	0.538	1.00 (0.28-3.53)	0.997	**3.00 (1.26-7.10)**	**0.013**	2.74 (0.95-7.93)	0.063
	Bergen	Medium	1.26 (0.32-4.98)	0.746	0.82 (0.21-3.18)	0.772	0.53 (0.12-2.24)	0.385	0.68 (0.11-4.35)	0.683
		High	-	-	-	-	0.94 (0.27-3.36)	0.919	1.15 (0.21-6.40)	0.874
O_3	Swedish	Medium	2.16 (0.46-10.26)	0.331	1.09 (0.28-4.24)	0.900	0.85 (0.34-2.14)	0.731	0.91 (0.34-2.42)	0.855

		High	1.03 (0.21-4.93)	0.975	0.86 (0.17-4.32)	0.853	0.54 (0.21-1.34)	0.181	0.97 (0.26-3.65)	0.961
	Bergen	Medium	3.06 (0.70-13.40)	0.139	1.95 (0.50-7.59)	0.334	1.28 (0.46-3.55)	0.635	1.09 (0.26-4.68)	0.904
		High	5.52 (0.50-60.90)	0.163	-	-	-	-	-	-
NDVI	Swedish	Medium	0.66 (0.18-2.38)	0.526	1.10 (0.52-2.35)	0.798	1.19 (0.53-2.68)	0.666	1.26 (0.62-2.56)	0.523
(300m)		High	0.76 (0.25-2.31)	0.623	1.46 (0.57-3.74)	0.425	0.76 (0.32-1.84)	0.545	1.36 (0.60-3.06)	0.462
	Bergen	Medium	2.16 (0.20-23.32)	0.527	1.95 (0.50-7.59)	0.334	1.13 (0.32-4.00)	0.851	1.00 (0.30-3.32)	0.997
		High	5.53 (0.63-48.49)	0.122	-	-	2.31 (0.75-7.14)	0.147	1.70 (0.44-6.66)	0.443

Abbreviations: BC, black carbon; CI, confidence interval; NDVI, normalized difference vegetation index; NO_2, nitrogen dioxide; O_3, ozone; OR, odds ratio; $PM_{2.5}$, particulate matter with an aerodynamic diameter lower than 2.5 µm; PM_{10}, particulate matter with an aerodynamic diameter lower than 10 µm. [1] All air pollutants exposures were back-extrapolated in time with the ratio method. [2] All models were adjusted for O_3 and NDVI (300m buffer), except for the O_3-model that was adjusted for NO_2 and NDVI (300m buffer) and the NDVI-model that was adjusted for O_3 and NO_2. All models were also adjusted for grandparental education and grandparental asthma. [3] All p-values < 0.05 = significant and marked bold. - = Too few observations.

Table S9. Analyses for parents born after 1985: Associations of paternal (N = 73) and maternal (N = 154) exposure to air pollutants and NDVI with offspring (N = 309) early onset asthma (Table 9a) and hay fever (Table 9b) in the RHINESSA generation study.

