Supplemental Material

Satellite-based Estimates of Ambient Air Pollution and Global Variations in Childhood Asthma Prevalence

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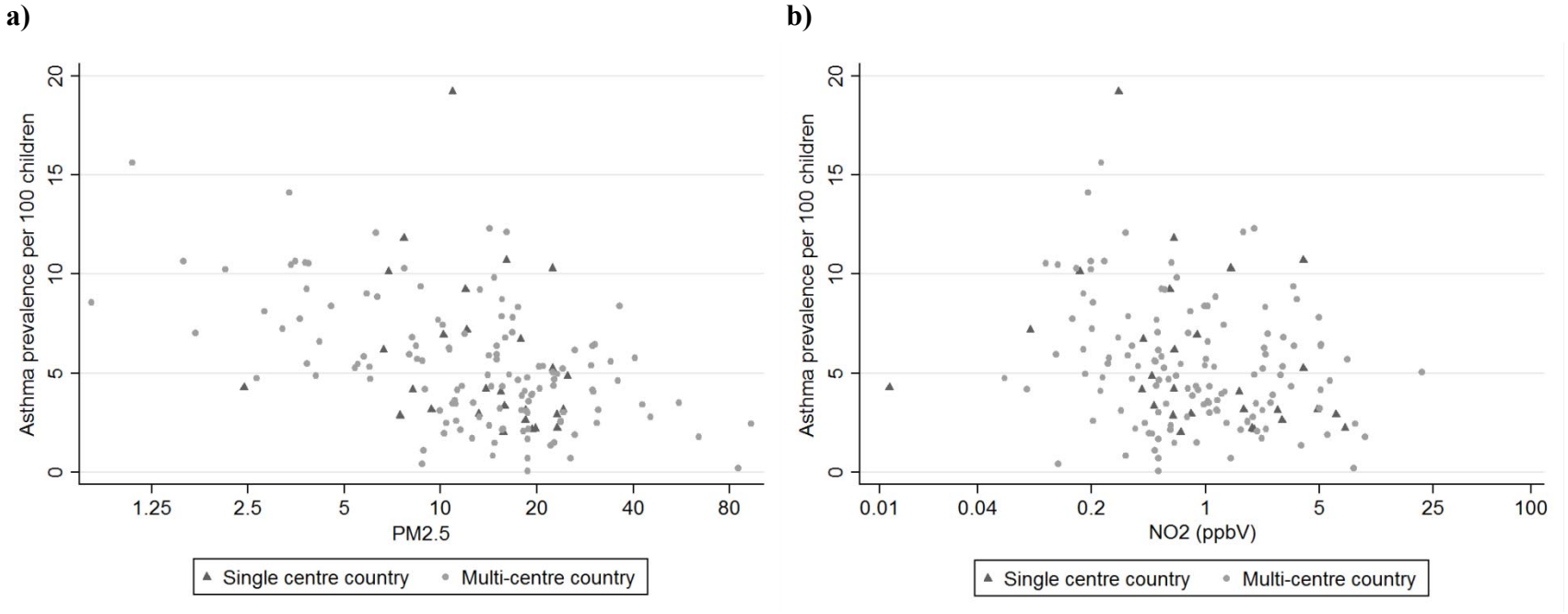
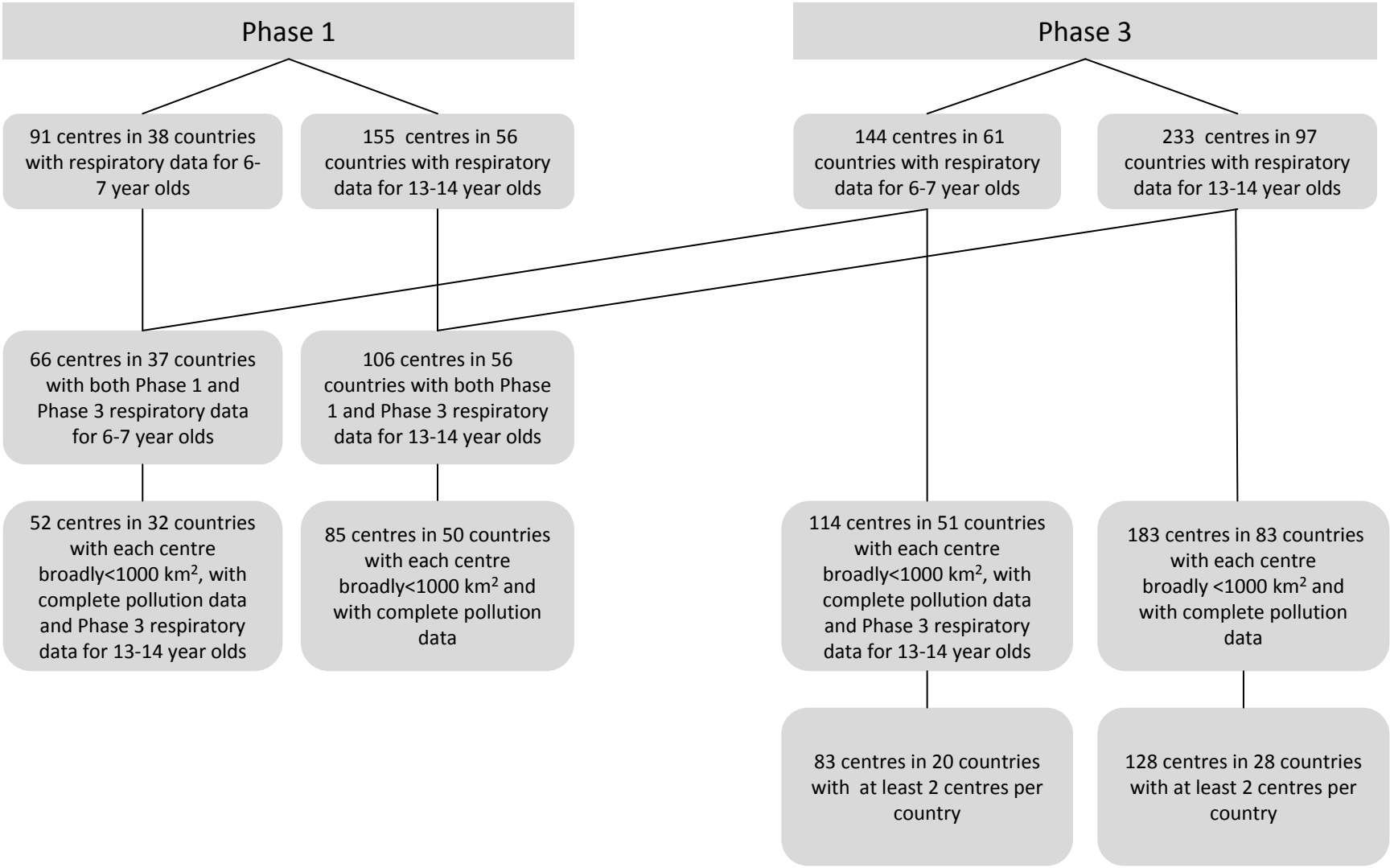


