

# Greenness effect on childhood allergic diseases

## CCHH project

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# Background

## China, Children, Homes and Health (CCHH) project

- ▶ Conducted during November 2010 to April 2012 in 10 Chinese cities.
- ▶ Participants were pre-school children aged 1-8 yrs.
- ▶ Questions were answered by their parents or guardians.
- ▶ Only six cities questionnaire contains the kindergarten address.
- ▶ No sampling weights in the dataset.
- ▶ We used data from 2010 to 2011

City	Survey Year	Used Year	Participants
Changshang	2011	2011	2,779
Chongqing	2010	2010	3,424
Shanghai	2011, 2012 (January - April)	2011	7,019
Nanjing	2011	2011	2,443
Taiyuan	2011	2011	2,084
Urumqi	2011	2011	1,491

# Background

- ▶ However, the dataset is messy.

1	138	SH3389	BS1		139	BS1-139	2	上海市	24-Feb-12	4.35	50.0	20.00	107.0	26	3	5	1	7	3	3	3	3	1
1	139	SH5595	BS1		140	BS1-140	1	上海市宝	#NULL!	3.60	50.0	24.00	122.0	23	6	4	1	7	2	1	2	3	1
1	140	SH8865	BS1		141	BS1-141	2	上海市虹	24-Feb-12	3.80	50.0	22.00	125.0	26	8	3	2	6	2	1	2	2	1
1	141	SH3350	BS1		142	BS1-142	2	上海市徐	24-Feb-12	2.83	49.0	20.00	120.0	28	7	3	2	6	5	3	3	2	1
1	142	SH1140	BS1		143	BS1-143	1	浙江嘉兴	24-Feb-12	3.25	50.0	27.00	122.0	26	7	5	2	6	1	1	2	3	1
1	143	SH2776	BS1		144	BS1-144	2	上海市宝	24-Feb-12	3.40	49.0	24.00	117.0	25	10	4	1	8	5	3	2	3	1
1	144	SH6653	BS1		145	BS1-145	2	上海市	#NULL!	3.77	50.0	30.00	117.0	30	4	3	1	6	4	2	2	2	1
1	145	SH13546	BS1		146	BS1-146	2	江苏南通	24-Feb-12	3.65	51.5	25.00	119.0	30	8	#NULL!	2	5	5	2	2	2	1
1	146	SH10979	BS1		147	BS1-147	2	浙江杭州	#NULL!	4.50	51.0	24.00	120.0	29	3	4	1	6	5	3	3	2	#NULL!
1	147	SH11437	BS1		148	BS1-148	2	上海市	#NULL!	4.00	65.0	27.00	122.0	26	10	5	1	6	4	3	2	3	1
1	148	SH10961	BS1		149	BS1-149	2	上海市徐	#NULL!	3.20	50.0	20.00	120.0	29	6	4	1	6	4	2	2	3	1
1	149	SH3716	BS1		150	BS1-150	2	江西抚州	26-Feb-12	4.00	50.0	26.00	110.0	24	7	4	2	7	3	3	#NULL!	3	2
1	150	SH11504	BS1		151	BS1-151	2	上海市	26-Feb-12	3.50	50.0	29.00	#NULL!	30	1	4	1	6	2	1	3	2	1
1	151	SH9271	BS1		152	BS1-152	2	上海市宝	26-Feb-12	3.00	46.0	21.00	120.0	27	2	3	2	7	3	1	2	2	1
1	152	SH431	BS1		153	BS1-153	2	上海市	7-Mar-12	3.30	#NULL!	19.00	105.0	30	2	4	1	4	4	2	2	2	1
1	153	SH10940	BS1		154	BS1-154	2	上海市虹	9-Mar-12	3.00	#NULL!	17.00	100.0	28	2	4	1	5	4	2	3	2	1
1	154	SH3426	BS1		155	BS1-155	1	上海市宝	9-Mar-12	3.20	48.0	20.00	112.0	27	7	5	1	4	1	1	2	2	1
1	155	SH11574	BS1		156	BS1-156	2	上海市长	7-Mar-12	3.60	50.0	#NULL!	118.0	25	2	4	1	4	2	2	2	2	1
1	156	SH15200	BS1		157	BS1-157	3	河南	9-Mar-12	3.70	52.0	#NULL!	118.0	26	1	4	1	4	4	2	#NULL!	2	1
1	157	SH432	BS1		158	BS1-158	2	上海市	9-Mar-12	3.20	50.0	20.00	111.0	27	6	4	1	4	4	2	2	2	1
1	158	SH3730	BS1		159	BS1-159	1	上海市虹	7-Mar-12	3.10	51.0	20.00	110.0	27	12	4	1	5	5	3	2	2	1
1	159	SH1462	BS1		160	BS1-160	2	上海市	9-Mar-12	2.30	47.0	15.00	96.0	28	7	2	2	4	1	1	2	2	1
1	160	SH1462	BS1		160	BS1-160	2	上海市	9-Mar-12	2.30	47.0	15.00	96.0	28	7	2	2	4	1	1	2	2	1

Figure 1: CCHH Dataset

- ▶ For the children health section, the questionnaire was designed in accordance to the protocols of International Study of Asthma and Allergies in Childhood (ISAAC).
- ▶ We studied the greenness's health effect on childhood allergic diseases and symptoms.