Table S9a. Early onset asthma

Exposure[1]	**Exposure level**	**Univariable Fathers (OR, 95% CI)**	**p[3]**	**Multivariable[2] Fathers (OR, 95% CI)**	**p[3]**	**Univariable Mothers (OR, 95% CI)**	**p[3]**	**Multivariable[2] Mothers (OR, 95% CI)**	**p[3]**
NO_2	Medium	1.21 (0.24-6.25)	0.816	0.39 (0.04-4.04)	0.430	2.40 (0.66-8.70)	0.183	7.76 (0.88-68.03)	0.064
	High	0.77 (0.14-4.42)	0.772	0.10 (0.00-3.09)	0.190	2.99 (0.85-10.47)	0.087	**14.0 (1.32-147.58)**	**0.028**
$PM_{2.5}$	Medium	-	-	-	-	2.22 (0.67-7.41)	0.195	2.65 (0.63-11.22)	0.184
	High	0.37 (0.05-2.99)	0.353	0.13 (0.01-3.27)	0.216	1.95 (0.51-7.49)	0.331	3.63 (0.85-15.48)	0.081
PM_{10}	Medium	0.18 (0.02-1.61)	0.126	**0.09 (0.01-0.88)**	**0.039**	1.61 (0.46-5.66)	0.456	1.92 (0.49-7.46)	0.349
	High	0.40 (0.05-3.28)	0.396	0.11 (0.00-4.77)	0.250	1.82 (0.49-6.80)	0.371	3.36 (0.89-12.71)	0.074
BC	Medium	1.83 (0.36-9.23)	0.462	1.15 (0.17-7.61)	0.885	3.06 (0.82-11.37)	0.095	4.84 (0.84-28.00)	0.078
	High	1.05 (0.16-6.66)	0.961	0.21 (0.01-4.23)	0.307	2.22 (0.59-8.30)	0.236	3.66 (0.44-30.84)	0.232
O_3	Medium	0.86 (0.16-4.56)	0.858	0.59 (0.06-5.48)	0.638	0.61 (0.14-2.59)	0.501	0.49 (0.11-2.07)	0.330
	High	0.33 (0.05-2.22)	0.256	0.08 (0.00-2.82)	0.163	0.61 (0.19-1.96)	0.407	3.79 (0.52-27.78)	0.190
NDVI (300m)	Medium	0.20 (0.02-1.73)	0.144	0.25 (0.03-2.32)	0.214	1.15 (0.31-4.22)	0.834	1.20 (0.29-5.01)	0.807
	High	0.59 (0.12-2.87)	0.511	0.41 (0.07-2.55)	0.340	0.25 (0.04-1.52)	0.132	0.26 (0.05-1.36)	0.111

Abbreviations: BC, black carbon; CI, confidence interval; NDVI, normalized difference vegetation index; NO_2, nitrogen dioxide; O_3, ozone; OR, odds ratio; $PM_{2.5}$, particulate matter with an aerodynamic diameter lower than 2.5 µm; PM_{10}, particulate matter with an aerodynamic diameter lower than 10 µm. [1] All air pollutants exposures were back-extrapolated in time with the ratio method. [2] All models were adjusted for O_3 and NDVI (300m buffer), except for the O_3-model that was adjusted for NO_2 and NDVI (300m buffer) and the NDVI-model that was adjusted for O_3 and NO_2. All models were also adjusted for grandparental education and grandparental asthma. [3] All p-values < 0.05 = significant and marked bold. - = Too few observations.

Table S9b. Hay fever

Exposure[1]	Exposure level	Univariable Fathers (OR, 95% CI)	p[3]	Multivariable[2] Fathers (OR, 95% CI)	p[3]	Univariable Mothers (OR, 95% CI)	p[3]	Multivariable[2] Mothers (OR, 95% CI)	p[3]
NO_2	Medium	-	-	-	-	2.14 (0.29-15.97)	0.458	5.78 (0.36-93.52)	0.216
	High	3.36 (0.19-59.54)	0.408	-	-	3.55 (0.56-22.46)	0.178	8.93 (0.32-245.97)	0.196
$PM_{2.5}$	Medium	-	-	-	-	3.67 (0.49-27.35)	0.205	4.68 (0.76-28.92)	0.097
	High	0.30 (0.02-5.56)	0.415	-	-	5.24 (0.83-33.13)	0.078	4.23 (0.54-33.17)	0.169
PM_{10}	Medium	-	-	-	-	3.62 (0.49-26.97)	0.209	3.80 (0.59-24.45)	0.160
	High	0.21 (0.01-3.85)	0.291	-	-	5.55 (0.88-35.14)	0.069	3.90 (0.60-25.41)	0.155
BC	Medium	-	-	-	-	2.28 (0.37-14.15)	0.376	3.11 (0.26-37.33)	0.371
	High	0.31 (0.02-5.48)	0.423	-	-	1.83 (0.24-13.91)	0.561	3.93 (0.17-90.61)	0.393
O_3	Medium	-	-	-	-	6.23 (0.71-54.25)	0.098	3.59 (0.36-35.86)	0.276
	High	1.94 (0.11-33.82)	0.648	-	-	2.54 (0.23-28.46)	0.450	6.57 (0.24-180.40)	0.266
NDVI (300m)	Medium	-	-	-	-	1.02 (0.14-7.38)	0.988	1.48 (0.14-15.50)	0.741
	High	0.38 (0.02-6.63)	0.506	-	-	1.11 (0.19-6.67)	0.906	1.84 (0.21-15.89)	0.580

