Supplementary Information for

Effects of Policy-Driven Hypothetical Air Pollutant Interventions on Childhood Asthma Incidence in Southern California

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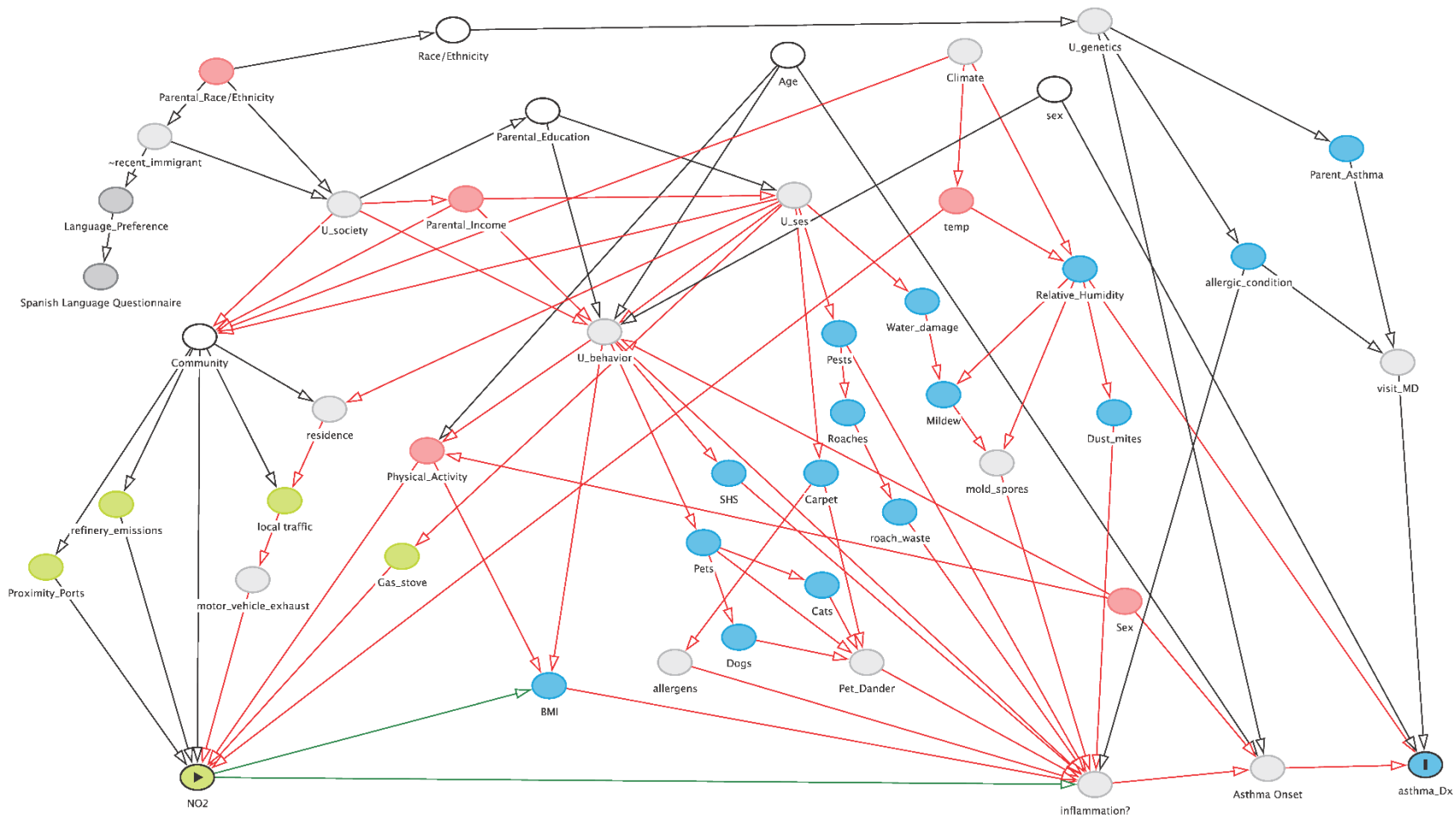**This PDF file includes:**

> Figs. S1
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Fig. S1. Directed acyclic graph used in our a priori assessment of confounding.

Table S1. Distribution of selected characteristics in the CHS study population.