# Variables

► Allergic diseases or symptoms

1. Diagnosed Asthma: Has a doctor ever diagnosed asthma in your child?
2. Allergic rhinitis: Has a doctor ever diagnosed allergic rhinitis/hay fever in your kid?

**or**

In the past 12 months, has your kid had a problem with sneezing or a runny or block or itchy, watery eyes when he/she was exposed to animal furs, plant, or pollens?

3. Current eczema: Has your child had eczema in the past 12 months

- ▶ We got the environment information based on the *kintergardens'* address
- 1. Greenness (NDVI): Half-Monthly data
- 2. PM<sub>2.5</sub>: Monthly data
- 3. Temperature: Monthly data
- ▶ We used the annual average level of environment information corresponding to the date of questionnaire completion of each child, either in 2010 or 2011

# Exposures

Variable	Chongqing (N=53)	Changsha (N=35)	Nanjing (N=21)	Shanghai (N=61)	Taiyuan (N=10)	Urumqi (N=14)
NDVI	0.19	0.18	0.18	0.20	0.19	0.18
PM <sub>2.5</sub>	83.68	95.27	78.63	64.90	94.33	82.84
T (°C)	18.33	17.87	15.86	16.98	10.46	6.76

The estimated annual average levels of environment information in each city

N represents the number of kindergartens in the city

# Results

Table 3: The odds ratios of childhood allergic diseases and symptoms for 0.1 unit change in NDVI, using generalized mixed model

	Overall		Northern China		Southern China	
	Ajusted OR	95%CI	Ajusted OR	95%CI	Ajusted OR	95%CI
Diagnosed Asthma	0.99	0.89-1.11	0.64	0.44-0.94	1.03	0.92-1.16
Allergic Rhinitis	1.01	0.93-1.10	0.91	0.71-1.18	1.02	0.93-1.11
Current Eczema	1.08	1.01-1.16	0.97	0.80-1.17	1.09	1.01-1.17

Adjusted for standardized PM2.5 concentration, standardized temperature, age, gender, breastfeeding, family allergic history residence location, maternal smoking during pregnancy, dampness problem and interior decoration as fixed effect and city as random effect.

# Subgroup Analysis

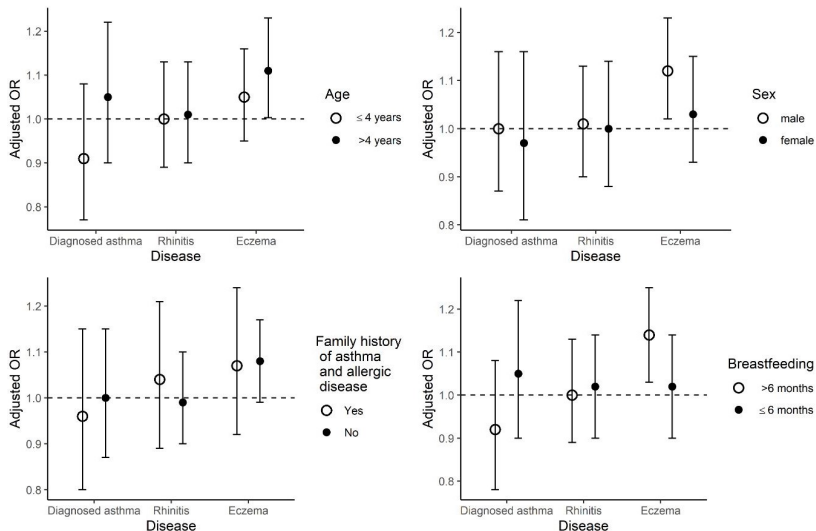


Figure 2: Subgroup Analysis



# Non-linear relationship

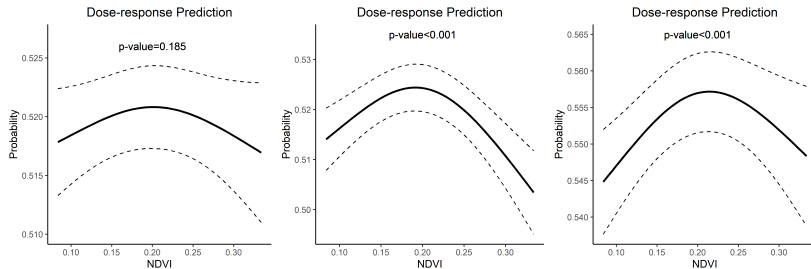


Figure 3: Non-linear dose-response relationship

Generalized additive model

Thanks