Abbreviations: BC, black carbon; CI, confidence interval; NDVI, normalized difference vegetation index; NO_2, nitrogen dioxide; O_3, ozone; OR, odds ratio; $PM_{2.5}$, particulate matter with an aerodynamic diameter lower than 2.5 µm; PM_{10}, particulate matter with an aerodynamic diameter lower than 10 µm. [1] All air pollutants exposures were back-extrapolated in time with the ratio method. [2] All models were adjusted for O_3 and NDVI (300m buffer), except for the O_3-model that was adjusted for NO_2 and NDVI (300m buffer) and the NDVI-model that was adjusted for O_3 and NO_2. All models were also adjusted for grandparental education and grandparental asthma. [3] All p-values < 0.05 = significant and marked bold. - = Too few observations.

Table S10. Correlation coefficients for the included air pollutants and NDVI.

S10a. Parental exposure

Air pollutant	$PM_{2.5}$	PM_{10}	NO_2	BC	O_3	NDVI
$PM_{2.5}$	1.0	0.917	0.873	0.657	-0.404	-0.267
PM_{10}	0.917	1.0	0.793	0.639	-0.291	-0.251
NO_2	0.873	0.793	1.0	0.786	-0.651	-0.432
BC	0.657	0.629	0.786	1.0	-0.814	-0.310
O_3	-0.404	-0.291	-0.651	-0.814	1.0	0.380
NDVI[1]	-0.267	-0.251	-0.432	-0.310	0.380	1.0

Abbreviations: BC, black carbon; NDVI, normalized difference vegetation index; NO_2, nitrogen dioxide; O_3, ozone; $PM_{2.5}$, particulate matter with an aerodynamic diameter lower than 2.5 µm; PM_{10}, particulate matter with an aerodynamic diameter lower than 10 µm.
[1]300-m buffer.

S10b. Offspring's exposure

Air pollutant	$PM_{2.5}$	PM_{10}	NO_2	BC	O_3	NDVI

$PM_{2.5}$	1.0	0.966	0.742	0.697	-0.298	0.190
PM_{10}	0.966	1.0	0.725	0.738	-0.310	0.213
NO_2	0.742	0.725	1.0	0.872	-0.318	0.013
BC	0.697	0.738	0.872	1.0	-0.230	0.112
O_3	-0.298	-0.310	-0.318	-0.230	1.0	0.007
NDVI[1]	0.190	0.213	0.013	0.112	0.007	1.0

Abbreviations: BC, black carbon; NDVI, normalized difference vegetation index; NO_2, nitrogen dioxide; O_3, ozone; $PM_{2.5}$, particulate matter with an aerodynamic diameter lower than 2.5 µm; PM_{10}, particulate matter with an aerodynamic diameter lower than 10 µm.
[1]300-m buffer.

Table S11. Correlation coefficients for the exposure time windows: parent (0-18 years), pregnancy and offspring (0-10 years).

S11a. NO_2

	Parents (0-18 years)	**Pregnancy**	**Offspring (0-10 years)**
Parents (0-18 years)	1.0	0.418	0.433
Pregnancy	0.418	1.0	0.859
Offspring (0-10 years)	0.433	0.859	1.0

Abbreviations: NO_2, nitrogen dioxide.

S11b. $PM_{2.5}$

	Parents (0-18 years)	**Pregnancy**	**Offspring (0-10 years)**
Parents (0-18 years)	1.0	0.542	0.590
Pregnancy	0.542	1.0	0.839
Offspring (0-10 years)	0.590	0.839	1.0

Abbreviations: $PM_{2.5}$, particulate matter with an aerodynamic diameter lower than 2.5 µm.

