Associations between indoor environmental smoke and respiratory symptoms among preschool children in Shanghai, China

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Whether indoor environmental smoke is harmful for preschool children's respiratory health in a society where female smoking is rare has not been determined. This study is part of a cross-sectional study (CCHH study-phase one in Shanghai) and investigated associations between parental smoking and incense-burning and respiratory symptoms among 4–6 year old children in Shanghai, China. A number of 13335 valid questionnaires (response rate: 85.3%) were analyzed. A number of 56.1% (as reported by a parent) of preschool children in Shanghai are exposed to environmental tobacco smoke (ETS). A number of 40.3% of fathers and 0.9% of mothers are smokers. A number of 53.7% and 12.6% of Shanghai residents have used mosquito-repellent incense and incensation respectively. Children exposed to any parental smoking have higher prevalence of wheeze and croup than those not exposed. Current maternal smoking has a significant and positive association with wheeze (in the last 12 months, AOR, 95% CI: 1.83, 1.11–2.99). However, paternal smoking either currently or at child's birth had only weak associations with wheeze and croup. Incense-burning (mosquito-repellent incense and incensation) had significant and negative association with doctor-diagnosed asthma (AOR, 95% CI: 0.85, 0.73–0.99) and hay fever (AOR, 95% CI: 0.80, 0.70–0.93). The results indicate that maternal smoking perhaps is a stronger risk factor for children's respiratory health than paternal smoking.

environmental tobacco smoke, incense, asthma, wheeze, preschool children, Shanghai

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It was estimated that worldwide, 40% of children were exposed to second hand smoke in 2004 [1]. Studies of environmental tobacco smoke (ETS) have found that it to be a risk factor for children's respiratory health in many developed countries or regions, for example in Italy [2], France [3], Portugal [4], Greece [5], Bulgaria [6], Singapore [7], Japan [8], USA [9–11] and Taiwan, China [12]. A study in Shanghai also found similar adverse effects from ETS [13]. Literature reviews have concluded that parental smoking is a risk factor for children's respiratory symptoms [14–20]. A review also found that effective tobacco smoke control can rapidly reduce the prevalence of respiratory diseases [21]. However, several studies found no association between parental smoking and asthma [22,23], wheeze [23,24], hay

fever [24,25] or rhinitis [3,25]. Moreover, a study conducted by ISAAC Phase One Study Group, found that “countries that have high adult male smoking rates have a lower risk of asthma and rhinitis symptoms in children” [26].

Combustion of incensation and anti-mosquito incense are other resources of indoor environmental smoke. Their emissions of particle number (PM) are comparable to those of typical cooking activities [27–29]. Thus incense-burning may also be a risk for child's health [30–34]. However, one study has found indoor incense-burning is not associated with an increase in respiratory symptoms [34].

Therefore, epidemiologic evidence of associations between parental smoking exposure and incense-burning and children's respiratory health still need to be investigated. Nested in the China, Children, Homes, Health (CCHH) study, the present study aimed: (1) to evaluate exposure to

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ETS and other kinds of non-cooking smoke in the residences among 4–6 years old preschool children in Shanghai; (2) to compare the risk of ETS and other kinds of smoke for preschool children's respiratory symptoms and (3) to compare the risk of maternal and paternal smoking in an East-Asian society in which maternal smoking is rare.

1 Methods

1.1 The survey

The CCHH study has been conducted in Shanghai and other Chinese cities. The first phase is a cross-sectional study, and the second phase is a nested case-control study. CCHH is focused on the home environment and its impact on asthma, allergies and other respiratory symptoms among preschool children. From April 2011 to April 2012, the cross-sectional study (phase one) in Shanghai was conducted in 5 districts (out of 18) by questionnaires. In total, 72 kindergartens were randomly selected in those districts and Parents of 17898 children were surveyed. Questionnaires were distributed by two methods: (1) delivered to parents and recovered on-site by us in kindergartens at the teacher-parents meetings, and (2) posted to kindergartens where teachers delivered them to parents, and then recovered them and mailed them back to us. The Shanghai Municipal Bureau of Education had agreed with the survey questionnaire and methods of its distribution and collection.

