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Prenatal and early life home environment exposure in relation to preschool children's asthma, allergic rhinitis and eczema in Taiyuan, China

ZHAO ZhuoHui[1†*], ZHANG Xin[2†], LIU RanRan[2], NORBACK Dan[3], WIESLANDER Gunilla[3], CHEN Jie[4] & SUNDELL Jan[5]

[1] *Department of Environmental Health, Key Laboratory of Public Health Safety, Ministry of Education, School of Public Health, Fudan University, Shanghai 200032, China;*
[2] *Research Center for Environmental Science and Engineering, Shanxi University, Taiyuan 030006, China;*
[3] *Department of Medical Sciences, Occupational and Environmental Medicine, Uppsala University, Uppsala SE-751, Sweden;*
[4] *School of Management, Fudan University, Shanghai 200433, China;*
[5] *Department of Building Science and Technology, Tsinghua University, Beijing 100084, China*

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Prenatal and early life home environment might be related to children's asthma or allergic diseases later in life. A cross-sectional epidemiological study was designed and a questionnaire survey was performed in 3700 preschool children in urban areas in Taiyuan, Shanxi Province, China. Questions on children's asthma and allergic diseases from the International Study on Asthma and Allergies in Childhood (ISAAC) were integrated with questions on home environment from the Swedish Dampness in Buildings and Health (DBH) study, appropriately modified for Chinese life habits. By multivariate regression analyses controlling for age, gender, heredity, location in urban/suburban or rural areas, environmental tobacco smoke (ETS) and breastfeeding, we found that home new furniture (HNF) before birth (referring to 1 year before pregnancy and during pregnancy) was positively associated with wheezing ever (odds ratio(OR) 1.23 with 95% CI of 1.03–1.48) and wheezing last 12 months (1.24,1.00–1.54), allergic rhinitis (AR) (1.26,1.06–1.51), and eczema (1.42,1.01–1.99). HNF between 0–1 years old was also positively associated with wheezing last 12 months. Home new decoration (HND) during 0–1 years old was positively associated with AR symptoms and eczema symptoms, more in the last 12 months. Stronger positive associations were found for signs of home mold and dampness with almost all children's asthmatic and allergic symptoms (OR ranging from 1.23–1.85, $P<0.05$). By mutual adjustment between HNF before children's birth and home mold or dampness, all the significance remained unchanged. Prenatal HNF and home mold or dampness was independently associated with children's asthmatic and allergic diseases later in life.

dampness, indoor, furniture, mold, volatile organic compounds (VOCs)

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With the increasing prevalence of children's asthma and allergic diseases, research on possible influencing factors and potential mechanisms is widely performed. While large scale studies have shown that the prevalence in some developed countries has remained stable, and decreased in western countries, the prevalence continues to increase in many developing countries, including China [1].

Within China, there is great variation between areas in the East, West, North and South, and between economically developed and less developed areas. However, the average prevalence of diagnosed asthma has increased in each province in the last two decades [2]. Air pollutants, western life style factors, home environment, allergens, heredity,

†These authors contribute equally to this work.
*Corresponding author (email: zhzhao@fudan.edu.cn)

personal growing environment and diet have all been investigated in relation to children's asthma or allergic diseases in Chinese children [3–5]. Prenatal exposure and early life factors have been less thoroughly studied [6]. Till now, studies have reported that prenatal exposure to tobacco smoke [7,8], presence of home mold odor [9], early life presence of particle-board furniture [10], pollen or spores [11], and new chemicals [12,13] were associated with respiratory symptoms, including asthma and allergic rhinitis, in children later in life.

With China's continuing rapid economic and social development, new household products, including new furniture and home decorations, are becoming common in Chinese cities [14]. New decorations and furniture, especially in preparation before or shortly after the marriage, becomes a major aspect of home consumption for young couples, especially those most likely to have a baby. On the other hand, maintenance of good indoor air quality is not usual in China. Indoor residential environments are often polluted by different mechanisms including low ventilation rates, mold, dampness or water intrusion, organic compounds, and polluted outdoor air transported to indoors [15,16].

With the aim of exploring potential associated and influencing factors, especially those in residential environments, related to asthma and allergic diseases in China, a multiple-city collaboration epidemiological study was initiated, the China, Children, Homes, Health (CCHH) study. The current study is of Taiyuan, the capital city of Shanxi province in Northern China. The aim of this study is to analyze associations between prenatal exposure (including 1 year before pregnancy and during pregnancy) and early life exposure (between 0–1 years old) to home new furniture, decorations and mold or dampness problems with children's asthmatic and allergic diseases later in life.