S11c. PM_{10}

	Parents (0-18 years)	**Pregnancy**	**Offspring (0-10 years)**
Parents (0-18 years)	1.0	0.522	0.574
Pregnancy	0.522	1.0	0.801
Offspring (0-10 years)	0.574	0.801	1.0

Abbreviations: PM_{10}, particulate matter with an aerodynamic diameter lower than 10 µm.

S11d. BC

	Parents (0-18 years)	Pregnancy	Offspring (0-10 years)
Parents (0-18 years)	1.0	0.467	0.476
Pregnancy	0.467	1.0	0.857
Offspring (0-10 years)	0.476	0.857	1.0

Abbreviations: BC, black carbon.

S11e. O_3

	Parents (0-18 years)	Pregnancy	Offspring (0-10 years)
Parents (0-18 years)	1.0	0.465	0.478
Pregnancy	0.465	1.0	0.841
Offspring (0-10 years)	0.478	0.841	1.0

Abbreviations: O_3, ozone.

S11f. NDVI

	Parents (0-18 years)	Pregnancy	Offspring (0-10 years)
Parents (0-18 years)	1.0	0.205	0.176
Pregnancy	0.205	1.0	0.737
Offspring (0-10 years)	0.176	0.737	1.0

Abbreviations: NDVI, normalized difference vegetation index.

Table S12. Mean annual average exposure (range) for air pollutants and NDVI (300m) per center for parent exposure (0-18 years) and offspring exposure (0-10 years).

Average exposure (range)[a]	Umea		Uppsala		Gothenburg		Bergen		EU limit values	WHO limit values
	Parent (0-18 years)	Offspring (0-10 years)	Parent (0-18 years)	Offspring (0-10 years)	Parent (0-18 years)	Offspring (0-10 years)	Parent (0-18 years)	Offspring (0-10 years)		
NDVI 300m	0.561 (0.276-0.777)	0.515 (0.154-0.815)	0.585 (0.376-0.768)	0.581 (0.216-0.846)	0.542 (0.236-0.710)	0.615 (0.170-0.833)	0.548 (0.188-0.773)	0.545 (0.096-0.788)		
NO_2 µg/m^3	14.0 (1.3-33.4)	10.9 (0.3-34.1)	22.5 (5.4-46.3)	14.4 (2.6-33.5)	38.0 (15.3-69.7)	19.0 (2.3-40.5)	23.7 (2.9-44.9)	16.1 (3.4-33.4)	40[b]	40[b]
$PM_{2.5}$ µg/m^3	10.3 (1.2-20.0)	7.3 (0.5-19.1)	17.4 (9.8-25.7)	9.9 (4.5-17.6)	24.4 (14.8-29.8)	11.9 (6.0-17.1)	14.5 (3.9-22.8)	8.9 (2.4-14.9)	25[b]	10[b]
PM_{10} µg/m^3	16.5 (11.8-25.1)	11.3 (7.6-19.3)	23.7 (16.7-32.5)	14.2 (9.2-20.2)	28.6 (19.8-37.0)	15.0 (10.8-20.9)	19.7 (13.3-27.0)	13.0 (7.7-18.9)	40[b]	20[b]
BC µg/m^3	0.09 (0-1.09)	0.23 (0-1.50)	0.64 (0.20-1.42)	0.52 (0-1.45)	1.09 (0.51-1.89)	0.67 (0.10-1.59)	0.91 (0-2.43)	0.45 (0-1.21)	-	-

O_3 µg/m^3	68.4 (62.6-73.3)	67.6 (58.1-75.0)	67.4 (62.3-71.3)	68.4 (56.3-75.5)	64.2 (57.6-70.5)	67.1 (57.3-76.2)	62.7 (51.2-74.6)	64.0 (54.3-76.6)	-[c]	-[c]

Abbreviations: BC, black carbon; EU, European Union; NDVI, normalized difference vegetation index; NO_2, nitrogen dioxide; O_3, ozone; $PM_{2.5}$, particulate matter with an aerodynamic diameter lower than 2.5 µm; PM_{10}, particulate matter with an aerodynamic diameter lower than 10 µm; WHO, World Health Organization.[a] All air pollutants exposures were back-extrapolated in time with the ratio method. [b] Annual mean values. [c] Only maximum daily 8-hour mean values available.