1.2 The questionnaire and statistical analysis

Questions on children's respiratory symptoms were the same as in the International Study of Asthma and Allergies in Childhood (ISAAC) [35]. Questions on parental smoking were similar to those used in the Dampness in Building and

Health (DBH) study in Sweden [36] and the ALLHOME study in Bulgaria [6]. Questions about incense (Table 1) were added according to Chinese living customs. Pictures of tobacco smoke mosquito-repellent incense and incensation which were involved in the survey were showed in Figure 1.

The data were input and analyzed by SPSS version 17.0 (SPSS Ltd., Chicago, Illinois, USA). All of the analyses were restricted to individuals with all complete data for the variables required in a particular analysis. Due to missing data for various items, the sums of children with different symptoms or different exposures in subgroups are not necessarily equal to the total numbers. Pearson *Chi*-Square Test (2-tailed) was used to analyze the statistical significance of differences between prevalences in different groups. Multiple logistic regression analysis was applied to further investigate associations, which were indicated in adjusted odds ratio (AOR) with a 95% confidence interval (95% CI). Statistical significance was indicated by $P \leq 0.05$. All analyses of associations between family (parental) smoking and incense-burning and respiratory symptoms were adjusted for age (≤ 4 years old vs. > 4 years old); sex; location of kindergartens (urban area vs. suburb); family history of asthma or allergies; Sick Building Syndrome (SBS), defined as producing at least one of following symptoms: fatigue, feeling heavy-headed, headache, nausea/dizziness, difficulties concentrating, itching or burning or irritation of the eyes, irritated or stuffy or runny nose, hoarse or dry throat, cough, dry or flushed facial skin, scurf or itching scalp or ears, dry hands, itching or red skin, and joint pain; among those families who filled out the questionnaire (yes vs. no); who filled out the questionnaire (mother vs. not mother); early furred pet-keeping; dampness (visible mould and/or visible damp stains on the floor, walls or ceiling in the child's room: yes vs. no); ownerships of current residence; breastfeeding (≤ 6 months vs. > 6 months).

Table 1 Questions and answers about indoor ETS exposure and incense-burning in the questionnaire

Items	Question	Answer
Environmental tobacco smoke	Does anyone smoke in your family currently?	Mother vs. father vs. grandmother vs. grandfather vs. none
	Did father or mother smoke during the first year of child's life?	Mother vs. father vs. none
	Did father or mother smoke during pregnancy?	Mother vs. father vs. none
Incense-burning ever	How often do you use mosquito-repellent incense at home?	Yes vs. no
	How often do you use incensation at home?	Yes vs. no

Figure 1 Illustration of sources of environmental smoke producers in the residence. (a) Tobacco smoking; (b) mosquito-repellent incense; (c), (d) incensation. Herein the incensation included the incense (c) used for changing indoor odors, or changing the odors of the clothing, and the incense (d) which is commonly used in Chinese temples for religious purposes.

2 Results

A number of 15266 valid questionnaires (response rate: 85.3%) of children aged from 1 to 8 years old were returned. 13335 children, aged “4 years old” (41.7%), “5 years old” (33.0%) and “6 years old” (25.3%), were selected for further analyses.

Totally, 56.1% of preschool children in Shanghai are reported to have ETS-exposure currently. Most of smokers are fathers, and maternal smoking is rare (Table 2). There is more paternal smoking in suburban than urban areas, while maternal smoking is the reverse. Those who own their current house smoke/smoked less than those who do not. Those with a family history of asthma or allergies smoke/smoked less than those without. Moreover, 53.7% and 12.6% of Shanghai inhabitants have used mosquito-repellent incense and incensation respectively (Table 2). Suburban residents

or those who did not own their current homes used more mosquito-repellent incense and incensation than urban residents or those who owned their current residence respectively. Residents with a family history of asthma or allergies used less mosquito-repellent incense but used more incensation than those without.