Supplemental Material, Figure S1:
Scatter plots of the association of asthma prevalence ages 6-7 years with a) $PM_{2.5}$ $\mu g/m^3$ and b) NO_2 (ppbV)



Supplemental Material, Figure S2:
Flow diagram illustrating sample attrition (data from Lai et al.2009, Pearce et al.2007)

Supplemental Material, Table S1: Descriptive statistics for the main analytic dataset ages 6-7 years

Variables	Time period	Median(IQ range)	Spearman correlation with:			
			Asthma prevalence	$PM_{2.5}$	NO_2	O_3
Full dataset: 114 centres clustered within 51 countries						
Sex (ISAAC Phase Three, ages 6-7 years)						
% boys in sample	≈2000-2003	50.4 (48.7 – 52.0)	-0.221*	0.256**	0.094	0.266**
Disease (ISAAC Phase Three, ages 6-7 years)						
Asthma prevalence (%)	≈2000-2003	3.86 (2.53 – 6.11)		-0.445***	-0.204*	-0.475***
Climate / Altitude						
Daily temperature (˚c)	1991-2000	17.6 (12.4 – 24.9)	0.116	0.031	-0.321***	-0.001
Water vapour pressure (hPa)	1991-2000	14.0 (10.4 – 22.1)	0.186*	-0.114	-0.323***	-0.143
Precipitation (mm/month)	1991-2000	75.9 (50.3 – 121.1)	0.148	-0.242**	-0.175	-0.321***
Altitude (m)	N/A	76.5 (20 – 450)	-0.094	0.223*	0.061	0.131
Economic / population						
GNI per capita (US $)	2001	3410 (1170 – 12511)	-0.067[a]	-0.057[a]	0.490[a]***	-0.070[a]
Population density (thousands per 0.1˚ x 0.1˚ grid square)	2005	162 (53.0 – 544)	-0.037	0.278**	0.398***	0.207*
Pollution						
$PM_{2.5}$ ($\mu g/m^3$)	2001-2006	15.5 (10.2 – 20.4)			0.405***	0.565***
NO_2 (ppbV)	2005	0.89 (0.47 – 2.22)				0.371***
O_3 (ppbV)	2005	53.5 (41.2 – 62.4)				