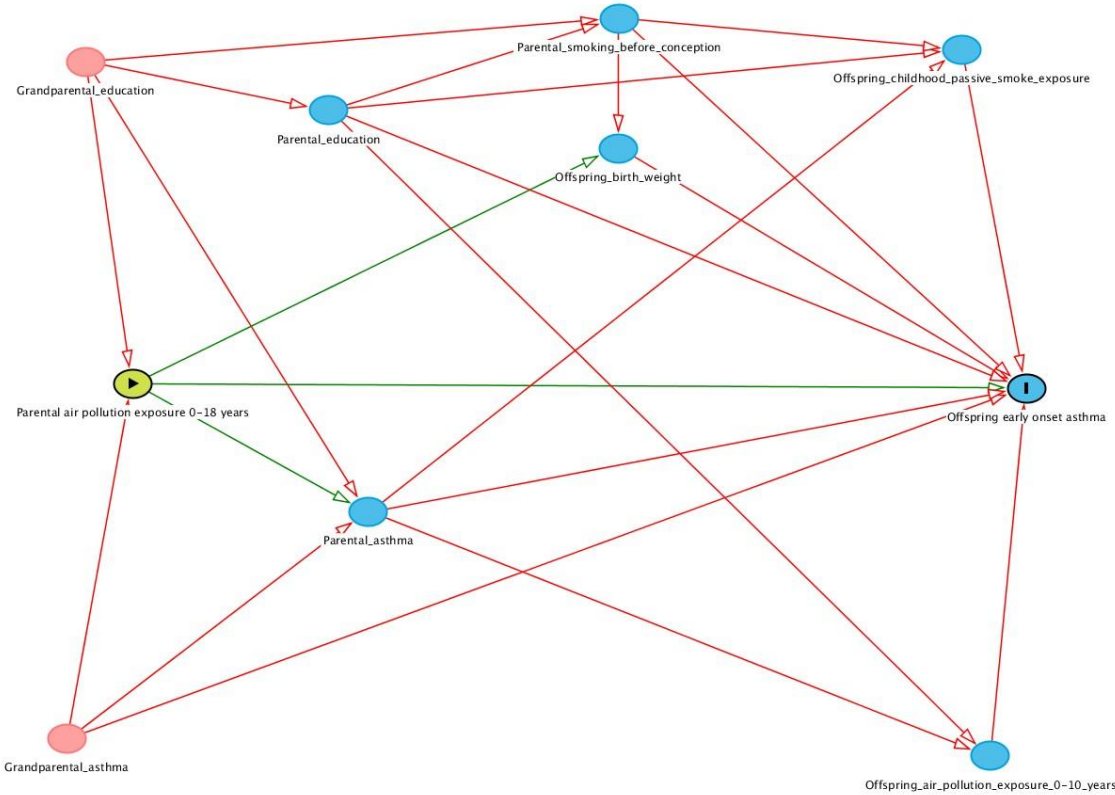

Figure S1. Directed Acyclic Graph for parental air pollution exposure and offspring's early onset asthma. Green circle with arrow: main exposure in the analysis. Blue circle with "I": main outcome. Other blue circles: risk factors for the outcome that are not risk factors for the exposure. Red circles: risk factors for both the outcome and the main exposure. Green arrows: paths from the main exposure. Red arrows: paths from other risk factors.