The prevalences of respiratory symptoms among 4–6 years old preschool children exposed to different indoor environmental smokes are shown in Table 3. The prevalence of rhinitis symptoms in the last 12 months, doctor-diagnosed asthma and hay-fever are significantly lower among those children in families who have used mosquito-repellant incense or incensation. However, most of differences between the prevalence of children with family (parental) smoking and the prevalence of those without family (parental) smoking are small and not statistically significant, except for wheeze ever (parental smoking during pregnancy or

Table 2 Percentages of parental smoking and incense-burning in the residence

		Family smoking currently				Parental smoking at birth			Parental smoking, pregnancy			Incense-burning ever	
		Total	Father	Mother	GP ^{a)}	Total	Father	Mother	Total	Father	Mother	Mosquito-repellent	Incensation
Total	<i>n</i>	7205	5216	123	3438	5444	5354	120	5115	5032	103	5991	1554
	%	56.1	40.3	0.9	26.5	41.6	40.7	0.9	39.1	38.3	0.8	53.7	12.6
The location of the kindergartens													
	Urban	53.1 ^{d)}	38.5 ^{d)}	1.1	24.3 ^{d)}	40.8	39.7 ^{c)}	1.5 ^{d)}	38.3	37.4 ^{c)}	1.2 ^{d)}	52.9 ^{d)}	12.4
	Suburban	58.9	42.6	0.8	29.4	42.1	42.0	0.2	39.8	39.6	0.2	37.8	12.8
Whether own the residence presently live in?													
	Yes	52.6 ^{d)}	36.8 ^{d)}	0.7 ^{c)}	26.2	38.4 ^{d)}	37.8 ^{d)}	0.8	36.3 ^{d)}	35.7 ^{d)}	0.8	47.8 ^{d)}	12.3
	No	60.8	46.1	1.3	27.2	46.3	45.5	1.0	43.5	42.8	0.8	63.7	13.2
Does the family member have asthma or allergies?													
	Yes	53.5 ^{c)}	37.4 ^{d)}	0.6	27.6	39.2 ^{b)}	38.7 ^{b)}	0.9	37.3 ^{b)}	36.9	0.8	49.8 ^{d)}	14.3 ^{d)}
	No	56.2	41.0	1.0	26.2	41.9	41.2	0.9	39.3	38.6	0.8	54.9	12.0

a) Grandparents, either grandmothers or grandfathers; b) $0.01 < P \leq 0.05$; c) $0.001 < P \leq 0.01$; d) $P \leq 0.001$.

Table 3 The prevalence of respiratory symptoms among 4–6 years old children with exposure to different no-cooking types of smoking^{a)}

Symptoms	Wheeze ever		Wheeze last 12 months ^{b)}		Dry cough during night ^{c)}		Asthma doctor-diagnosed		Croup ever		Pneumonia ever		Rhinitis ever		Rhinitis last 12 months ^{b)}		Hay fever doctor-diagnosed	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Total	3722	28.3	2858	21.7	2569	19.5	1342	10.3	963	7.6	4335	33.6	7076	54.1	5532	42.7	1624	12.6
Family smoking Currently?																		
Yes	2050	28.9	1587	22.4 ^{d)}	1391	19.5	729	10.4	545	7.9	2337	33.5	3801	53.8	2985	42.5	883	12.7
No	1564	27.5	1191	20.9	1114	19.5	571	10.2	384	7.2	1878	33.7	3059	54.1	2394	42.8	703	12.5
Parental smoking during the first year of child's life?																		
Yes	1572	29.4 ^{d)}	1203	22.4	1052	19.5	568	10.7	425	8.2 ^{d)}	1791	34.1	2875	53.8	2237	42.2	667	12.6
No	2093	27.4	1608	21.1	1489	19.5	751	10.0	528	7.1	2495	33.4	4106	54.2	3230	43.0	933	12.4
Parental smoking during pregnancy?																		
Yes	1472	29.3 ^{d)}	1125	22.3	1005	19.9	539	10.8	392	8.1	1693	34.3	2694	53.6	2111	42.3	625	12.6
No	2186	27.6	1679	21.2	1531	19.2	775	9.9	555	7.2	2587	33.3	4272	54.3	3342	42.9	973	12.5
Whether used mosquito-repellent incense ever?																		
Yes	1647	27.9	1265	21.4	1143	19.3	521	9.0 ^{f)}	423	7.4	1906	33.0	3113	52.9	2386	41.0 ^{d)}	623	10.7 ^{f)}
No	1422	27.9	1089	21.3	983	19.2	562	11.1	366	7.4	1715	34.1	2724	53.6	2175	43.1	714	14.2
Whether used incensation ever?																		
Yes	460	30.0	370	24.0 ^{d)}	338	21.9 ^{e)}	139	9.3	125	8.5	445	32.9	896	58.5 ^{f)}	692	45.9 ^{c)}	164	11.0 ^{d)}
No	3002	28.1	2290	21.4	2053	19.2	1116	10.6	767	7.4	3554	33.9	5664	53.3	4443	42.2	1353	12.9

a) “%” are prevalence, and “*n*” are the diseased children’s numbers; b) in the last 12 months; c) in the last 12 months, the child had dry cough at night for more than two weeks, apart from a cough associated with a cold or chest infection; d) $0.01 < P \leq 0.05$; e) $0.001 < P \leq 0.01$; f) $P \leq 0.001$.