1 Materials and methods

1.1 Study population

Ten kindergartens were selected in 5 administrative areas across the urban areas of Taiyuan. In each administrative area, 1–4 kindergartens were randomly selected with no previous knowledge of children's respiratory health or about their living environment. Taiyuan city, the capital of Shanxi Province, located in the middle reaches of the Yellow River in North China, around 500 km south-west of Beijing. There are totally 6 administrative urban areas, 3 counties and 1 county-level city. This study was performed in the 5 urban districts out of the total 6 ones. Participating kindergartens consisted of 1 kindergarten from Xiaodian, 1 from Jiancaoping, 2 from Yingze, 2 from Wanbailin and 4 from Xinhualing areas. The parents of all children in the recruited kindergartens were invited to complete a questionnaire. The children were from 4 grades, and ranged from 1.8 to 6.8 years old.

This study was approved by the ethical committee in Fudan University, Shanghai, China.

1.2 Questionnaire survey

The questionnaire used was developed for the DBH study initiated in Sweden in 2000, and modified so as to adapt to local home and life habits in China. Sets of questions addressed children's personal life, growth and family, parental allergic diseases, children's asthma, allergic rhinitis and eczema symptoms and prenatal, early life and current home environment [17].

Questions on children's asthma or related diseases were from the International Study on Asthma and Allergies in Childhood (ISAAC). The main issues addressed in this study were wheeze ever, rhinitis (AR) ever, eczema ever and related symptoms in the last 12 months. Physician diagnosed asthma and allergic rhinitis were also queried. The ISAAC questionnaire has been previously used in Chinese children [18–20] and validated by clinical investigation [21].

Questions on home environmental factors included home new furniture and new interior decoration or renovation, during the year before pregnancy, during pregnancy and between 0–1 years old, as well as signs of mold or dampness and water condensation at the time when the child was born. The time windows of '1 year before pregnancy' and 'during pregnancy' were combined into 'before children's birth' due to the high correlation with each other for the frequency of home new furniture and new interior decoration or renovation. It was asked whether there had been obvious signs of mold or dampness in floors, walls or ceiling in the home when the child was born. It was also asked whether there was water condensation in the bottom of windows (facing the room) in the winter season in children's birth residence.

Questions on heredity determined whether the father or mother had been diagnosed with asthma, allergic rhinitis or eczema. Questions on current environmental tobacco smoke (ETS) asked whether any person living with the child was smoking. Breastfeeding questions divided length of breastfeeding into two categories, less than 6 months and equal to or longer than 6 months. Information on living location (urban/suburban or rural) and parental smoking at the time of the child's birth was also collected.

The questionnaire survey was performed and completed in 2 weeks during October 2011 in Taiyuan City. Firstly, the director of each kindergarten agreed on participation. Then the questionnaire was distributed by responsible teachers in each class to the parents. The children brought the questionnaires home to their parents or legal guardians, and returned the completed questionnaires to their teachers.

1.3 Data analysis

The data were double-inputted independently using Epidate

3.1 software. A *Chi*-square test was used to test prevalence differences stratified by gender and environmental factors. For comparing continuous variables, a *T*-test was applied. Correlation analyses were performed by the Kendall tau-b method for different home environmental factors. Multivariate logistic regression analyzed associations between prenatal/early life environmental factors and children's asthma, allergic rhinitis, eczema and related symptoms, controlling for potential confounders. Mutual adjustment was also used to evaluate home new furniture before children's birth and mold or dampness when children were born. In all statistical analyses, two-tailed tests and a 5% significance level were applied. The analyses were performed by SPSS 11.5 (Chicago, USA).

2 Results

Four thousand and five hundred questionnaires were distributed and 3700 valid questionnaires were returned (response rate 82.2%). The mean age was 4.4 years old (range 1.8–6.8 years), with boys accounting for 52.3%. The age distribution was <3 years (4.4%), ⩽3–4 years (30.3%), ⩽4–5 years (36.6%) and ⩾5 years (26.1%).

With respect to children's health, Table 1 shows that 22.3% of the children were reported to have had wheezing ever and 14.8% with wheezing in the past 12 months. For allergic rhinitis (AR) symptoms, around 40% of children were reported to have had rhinitis symptoms ever (with no cold or flu), and 24.3% to have had rhinitis symptoms in the last 12 months. Boys were reported to have had more symptoms than girls on wheezing ever (P=0.004) and rhinitis ever (P=0.005), while older children had less symptoms in the last 12 months both for wheezing (P<0.001) and AR (P=0.001). Younger children had more eczema symptoms ever than the older ones (P=0.040).