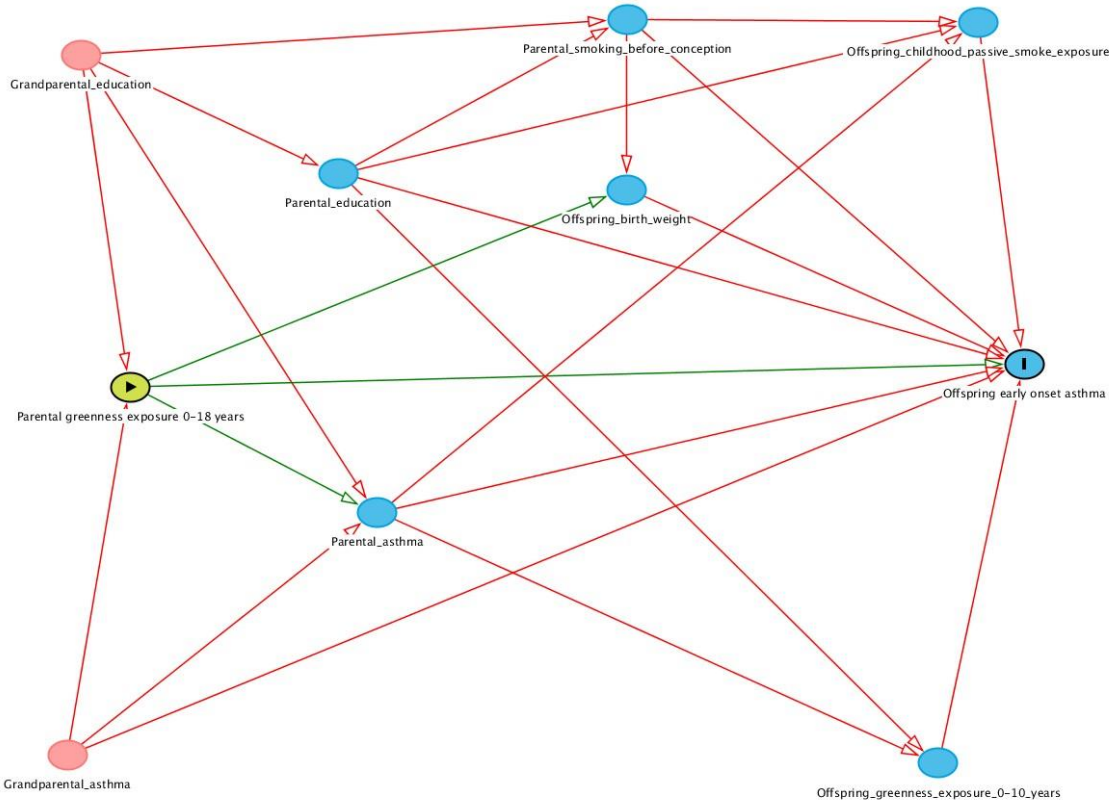

Figure S2. Directed Acyclic Graph for parental greenness exposure and offspring's early onset asthma. Green circle with arrow: main exposure in the analysis. Blue circle with "I": main outcome. Other blue circles: risk factors for the outcome that are not risk factors for the exposure. Red circles: risk factors for both the outcome and the main exposure. Green arrows: paths from the main exposure. Red arrows: paths from other risk factors.