in first year of child's life), croup ever (parental smoking during first year of life), and rhinitis in last 12 months (family smoking currently).

Adjusted associations between family (parental) smoking during different times and incense burning and children's illnesses and symptoms are shown in Table 4. Family smoking currently and parental smoking either at child's birth or during pregnancy were significant risk factors for wheeze. However, incense-burning ever was significantly and negatively associated with doctor-diagnosed asthma (AOR, 95% CI: 0.85, 0.73–0.99) and hay fever (AOR, 95% CI: 0.80, 0.70–0.93). The risks of paternal smoking and maternal smoking during different durations are compared in Table 5. Paternal smoking either currently or at child's birth was a significant risk factor for croup and wheeze in the last 12 months. Current maternal smoking seemingly had stronger associations with children's symptoms than paternal smoking, but was significant only for wheeze in the last 12 months.

3 Discussion

Currently, 56.1% of preschool children in Shanghai are exposed to household ETS. The rate of paternal smoking (40.3%) is comparable to that in many countries or regions. The percentages of maternal smoking (0.9%) in families with 4–6 years old children in Shanghai were much smaller than those in western countries, but similar to those in other Asian countries. For example, in Bulgaria, 72.9% of the families had at least one of family member who smoked, and 47.9% of mothers were smokers [6]. In the Czech Republic, “35.6% of the mothers and 48.9% of their husbands or partners were smokers” and 58.4% of children were exposed to ETS [37]. In Portugal, the rates of maternal and paternal smoking were 32.0% and 38.0% respectively, and household ETS was present in 41% [4]. About half of German 3–14 years old children were exposed to ETS in their homes [38]. But among one year old infants in Thailand, only 0.3% of the mothers and 35.1% of the fathers were

Table 4 Logistic regression analysis of indoor ETS exposure in different times and incense-burning ever

AOR, 95% CI (<i>n/N</i>) ^{c)}	Family (parental) smoking (none smoking=1.00)			Incense-burning ever (never using incense=1.00)		
	Currently ^{a)}	At child's birth ^{b)}	Pregnancy ^{b)}	Overall	Mosquito-repellent	Incensation
	(7205/12840)	(5444/13157)	(5115/13132)	(6695/11148)	(5991/11150)	(1554/12355)
Wheeze, ever	1.11, 1.01–1.23 ^{c)}	1.15, 1.04–1.26 ^{d)}	1.11, 1.01–1.22 ^{c)}	0.98, 0.89–1.09	1.01, 0.91–1.11	0.99, 0.86–1.14
Wheeze, in the last 12 months	1.13, 1.01–1.25 ^{c)}	1.13, 1.01–1.25 ^{c)}	1.01, 0.99–1.22	0.98, 0.88–1.10	1.02, 0.91–1.14	1.00, 0.86–1.17
Dry cough, during nights	1.03, 0.93–1.15	1.06, 0.95–1.17	1.08, 0.97–1.20	1.15, 1.03–1.29 ^{c)}	1.10, 0.98–1.23	1.15, 0.98–1.34
Asthma, doctor-diagnosed	1.12, 0.97–1.29	1.14, 0.99–1.31	1.14, 0.99–1.32	0.85, 0.73–0.99 ^{c)}	0.86, 0.73–1.00 ^{c)}	0.78, 0.62–0.97 ^{c)}
Croup, ever	1.15, 0.98–1.36	1.23, 1.04–1.44 ^{c)}	1.15, 0.98–1.36	1.13, 0.94–1.35	1.08, 0.90–1.28	1.12, 0.88–1.41
Pneumonia, ever	1.00, 0.91–1.09	1.02, 0.94–1.12	1.03, 0.94–1.13	0.96, 0.87–1.06	0.96, 0.87–1.06	0.95, 0.83–1.09
Rhinitis, ever	0.99, 0.91–1.08	0.98, 0.90–1.07	0.98, 0.90–1.07	1.09, 0.99–1.19	1.05, 0.96–1.15	1.09, 0.95–1.24
Rhinitis, in the last 12 months	1.03, 0.94–1.12	1.01, 0.93–1.11	1.02, 0.94–1.12	1.05, 0.95–1.15	1.02, 0.93–1.12	1.01, 0.89–1.16
Hay fever, doctor-diagnosed	1.08, 0.94–1.23	1.13, 0.99–1.29	1.13, 0.99–1.29	0.80, 0.70–0.93 ^{d)}	0.86, 0.75–1.00 ^{c)}	0.70, 0.56–0.86 ^{c)}