Parental asthma or allergic diseases were reported for 8% of the total population. About 1/3 of children (32.1%) were breastfed for less than 6 months. Home environmental tobacco smoke (ETS) from people who live with children was reported in 60.1% families, which highly correlated (Kendall tau-b 0.609, P<0.001) with parental smoking when children were born (52.3%). Maternal smoking was seldom reported, averaging less than 1% before pregnancy, during pregnancy and currently. More than 80% of the children live in urban areas of Taiyuan, and 64.6% (n=2390) of the children have lived in the current home since birth. The prevalences of asthma and allergic diseases were compared for different life and heredity factors (Table 2). Significant differences were found in children with or without parental allergic diseases, and with or without current home ETS.

For all children, 23.3% of parents answered "yes" to the question on the "new furniture 1 year before pregnancy" and 8.7% during pregnancy; 25.9% reported home new decoration within the year before pregnancy, and 5.9% during pregnancy. There was a significant correlation between new home decoration 1 year before pregnancy and during pregnancy (Kendall's tau-b coefficient 0.18, P<0.001), and between new furniture 1 year before pregnancy and during pregnancy (Kendall's tau-b 0.25, P<0.001). These two time periods were combined into one period, 'before children's birth' for prenatal exposure to new decoration and new furniture. In children's early life time (referring to 0–1 years old in this study), 8.7% of families reported new furniture and 5.1% new decoration. Signs of home mold or dampness when children were born were reported by 12.3% of families, and 49.8% of families answered "yes" on windowpane condensation in winter season.

By univariate analyses (Table 3), significantly higher prevalences of allergic symptoms were observed in children with home new furniture and new decoration, both before children's birth and between 0–1 years old. With respect to before birth, the prevalence of wheezing, allergic rhinitis and eczema symptoms in the last 12 months in children with or without home new furniture was 16.9/13.8% (P<0.05), 27.8/21.9% (P<0.001) and 6.4/4.3%(P<0.05) , respectively.

Table 1 Prevalence (%) of asthma, allergic rhinitis and eczema and related symptoms in relation to age and gender in children in Taiyuan (n=3700)

	Gender				Age			
	Total (n=3700)	Boys (52.3%)	Girls (47.7%)	$P^{a)}$	<4 years (34.7%)	⩽4–5 years (36.6%)	⩾5 years (26.1%)	$P^{b)}$
Wheezing ever	22.3	24.2	20.2	0.004	23.4	22.9	19.9	0.101
Wheezing last 12 months	14.8	15.5	14.0	0.204	18.0	14.7	10.8	0.000
Physician-diagnosed asthma	1.6	1.6	1.6	0.895	1.3	1.7	1.8	0.471
Rhinitis symptoms ever	38.7	40.9	36.3	0.005	39.9	39.7	36.3	0.154
Rhinitis symptoms last 12 months	24.3	25.4	23.2	0.138	26.1	26.0	20.1	0.001
Diagnosed allergic rhinitis	2.6	2.8	2.3	0.395	2.3	2.4	3.2	0.392
Eczema symptoms ever	14.2	15.3	13.0	0.053	16.1	13.4	12.6	0.040
Eczema symptom last 12 months	5.0	4.9	5.1	0.818	6.2	4.4	4.3	0.058

a) P value by *Chi*-square test on prevalence of allergic symptoms and diseases between boys and girls; b) P value by *Chi*-square test on prevalence of allergic symptoms and diseases between different age groups.

Table 2 Prevalence (%) of asthma, allergic rhinitis and eczema or related symptoms stratified by personal life and family factors[a)]

	Parental asthma/ allergic diseases		Current ETS		Breastfeeding ⩾6 months		Live in urban/ suburban or rural		Parental smoking at children's birthtime	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Wheezing ever	29.0**	21.8	24.0**	19.8	21.7	23.8	22.7	21.4	23.4	21.3
Wheezing last 12 months	19.9*	14.4	16.3**	12.4	14.5	15.0	15.2	13.7	15.8	13.7
Physician-diagnosed asthma	2.7	1.5	1.4	1.9	1.5	1.6	1.7	1.2	1.4	1.8
Rhinitis symptoms ever	49.0***	37.6	39.6	37.6	38.9	38.1	38.4	42.0	39.2	38.6
Rhinitis symptoms last 12 months	33.8***	23.3	25.4	22.8	23.9	24.2	24.1	16.1	24.8	24.0
Diagnosed allergic rhinitis	7.6***	2.2	2.1	3.3*	2.9	2.0	2.7	2.0	2.2	3.1
Eczema symptoms ever	22.7***	13.3	14.7	13.3	14.5	13.5	14.4	13.7	14.5	13.6
Eczema symptom last 12 months	9.0**	4.7	5.6	4.2	5.0	4.9	5.1	5.1	5.2	4.8