Characteristic	All Participants, N (%)	Cohort Follow-up Period, N (%)		
		1993-2001	1996-2004	2006-2014
Subjects	4140	1093	1170	1877
Person-years of follow-up	24254	6201	6842	11211
Incident asthma cases	525	139	184	202
Age at study entry, mean (SD), years	9.5 (0.6)	9.9 (0.5)	9.5 (0.4)	9.3 (0.7)
Sex				
Female	2179 (52.6)	569 (52.1)	606 (51.8)	1004 (53.5)
Male	1961 (47.4)	524 (47.9)	564 (48.2)	873 (46.5)
Ethnicity				
Non-Hispanic	2310 (57.8)	776 (71.7)	750 (64.5)	784 (44.8)
Hispanic	1686 (42.2)	307 (28.4)	413 (35.5)	966 (55.2)
Race				
White	2273 (58.6)	704 (65.7)	692 (59.8)	877 (53.2)
Native American Indian/Other	890 (23)	182 (17)	249 (21.5)	459 (27.8)
Mixed	392 (10.1)	76 (7.1)	106 (9.2)	210 (12.7)
Asian/Pacific Islander	178 (4.6)	60 (5.6)	56 (4.8)	62 (3.8)
Black	145 (3.7)	50 (4.7)	54 (4.7)	41 (2.5)
Parental education				
Some college or above	2476 (63.5)	689 (64.5)	728 (65.4)	1059 (61.6)
High school graduate or below	1424 (36.5)	379 (35.5)	385 (34.6)	660 (38.4)
Gas stove in home				
Yes	3153 (80.1)	824 (77.2)	860 (75)	1469 (85.3)
No	784 (19.9)	243 (22.8)	287 (25)	254 (14.7)
Participation in team sports				
Yes	2104 (52.1)	542 (50.5)	597 (52.6)	965 (52.7)
No	1938 (48)	532 (49.5)	539 (47.5)	867 (47.3)

Table S2. Exposure distribution under natural course of exposure and hypothetical air pollutant interventions.

	Pollutant concentration [mean (range)]	Affected by intervention (N)	
		Participants	**Cohort- communities**
NO$_2$ (ppb)			
Natural course	20.4 (7.2-41.7)	-	-
Remain at 1993 levels	23.7 (8.0-41.7)	3047	18
Percent Reduction			
10%	18.3 (6.5-37.5)	4140	27
20%	16.3 (5.8-33.4)	4140	27
30%	14.3 (5.0-29.2)	4140	27
Hypothetical Standards			
30 ppb	19.1 (7.2-30.0)	976	7
20 ppb	16.1 (7.2-20.0)	1774	12
10 ppb	9.6 (7.2-10.0)	3192	22
PM$_{2.5}$ (µg/m^3)			
Natural course	17.4 (7.1-32.9)	-	-
Remain at 1993 levels	20.9 (8.9-32.9)	3047	18
Percent Reduction			
10%	15.6 (6.4-29.6)	4140	27
20%	13.9 (5.7-26.3)	4140	27
30%	12.2 (5.0-23.0)	4140	27
Hypothetical Standards			
15 µg/m^3	12.7 (7.1-15.0)	2236	15
12 µg/m^3	10.9 (7.1-12.0)	2520	17
10 µg/m^3	9.6 (7.1-10.0)	3128	21

Table S3. Exponentiated parameter coefficients from main air pollution models and from sensitivity analyses models.

	NO$_2$ Models		PM$_{2.5}$ Models	
	exp(β) (95% CI)	P-value	exp(β) (95% CI)	P-value
Main Model	1.053 (1.024-1.082)	0.0003	1.026 (1.002-1.051)	0.03
Restricted to longer follow-up				
Followed until event or year 7 or later	1.049 (1.020-1.078)	0.0008	1.027 (1.002-1.052)	0.03
Followed until event or year 5 or later	1.053 (1.024-1.082)	0.0003	1.028 (1.003-1.053)	0.03
Additionally adjusted for:				
Income, education, and insurance	1.056 (1.027-1.086)	0.0001	1.028 (1.003-1.054)	0.03
Exposure to smoking in utero, and secondhand smoke exposure	1.053 (1.024-1.082)	0.0002	1.027 (1.002-1.052)	0.03
Pests in home, pets in home, and carpet in child's bedroom	1.051 (1.023-1.081)	0.0004	1.024 (1.000-1.050)	0.05
Main model with time-varying exposure	1.033 (1.014-1.053)	0.0007	1.023 (1.001-1.045)	0.04

All models fitted using Poisson regression except for model with time-varying exposure which was fitted using Cox proportional hazards regression without a random effect.

Models adjusted for community as a fixed effect, age at baseline, sex, ethnicity, race, gas stove in home, participation in sports, and community-level average temperature for baseline year.

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Table S4. P-values for interaction term between air pollution exposure and several covariates.

Covariate	Pollutant	
	NO$_2$	PM$_{2.5}$
Sex	0.53	0.20
Ethnicity	0.41	0.82
Race	0.46	0.22
In utero exposure to smoking	0.13	0.74
Secondhand smoke exposure	0.62	0.13
Parental education	0.60	0.87
Parental history of asthma	0.86	0.78
High/low 1993 air pollution level	0.80	0.07