a) At least one of family members (father, mother, grandfather, and grandmother) smoke in the residence currently; b) at least one of parent (father and mother) smoked in the residence at child's birth; “*n*” are the amounts of families with smoking or burning incense in different groups, and “*N*” are the total valid amounts of different groups; c) $0.01 < P \leq 0.05$; d) $0.001 < P \leq 0.01$; e) $P \leq 0.001$.

Table 5 Logistic regression analysis of the risk of paternal smoking and maternal smoking at different times

AOR, 95% CI (none smoker=1.00)	Currently		At child's birth		During pregnancy	
	Fathers (<i>n</i> =3651) ^{a)}	Mothers (<i>n</i> =123)	Fathers (<i>n</i> =5323) ^{b)}	Mothers (<i>n</i> =120)	Fathers (<i>n</i> =5011) ^{b)}	Mothers (<i>n</i> =103)
Wheeze, ever	1.14, 1.02–1.28 ^{c)}	1.59, 0.99–2.57	1.14, 1.04–1.26 ^{d)}	1.53, 0.95–2.46	1.11, 1.01–1.22 ^{c)}	1.21, 0.70–2.10
Wheeze, in the last 12 months	1.16, 1.03–1.32 ^{c)}	1.83, 1.11–2.99 ^{c)}	1.12, 1.01–1.24 ^{c)}	1.38, 0.82–2.33	1.11, 0.99–1.23	0.81, 0.41–1.58
Dry cough, during nights	1.03, 0.90–1.17	1.42, 0.83–2.40	1.06, 0.95–1.18	0.89, 0.50–1.60	1.08, 0.97–1.20	0.92, 0.49–1.76
Asthma, doctor-diagnosed	1.21, 1.02–1.43 ^{c)}	1.30, 0.63–2.68	1.13, 0.98–1.30	1.53, 0.80–2.92	1.14, 0.99–1.32	1.25, 0.58–2.70
Croup, ever	1.22, 1.01–1.49 ^{c)}	1.64, 0.79–3.40	1.21, 1.03–1.43 ^{c)}	1.88, 0.94–3.77	1.15, 0.98–1.36	1.13, 0.44–2.89
Pneumonia, ever	1.01, 0.91–1.13	0.83, 0.50–1.38	1.02, 0.93–1.12	1.12, 0.70–1.80	1.03, 0.94–1.13	0.94, 0.55–1.60
Rhinitis, ever	0.91, 0.82–1.00	1.29, 0.80–2.09	0.99, 0.91–1.08	0.76, 0.48–1.20	0.99, 0.91–1.08	0.61, 0.37–1.02
Rhinitis, in the last 12 months	0.95, 0.85–1.05	1.03, 0.64–1.65	1.01, 0.93–1.11	0.99, 0.63–1.58	1.03, 0.94–1.12	0.84, 0.50–1.42
Hay fever, doctor-diagnosed	1.09, 0.93–1.28	1.60, 0.82–3.11	1.14, 0.99–1.30	0.85, 0.41–1.77	1.13, 0.99–1.29	0.98, 0.45–2.14

a) To eliminate the confounding from GP smoking and maternal smoking, only these families with sole fathers smoking were selected; b) to eliminate the confounding from maternal smoking, only these families with sole fathers smoking were selected; c) $0.01 < P \leq 0.05$; d) $0.001 < P \leq 0.01$.

smokers [39]. In Japan [8] and South Korea [40], 43.9% and 50.9% of children were exposed to ETS at home at the time of the survey. In Singapore, 13.2% of children were exposed to parental smoking [7]. In Taiwan, China, 44.9% of children had current household ETS exposure, and 36.0% of fathers and 3.4% of mothers are smokers [12]. In our study, the rate of paternal smoking was higher in suburban than in urban areas, but the reverse was found for maternal smoking, consistent with the findings of other studies [4,41] in western countries.