a) *P<0.05; ** P<0.01; ***P<0.001. Comparisons (*Chi*-square test with P value) were made on the prevalences of allergic symptoms and diseases between "Yes" and "No" answers to each personal and family factor.

Table 3 Prevalence (%) of asthma, allergic rhinitis and eczema or related symptoms stratified by home environment before, around children's birthtime and in children's early life (0–1 years)[a)]

	Before children's birth[b)]				Between 0–1 years old				Around children's birth			
	New Furniture		New decoration		New furniture		New decoration		Home mold or dampness		Water condensation in windows	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Wheezing ever	24.8*	21.2	25.6	22.1	25.7	21.5	29.7	22.3	28.8**	21.3	25.2***	19.3
Wheezing last 12 months	16.9*	13.8	18.2*	14.5	20.1**	13.9	20.0	14.9	19.8**	14.0	16.7**	12.7
Physician-diagnosed asthma	1.5	1.5	1.3	1.5	0.3	1.4	0	1.4	2.9*	1.4	1.6	1.5
Rhinitis symptoms ever	40.0	36.9	38.7	36.8	42.6	37.2	50.0*	36.6	48.1***	37.4	41.3**	35.9
Rhinitis symptoms last 12 months	27.8***	21.9	26.2*	22.0	27.9	23.0	34.4**	22.1	31.2***	23.4	26.7***	21.6
Diagnosed allergic rhinitis	2.9	2.3	4.2*	2.3	2.5	2.4	0	2.7	4.3*	2.4	3.0	2.2
Eczema symptoms ever	15.2	13.8	15.4	13.9	14.0	14.3	20.2	13.8	18.0*	13.6	15.3	12.9
Eczema symptom last 12 months	6.4*	4.3	6.1	4.1	6.0	4.9	8.9	4.1	8.1**	4.6	5.9**	4.0

a) *P<0.05; ** P<0.01; ***P<0.001. Before children's birth referred to the time frame of 1 year before pregnancy and/or during pregnancy; b) comparisons (*Chi*-square test with P value) were made on the prevalences of allergic symptoms and diseases between "Yes" and "No" answers to home environmental factors.

The presence of signs of mold or dampness at home when children were born was associated with higher prevalence of all asthma, allergic rhinitis and eczema and symptoms, and windowpane condensation was associated with higher prevalence of most symptoms and diseases.

Considering the potential confounding effects by other factors, multivariate logistic regression was performed controlling for age, gender, parental asthma, allergic rhinitis or eczema, ETS, living in urban or suburban/rural areas and breastfeeding (model I in Table 4). Wheezing symptoms were associated with home new furniture both before children's birth and during 0–1 years old; rhinitis and eczema symptoms, more during the last 12 months, were positively associated with home new furniture before children's birth and home new decoration/renovation between 0–1 years old. Home mold or dampness and water condensation when children were born was profoundly significantly associated with higher prevalence of most symptoms of interest. Physician-diagnosed asthma and diagnosed rhinitis was not analyzed in the multivariate logistic regression because there were too few cases reported.

In order to differentiate between the effects of home mold/dampness and new furniture, mutual adjustment was performed between these two factors. Data are showed in model II in Table 4. By comparing with the data in model I, the results remained the same with almost no changes.

3 Discussion

"Ever" or current (last 12 months) asthmatic, rhinitis or eczema symptoms among children aged 2–6 years were associated with prenatal or early life home environment exposure, either to new furniture, new decoration or mold or dampness problems. Compared to new furniture or decoration, mold or dampness showed a stronger association as

Table 4 Association between children's asthma, allergic rhinitis and eczema and related symptoms and home environment before, around children's birthtime and in early life (0–1 years) in Taiyuan (2–6 years) by multivariate logistic regression (OR, 95% CI)[a)]

