The effects of disease awareness on lifestyle changes and the use of preventive measures in asthma patients

Adam J. Sybilski, M.D., Ph.D.,[1,2] Adam Lusawa, Ph.D.,[1] Agnieszka Lipiec, M.D., Ph.D.,[1] Barbara Piekarska, Ph.D.,[1] Filip Raciborski, Ph.D.,[3] Edyta Krzych-Fałta, Ph.D.,[1] Aneta Tomaszewska, Ph.D.,[1] and Bolesław Samoliński, M.D, Ph.D.[1]

ABSTRACT

Reduction in asthma incidences and mortality, as well as improved quality of life, can be achieved via a wide use of prevention methods. A number of randomized cohort studies demonstrated the effectiveness of such management and the need for multiple treatments. Here, we evaluate whether asthma awareness influences the lifestyle and the use of prevention, as well as the effects of age, sex, economic status, and education on the use of prophylaxis. A total of 18,617 (53.8% female; 24.2% 6–7 years old, 25.4% 13–14 years old, and 50.4% 20–44 years old) were selected by a stratified cluster sampling method in eight cities and one rural area, each over 150,000 citizens. The sample was selected based on the methods and questionnaires of International Study of Asthma and Allergies in Childhood and European Community Respiratory Health Survey. Patients aware of asthma significantly less often ($p < 0.05$) reported owning asthma-inducing items and significantly more often reported behaviors minimizing the number of allergens ($p < 0.05$). Patients aware of asthma took all actions reducing their exposure to in-house allergens significantly more often than the healthy ($p < 0.05$) and individuals with symptoms only ($p < 0.05$). Allergy prevention was used more often in children ($p < 0.0005$), responders aware of diseases ($p < 0.05$), higher levels of education ($p < 0.05$), and higher household income ($p < 0.05$). The most common type of prophylaxis used is prophylactic actions, which are undertaken by patients diagnosed with asthma and who are aware of their disease. Adults do not use preventive measures as often as children or adolescents do. Higher rates of prevention-oriented behavior were observed in groups characterized by higher levels of education and higher household income.

(Allergy Asthma Proc 36:e14–e22, 2015; doi: 10.2500/aap.2015.36.3822)

For the last several decades, there has been a rapid increase in the incidence of asthma and other allergic conditions.[1–8] Currently, these constitute a serious public health problem and a huge burden for the health care system. Importantly, severe or uncontrolled asthma may be the reason behind life-threatening situations, and in many cases, it leads to death. This applies in particular patients with uncontrolled asthma, obese or overweight.[9,10] Moreover, asthma has a detrimental effect on the quality of life of millions of children and adults.[11,12]

Reduction in asthma incidence and mortality, as well as improved quality of life, can be achieved via a wide use of preventative methods. Effective prevention involves modifying the patient's health-oriented behaviors, increasing patient's awareness of the nature of the disease, and promoting health. Key prophylactic measures can be classified as primary, defined as actions undertaken to prevent the occurrence of disease, and secondary, defined as measures intended to stop or slow down disease development. Current expert recommendations on primary and secondary asthma prevention, endorsed by World Health Organization and World Allergy Organization, include limiting allergen exposure (mainly to in-house allergens), limiting factors promoting the growth of mold, avoiding contact with furry animals, and exposure to cigarette smoke.[1,13] A number of randomized cohort studies demonstrated the effectiveness of such management and the need to use multiple treatments.

To the authors' best knowledge, the use of allergy prevention measures has not yet been surveyed, especially with respect to asthma prevention, either in affected or healthy populations. Moreover, the significance of sociological and economic factors on the extent of preventative actions has also not yet been assessed. This was the reason why the Epidemiology of Allergic Disorders in Poland project evaluated the use of allergy prevention.