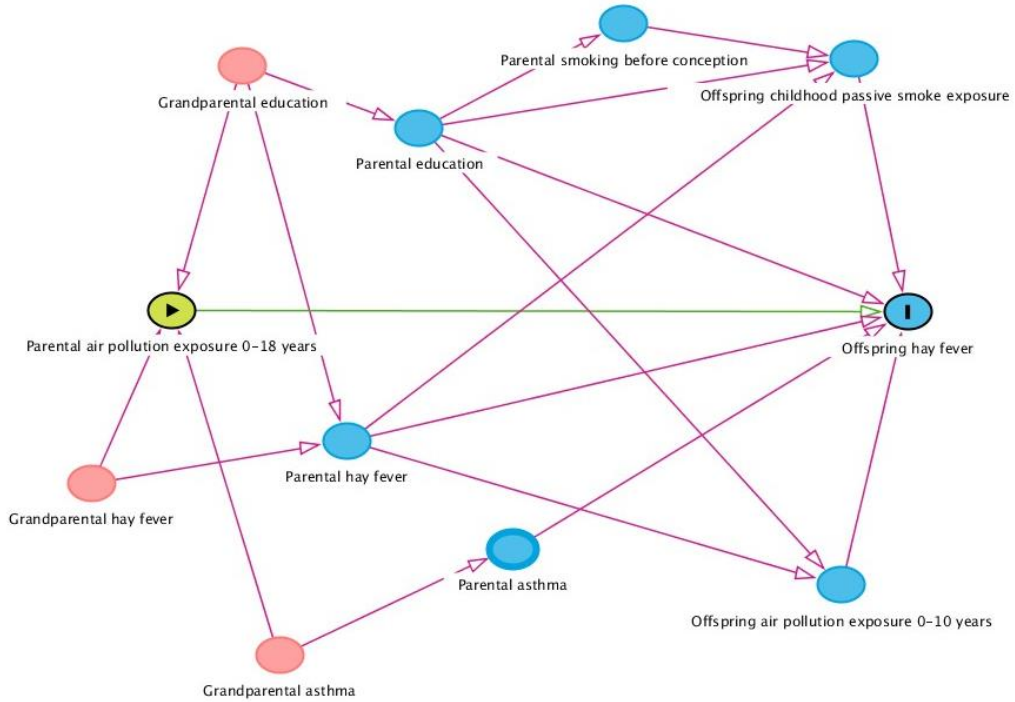

Figure S3. Directed Acyclic Graph for parental air pollution exposure and offspring's hay fever.
Green circle with arrow: main exposure in the analysis. Blue circle with "I": main outcome. Other blue circles: risk factors for the outcome that are not risk factors for the exposure. Red circles: risk factors for both the outcome and the main exposure. Green arrows: paths from the main exposure. Red arrows: paths from other risk factors.

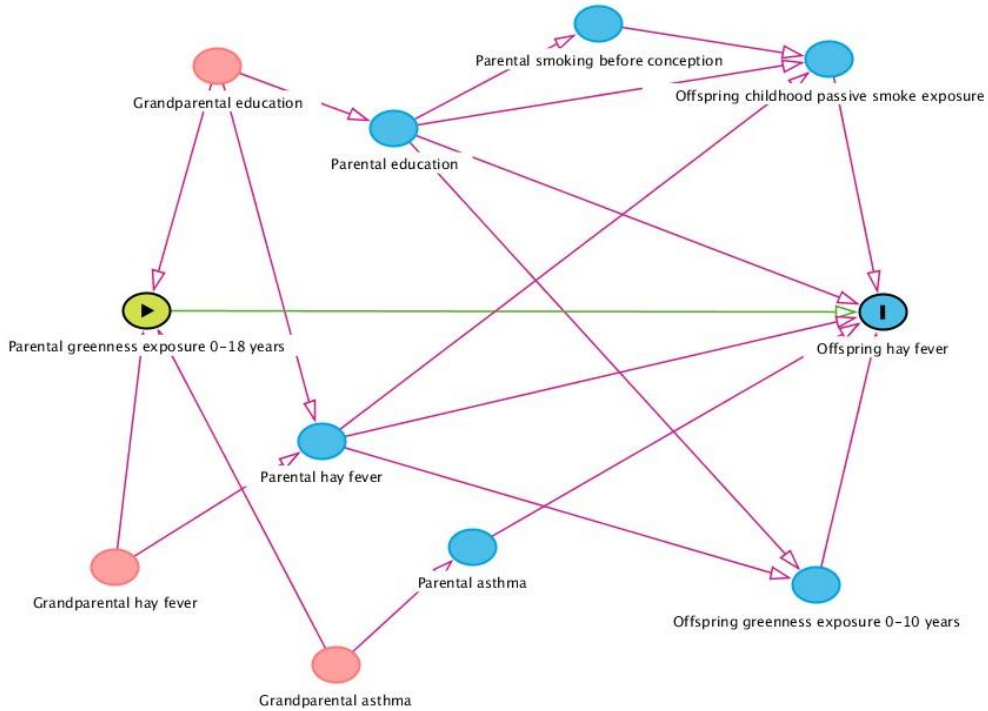

Figure S4. Directed Acyclic Graph for parental greenness exposure and offspring's hay fever. Green circle with arrow: main exposure in the analysis. Blue circle with "I": main outcome. Other blue circles: risk factors for the outcome that are not risk factors for the exposure. Red circles: risk factors for both the outcome and the main exposure. Green arrows: paths from the main exposure. Red arrows: paths from other risk factors.

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