		Before children's birth[b)]		Between 0–1 years old		When children were born	
		New furniture	New decoration	New furniture	New decoration	Home mold or dampness	Water condensation in windows
Wheezing ever	Model I	1.23 (1.03–1.48)*	1.15 (0.92–1.45)	1.23 (0.93–1.63)	1.45 (0.93–2.33)	1.63 (1.30–2.05)***	1.40 (1.18–1.65)***
	Model II	1.23 (1.03–1.48)*	1.16 (0.92–1.46)	1.18 (0.89–1.56)	1.49 (0.93–2.39)	1.60 (1.26–2.05)***	1.49 (1.25–1.78)***
Wheezing last 12 months	Model I	1.24 (1.00–1.53)*	1.24 (0.95–1.61)	1.47 (1.08–2.00)*	1.40 (0.82–2.40)	1.64 (1.27–2.13)***	1.36 (1.12–1.65)**
	Model II	1.24 (1.00–1.54)*	1.25 (0.96–1.63)	1.40 (1.02–1.91)*	1.43 (0.83–2.46)	1.73 (1.32–2.28)***	1.46 (1.19–1.80)***
Rhinitis symptoms ever	Model I	1.07 (0.91–1.26)	1.03 (0.84–1.26)	1.27 (0.99–1.63)	1.72 (1.11–2.65)*	1.54 (1.25–1.90)***	1.23 (1.06–1.41)**
	Model II	1.07 (0.92–1.26)	1.03 (0.84–1.26)	1.24 (0.97–1.59)	1.76 (1.14–2.71)*	1.45 (1.16–1.81)**	1.25 (1.07–1.45)**
Rhinitis last 12 months	Model I	1.26 (1.06–1.51)*	1.14 (0.91–1.44)	1.30 (0.99–1.71)	1.81 (1.17–2.87)*	1.51 (1.20–1.89)***	1.28 (1.09–1.51)**
	Model II	1.23 (1.05–1.48)*	1.15 (0.91–1.44)	1.26 (0.96–1.66)	1.85 (1.17–2.93)**	1.40 (1.09–1.79)**	1.31 (1.10–1.56)**
Eczema symptoms ever	Model I	1.13 (0.90–1.40)	1.12 (0.85–1.49)	0.94 (0.66–1.34)	1.68 (0.98–2.89)	1.33 (1.00–1.76)*	1.17 (0.96–1.74)
	Model II	1.13 (0.91–1.41)	1.12 (0.84–1.48)	0.93 (0.65–1.33)	1.69 (0.98–2.90)	1.36 (1.01–1.83)*	1.16 (0.94–1.43)
Eczema symptoms last 12 months	Model I	1.42 (1.01–1.99)*	1.47 (0.94–2.29)	1.06 (0.62–1.80)	2.35 (1.08–5.12)*	1.80 (1.21–2.66)**	1.43 (1.04–1.97)*
	Model II	1.42 (1.01–1.98)*	1.51 (0.97–2.36)	1.00 (0.59–1.72)	2.37 (1.09–5.17)*	1.85 (1.22–2.80)**	1.41 (1.00–1.98)*

a) *P<0.05; ** P<0.01; ***P<0.001. Model I for all factors: controlling for age, gender, parental asthma/ allergic diseases, breastfeeding, living in urban/suburban or rural areas and ETS; Model II for new furniture, new decoration, variable "home mold or dampness" was added in addition to model I; for home mold or dampness and water condensation, variable "home new furniture before children's birth" was added in addition Model I; b) before children's birth referring to the time frame of 1 year before pregnancy and/or during pregnancy.

shown by an averagely higher OR value. These associations were independently significant and consistent as indicated by mutual adjustment for each other.

New furniture in the home is most likely made of artificial board, synthesized resin and new paint, which may strongly emit formaldehyde, other VOCs including BTX (benzene, toluene and xylene) and SVOCs [22]. Despite a typically decreasing level of indoor formaldehyde after home remodeling, it is nonetheless common to see high levels of formaldehyde up to 1 year after home redecoration in Chinese urban areas [22]. Zhang et al. [23] in a study of 11 cities in Jiangxi Province in China showed a high level of formaldehyde 2 years after home remodeling, 0.138 mg/m^3, decreased from 0.25 mg/m^3 at the time of remodeling. Total volatile organic compounds (TVOC), although questioned as a health relevant measure [26], is another entity whose concentration is increased by household products and decoration. In a survey by Xu et al. [24] on indoor TVOC in Chinese cities, the average TVOC level was 2.18±12.94 mg/m^3 in 982 residential homes. In seven out of 9 cities the average TVOC level was higher than the Chinese Indoor Air Quality Standard (GB/T 18883–2002) [25] of 0.6 mg/m^3 as an 8-hour average. Finally, modern chemicals including phthalates [12], and glycol ethers [13] emitted by indoor decorations and furniture have shown a strong association with asthma and allergies. In this study, 28.7% of families reported new decoration before children's birth and 31.6% new furniture, with more than 60% (64.6%) of children living in the current place since children's birth. This information indicates that very likely the higher level of chemicals from new furniture or new decoration existed in prenatal time and possibly extended to children's early life time.