The purpose of this study was to evaluate whether asthma awareness influences lifestyles and the use of prevention, as well as the effect that age, sex, economic status, and education can have regarding the use of

[1]*Department of the Prevention of Environmental Hazards and Allergology, Medical University of Warsaw, Poland,* [2]*Department of Pediatric and Neonatology, Central Clinical Hospital of Ministry of Internal Affair, Warsaw, Poland, and* [3]*Department of Epidemiology and Health Promotion, Institute of Rheumatology, Warsaw, Poland*
Funded by the Ministry of Health of the Republic of Polish
The authors have no conflicts of interest to declare pertaining to this article
Address correspondence to Adam J. Sybilski, M.D., Ph.D., Department of Pediatric and Neonatology, Central Clinical Hospital of Ministry of Internal Affair, Wołoska 137, 02-507 Warsaw, Poland
E-mail address: adam.sybilski@cskmswia.pl
Copyright © 2015, OceanSide Publications, Inc., U.S.A.

DO NOT COPY

prophylaxis. Another aim of the study was to determine any correlation between hospitalization rate and the use of allergy prevention in patients.

MATERIALS AND METHODS

The study presented here is part of the Epidemiology of Allergic Disorders in Poland project. This was an epidemiologic probability survey study conducted based on the methods and questionnaires of the International Study of Asthma and Allergies in Childhood and the European Community Respiratory Health Survey.[6,14] Detailed methods and protocol requirements have been presented in earlier publications (www.ecap.pl).[15] A total of 22,703 respondents took part in the survey study (response rate, 64.4%), and 18,617 completed questionnaires passed the final quality assessment. The entire project included children aged 6–7 (n = 4510; 24.2%) and 13–14 (n = 4721; 25.4%), as well as adults (age 20–44) (n = 9386; 50.4%). Parent or guardian assisted the 6- to 7-year-old children in completing the survey. The respondents included 10,011 females (53.8%) and 8606 males (46.2%).

The next diagnostic criteria were adopted in the study:

Diagnosis of asthma was established based on an affirmative response to one of the next questions: 1) Have you ever had asthma? or 2) Have you had wheezing or whistling in your chest at any time in the last 12 months? The respondents with asthma were divided into two groups:

1) Respondents aware of their disease (asthma+), must be an affirmative response to the first question or both questions, and

2) Respondents who exhibited signs and symptoms of asthma according to the questionnaire but were undiagnosed and unaware of their condition (asthma−), an affirmative response only to the second question and responding "no" to question 1.

Analyses and description of the prevention use rates were based on variables associated with asthma risk, presented in Appendix 1.

The χ^2 statistic was used to determine any relationships between variables, and the odds ratio was used to determine the strength of such relationships for data tabularized into cross tables. $p < 0.05$ was considered to be statistically significant.

The study was approved by the institutional Ethics Committee. It was carried out as part of the project Implementation of the System for Prevention and Early Diagnosis of Allergic Disorders in Poland (number 6 P05 2005 C/06572) funded by Minister for Health and Minister for Science.

RESULTS

A total of 15.5% of respondents (n = 2888) were diagnosed with asthma, 4.6% (n = 856) out of whom were diagnosed and aware of the diagnosis (asthma+ group), and 10.9% (n = 2032) were only showing signs and symptoms of asthma without having been clinically diagnosed. The members of the latter group were unaware of their condition (asthma− group).

Risk Factors Associated With Living Conditions

Table 1 presents the reported risk factors for asthma: in-house allergens, such as house dust mite (HDM), pets, cockroaches, molds, and fungi, as well as smoking and second-hand smoke exposure. Patients diagnosed with asthma and aware of the disease significantly less often ($p < 0.05$) reported owning asthma-inducing items (except wall-to-wall carpets) and significantly more often reported behaviors minimizing the number of allergens ($p < 0.05$). Such differences were not observed in healthy respondents or in respondents exhibiting signs and symptoms of asthma. Those diagnosed with asthma do not keep cats as often as healthy individuals do ($p = 0.04$). However, out of the people who keep cats, those affected with asthma let their cats spend more time in the house ($p = 0.008$). As far as the presence of cats in the respondents' childhood is concerned, no statistically significant differences were observed. There were no differences between the healthy individuals and those affected with asthma in terms of owning a dog, although the findings showed that in comparison with healthy individuals, those affected who did own a dog let it spend more time inside the house ($p < 0.0005$) and in the respondent's bedroom ($p = 0.016$). Both those already diagnosed with asthma and those with only signs and symptoms more often reported the presence of cockroaches ($p < 0.0005$), mold ($p < 0.0005$), excessive moisture ($p = 0.001$), and flooding ($p < 0.0005$) in their building. The healthy and the diagnosed respondent groups showed no statistically significant differences in terms of smoking. The respondents with asthma manifestations and patients aware of their disease had been exposed to cigarette smoke in their childhood more often than healthy individuals ($p < 0.0005$).