* $p<0.05$, ** $p<0.01$, *** $p<0.001$.

[a] Correlations for GNI per capita (available only at country-level) are with country-level variables (defined as in manuscript formula 1.1). There are 51 countries. All other correlations are across all 114 centres.

Supplemental Material, Table S2: The association of asthma prevalence ages 6-7 years with $PM_{2.5}$ and NO_2.

			Estimated change in centre-level asthma prevalence (95% CI) per 100 children per 10% increase in:			
			$PM_{2.5}$		NO_2	
No.	**Model type:**	**Adjustment**	**Country-level[a]**	**Centre-level[b]**	**Country-level[a]**	**Centre-level[b]**
Using data from 114 centres in 51 countries						
1	Random intercept	Unadjusted	-0.169 (-0.352 to 0.014)	-0.041 (-0.167 to 0.085)	-0.048 (-0.139 to 0.043)	-0.015 (-0.065 to 0.035)
2	Random intercept	Sex, climate, GNI	-0.256* (-0.452 to -0.060)	-0.016 (-0.152 to 0.121)	-0.040 (-0.149 to 0.068)	-0.019 (-0.071 to 0.033)
3	Random intercept	Sex, climate, GNI, population density	-0.306** (-0.514 to -0.098)	0.026 (-0.120 to 0.172)	-0.059 (-0.188 to 0.071)	0.004 (-0.059 to 0.068)
Restricted to two or more centres per country (83 centres in 20 countries)						
4	Random intercept	Sex, climate, GNI, population density	-0.430*** (-0.668 to -0.191)	0.026 (-0.116 to 0.168)	0.046 (-0.147 to 0.240)	0.004 (-0.059 to 0.067)
5	Random intercept/random slope[c]	Sex, climate, GNI, population density	-0.430*** (-0.669 to -0.191)	0.026 (-0.117 to 0.168)	0.049 (-0.144 to 0.243)	-0.009 (-0.073 to 0.055)
6	Random intercept	Sex, climate, GNI, population density, O_3	-0.356 (-0.767 to 0.055)	0.030 (-0.108 to 0.167)	0.130 (-0.027 to 0.287)	0.017 (-0.044 to 0.079)
7	Random intercept	Sex, climate, GNI, population density, $\log(PM_{2.5})$ or $\log(NO_2)$ as appropriate	-0.475*** (-0.717 to -0.232)	0.028 (-0.136 to 0.192)	0.125 (-0.023 to 0.274)	-0.002 (-0.074 to 0.071)
8	Random intercept	Sex, climate, GNI, population density, O_3, $\log(PM_{2.5})$ or $\log(NO_2)$ as appropriate	-0.320 (-0.705 to 0.066)	0.014 (-0.144 to 0.172)	0.124 (-0.027 to 0.275)	0.014 (-0.057 to 0.086)

*p<0.05; **p<0.01; ***p<0.001

[a]Country-level effect: estimate of the association between centre-level asthma prevalence and country-level pollutant (defined as in manuscript formula 1.1).

[b]Centre-level effect: estimate of the within country association between centre-level asthma prevalence and centre-level pollutant.

[c] Test for a random slope in $PM_{2.5}$ (Model 5), χ^2=0.005 (degrees of freedom=2) p>0.05; test for a random slope in NO_2 (Model 5), χ^2=2.09 (degrees of freedom=2) p>0.05.

Note: With the exception of GNI per capita (available only at country-level), sex, climate (i.e. temperature, precipitation, water vapour pressure), population density and pollutants, if included in models were included both as country-level (defined as in manuscript formula 1.1) and centre-level variables.

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