Adverse health effects of indoor air chemicals have been suggested by positive associations as well as by observed exacerbation of allergic diseases or symptoms [10,15,20,27,28]. A study of exposure at age 1 month and subsequent diagnosed rhinitis at 18 months found that the introduction of particle-board furniture less than 12 months old in the bedroom was associated with an increased risk of non-allergic rhinitis (OR 1.87, 95% CI 1.21–2.90) [10]. Aldehydes, particularly formaldehyde, were found to be the major pollutant in particle-board less than 1 year old after manufacture reported by the same group, and were associated with an increased risk of rhinitis [29]. Until now, many studies emphasized the association between prenatal exposure to tobacco smoke and children's respiratory health later in life [7,30,31], and gave less attention to new furniture/decoration. If the relationship is cause-and-effect, it is likely that an immune response is part of the mechanism [32]. One study reported that an increased level of IL-4 cytokine production in newborns was associated with maternal exposure to VOCs during pregnancy [33], noting that IL-4 was usually increased in atopic children.

Prenatal and early life exposure to new home furniture

could interact with exposure to other current household materials. Information on current wall and floor materials was collected in our questionnaires, and we found there was a higher percent of decorated walls (water-based painting/organic-based painting/wall paper/wood) in prenatal new furniture homes than in non-prenatal new furniture homes (75.1%/70.1%, $P<0.01$). However, further analyses (not shown), controlling for current wall material, showed that all significant associations remained unchanged for home new furniture.

Mold and dampness in the children's homes were evaluated by parents in the questionnaire, and showed strong positive associations with most of the children's allergic symptoms in this study. This positive association agrees with reviews in the scientific literature [34,35], and with many cross-sectional [36] and birth-cohort studies [9,37] studies of dampness in home environments and children's asthmatic and allergic diseases in western countries. Studies from Taiwan, China, also support the positive association of indoor dampness with childhood asthma [38]. However, few studies have reported from mainland China [39]. Our findings on home dampness or mold when children were born might be, with respect to time spans, a surrogate for current home mold or dampness problems. Still, adjusting for current home mold or dampness, there were no major changes in the significant associations. On the other hand, a recently published longitudinal study from Sweden found that self reported dampness or mold could be biased, since the baseline findings of a strong association between dampness and allergies disappeared in the follow-up study 5 years later [40]. This could be due to a reporting bias in a country (Sweden) where the lay public has been educated on the association of dampness/mold with asthma [34,40,41]. We do not know whether the current positive associations were due to a reporting bias; possibly, home environment questionnaires could be validated by blinded objective observations in Chinese local homes, or by longitudinal studies, but this issue requires further studies.

Another consideration is whether one indoor environmental factor could be a surrogate or proxy for other factors, since many factors are simultaneously operating in indoor environments. We performed mutual adjustment between home new furniture before children's birth and mold or dampness when children were born (Table 4, model II) and did not see significant changes in the associations. However, other factors which might be relevant to the issues of interest in this paper, such as environmental allergens and pet keeping, require further analyses.

Tobacco smoking, including maternal smoking and passive smoking, has been one of the most widely studied factors in studies of the relation of prenatal exposures to children's asthmatic or allergic diseases [7,30,31]. Our study showed maternal smoking to be very uncommon, at 0.1%, 1.1% and 0.6% for pregnancy, birth time and the present respectively. Passive smoking, on the other hand, is a major pathway for both mothers' and children's exposure to ETS. Thus, current exposure to ETS about 50%, was mainly from fathers smoking, and even higher (75.1%, $P>0.001$) at the time of birth. Due to the high correlation between current ETS and ETS when children were born, tobacco smoke in early life time was not analyzed.

4 Conclusions

In conclusion, prenatal or early life exposure to home new furniture or decoration and dampness or mold (including water condensation on windows during winter) were positively associated with children's asthmatic and allergic diseases later in life. Thus, our findings suggest that exposure to home new furniture and mold or dampness should be prevented in children's early life, during the mother's pregnancy and perhaps before pregnancy.

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