Preventive Measures Undertaken by Respondents

The main question that helped determine the respondents' lifestyle depending on his or her disease awareness was the question on the use of preventive measures. Table 2 presents the number of actions taken by respondents to limit their antigen exposure at home. The table also shows the rates at which the individual exposure-limiting actions were taken by asthma patients (those aware of their disease and those only reporting symptoms) as well as by healthy individuals.

Patients diagnosed with asthma and who were aware of their disease (asthma+ group) were found to take all actions reducing their exposure to in-house

DO NOT COPY

Table 1 **The presence of risk factors related to the conditions inside the housing (n = 18,617)**

Risk Factor	Healthy	Asthma−	p Value	Asthma+	p Value
Related to HDM					
In most use room					
Fitted carpets	28.7	**31.3**	<0.05	**29.8**	<0.05
Contain rugs	56.2	**52.3**	<0.05	**47.6**	<0.05
Soft furnishings	64.3	65.1		**60.1**	<0.05
In bedroom					
Fitted carpets	28.6	29.9		29.0	
Contain rugs	55.2	**51.8**	<0.05	**45.1**	<0.05
Soft furnishings	62.6	**64.6**	<0.05	**58.3**	<0.05
Not launder the quilt and pillow	59.2	**50.6**	<0.05	**45.2**	<0.05
Feather quilt	21.6	**18.6**	<0.05	**11.7**	<0.05
Feather pillow	40.0	**36.0**	<0.05	**22.0**	<0.05
Not feather quilt or pillow	57.4	**61.9**	<0.05	**76.4**	<0.05
Launder the quilt	37.8	**46.2**	<0.05	**51.6**	<0.05
Launder the pillow	33.6	**41.9**	<0.05	**48.2**	<0.05
Bedding without feathers	57.4	**61.9**	<0.05	**76.4**	<0.05
Related to pet					
Have a cat					
Now	17.8	16.7		**15.1**	<0.05
First year of life	11.1	10.2		9.9	
Aged 1 to 4	16.4	15.6		15.0	
Aged 5–15	20.5	20.0		22.2	
Have a dog					
Now	33.9	31.4		34.4	
First year of life	15.3	17.7		15.5	
Aged 1 to 4	23.3	24.0		24.6	
Aged 5–15	33.9	35.7		35.1	
Cat allowed in the house	77.3	**82.6**	<0.05	**86.9**	<0.05
Cat allowed in the bedroom	67.6	72.8		72.3	
Dog allowed in the house	73.3	**82.4**	<0.05	**86.2**	<0.05
Dog allowed in the bedroom	65.3	72.6		72.0	
Related to house condition					
Cockroaches	5.7	**9.3**	<0.05	**9.8**	<0.05
Water damage	19.5	**28.4**	<0.05	**26.0**	<0.05
Damp last 12 months	18.3	**26.2**	<0.05	**22.9**	<0.05
Mold ever	24.6	**32.7**	<0.05	**33.3**	<0.05
Mold inside the home	57.7	60.8		58.8	
Related to smoking					
Ever smoked	44.1	61.4		46.6	
Now smoke	66.0	73.2		64.5	
Exposed to tobacco smoke	37.6	**46.7**	<0.05	**40.9**	<0.05
People smoke at work	28.7	32.8		29.2	
Mother smoked	29.3	**33.1**	<0.05	**35.9**	<0.05
Father smoked	46.4	48.2		47.7	
Mother smoked as you were infant	20.5	23.5		**29.1**	<0.05

Data are presented as percentages. Statistical differences are calculated relative to healthy subjects. Statistically significant values are shown in bold.