Most of the associations between family (mainly parental) smoking and children's health in the present study are not significant. Although many studies have found *in utero* exposure to ETS have significant associations with asthma and wheeze [3,9,10,12], our results in Table 4 indicated there are no significant associations between ETS exposure during pregnancy and children's symptoms except wheeze. Several studies [2–8,11–13,41] and reviews [14–20] also have concluded that childhood ETS exposure has significant associations with lifetime wheeze and asthma. We only found that family smoking either currently or at child's birth has weak associations with child's wheeze ever or in the last 12 months (Table 4). We also found no significant associations between parental smoking (both paternal and maternal smoking) and child's rhinitis and hay fever, which are consistent with previous studies [3,24,25]. Therefore, smoking among parents may be not a strong risk factor for respiratory symptoms. When we conducted the questionnaires, parents with family smokers have told us that these smokers avoid smoking in the presence of children. Moreover, some other studies found that maternal smoking is a greater risk than paternal smoking for child's current wheeze [2,26] and asthma [41]. We have found similar results (Table 5). Thus, maternal smoking seemingly is a stronger risk factor for children's asthmatic symptoms than paternal smoking. But it's still need to be further verified, and more accurately quantitative measure about indoor ETS exposure also should be explored.

In Asian countries, incense-burning, including mosquito-repellent incense and incensation, is an important source of indoor environmental smoke [30,34]. Several studies have investigated the characteristics of burning incense's emission [27–31] and their associations with health [31–34]. The smoldering combustion of both anti-mosquito products and incensation emit comparable particle numbers and size fractions to typical cooking activities [27] or other indoor sources of smoke [28]. Liao et al. [30] found the major contributors of indoor 1–5 μm particles to be cooking and incense burning activities. Liu et al. [31] found that burning one mosquito coil would produce the same amount of $\text{PM}_{2.5}$ mass as burning 75–137 cigarettes, and the same quantity of formaldehyde as 51 cigarettes. Using questionnaire assessment, Wang et al. [33] found that incense burning has significant positive associations with current asthma and wheeze. However, Koo et al. [34] found no associations

between incense-burning exposure and respiratory symptoms (wheeze, asthma, rhinitis and pneumonia). The results in Table 4 are partly consistent with Koo et al.'s findings [34]. But we found that incense-burning was a significant protective factor for doctor-diagnosed asthma and hay fever, although different kinds of incense may emit different particle numbers and size fractions [27–29]. Thus the associations between different kinds of incense-burning and children's symptoms are not clear and need further investigations.

The present study has some limitations. Firstly, maternal smoking was so rare as to weaken the statistical significance of associations (Tables 4 and 5). Secondly, parental avoidance behavior for smoking and incense-burning were not directly asked about. Thus we can not exactly analyze that how much those associations are influenced by these avoidance behavior. Finally, other factors, such as how often, what kind of incense were burned in the residence, ventilation during incense burning and the daily amount of parental smoking, were not analyzed in this study and need to be further investigated.

Nonetheless, the present study has several strengths. The sample was large, and the response rate was high. The data therefore are likely representative for Shanghai's 4–6 year old children and their various home situations. The large sample size means that potential confounders, such as age, sex, family history of asthma or allergies and geographical background, can be properly adjusted for. Moreover, an internationally standardized questionnaire of symptoms [35] and on environmental factors [6,7,11,12,36] was used. Thus, results could be reliably compared to those of many other similar studies, and could reveal the associations between parental smoking and incense-burning and preschool children's respiratory symptoms to a certain extent in Shanghai City.

4 Conclusions

The rate of paternal smoking among Shanghai preschool children is comparable to that in many countries, while the low rate of maternal smoking (about 1.0%) is comparable to that of other Asian countries, but not western countries. Maternal smoking may be a stronger risk factor for children's respiratory health than paternal smoking. The associations between mosquito-repellent incense or incensation and children's symptoms are not clear.

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