Asthma−, participants with symptoms of asthma and who are not aware of their disease; asthma+, participants aware of asthma.

DO NOT COPY

Table 2 **Preventive actions taken by participants (n = 18,617)**

Preventive Action	Total	Healthy	Asthma−	p Value	Asthma+	p Value
Number of preventive actions taken						
0	71.6	74.9	**62.5**	<0.05	**48.5**	<0.05
1	11.2	10.3	**14.5**	<0.05	**16.5**	<0.05
2	11.9	10.7	**14.8**	<0.05	**21.0**	<0.05
>3	5.3	4.2	**8.3**	<0.05	**14.0**	<0.05
Changed carpet						
In most use room	13.4	11.7	**17.5**	<0.05	**28.0**	<0.05
Bedroom	12.2	10.5	**16.9**	<0.05	**24.8**	<0.05
New carpet						
In most use room	8.3	7.5	**10.6**	<0.05	**13.7**	<0.05
Bedroom	7.4	6.7	**9.3**	<0.05	**12.7**	<0.05
Antidust-mite sprays	5.3	4.4	**7.5**	<0.05	**13.1**	<0.05
Allergy-proof cover	3.5	3.1	4.9		5.9	
Taken away a pet	3.9	3.0	**6.3**	<0.05	**9.4**	<0.05
Stopped or cut down smoking	58.2	57.5	**58.3**	<0.05	**66.1**	<0.05

Data are presented as percentages. Statistical differences are calculated relative to healthy subjects. Statistically significant values are shown in bold. Asthma−, participants with symptoms of asthma and who are not aware of their disease; asthma+, participants aware of asthma.

Table 3 **Number of actions undertaken by participants to reduce allergens or exposure to allergens (n = 18,617)**

Number of Actions	6–7 Years Old	13–14 Years Old	Adults	Female	Male
0	66.6	67.2	76.3	71.2	72.0
1	13.7	11.8	9.7	11.6	10.9
2	13.1	14.2	10.1	11.8	11.9
>3	6.6	6.8	3.9	5.4	5.2

Data are presented as percentages.

allergens significantly more often than both the healthy individuals ($p < 0.05$), as well as respondents with asthma symptoms only ($p < 0.05$). Moreover, the evaluated groups differed significantly in terms of the number of preventive actions taken ($p < 0.05$). The most common exposure-limiting action taken in all groups was removal of the living-room rug (n = 2503; 13.4%), and the least common action was getting rid of the dog or cat (n = 720; 3.9%). Conversely, patients with asthma (diagnosed or only symptomatic) decided to get rid of the dog or cat considerably more often ($p < 0.0005$). Individuals who were aware of their disease quit or limited their smoking considerably more often than healthy individuals ($p = 0.021$).

Sociological and Economic Analysis of the Use of Preventive Measures

Allergy prevention was used more often in children of either age group than in adults ($p < 0.0005$). However, male and female respondents did not differ significantly in terms of the number of actions they would take to limit exposure to allergens in their homes ($p = 0.451$) (Table 3).

Individuals from all subgroups (stratified by: age, sex, level of education, or socioeconomic status) who reported asthma symptoms used preventive measures more often than the healthy individuals, with the rates of prevention even higher among patients diagnosed with and aware of their asthma compared with symptomatic only individuals. This trend was especially visible in children (Table 4).

The rates of preventive measures did not differ significantly between the sexes. However, they tended to be more common in healthy respondents with a higher education level ($p < 0.0005$), as well as diagnosed respondents ($p = 0.035$). Regardless of the level of education, the use of preventive measures was significantly higher in symptomatic-only respondents than in healthy respondents ($p < 0.0005$); it was also significantly higher in those aware of their asthma than in those only reporting asthma symptoms ($p < 0.0005$). The proportion of respondents who used allergy prevention measures was higher in those who reported a higher household income, reaching 58.0% in the subgroup diagnosed with asthma who reported the highest income. These increasing rates of allergy prevention measures taken at home were es-

DO NOT COPY

Table 4 **Undertaken prophylaxis actions by participants in age, gender, education and socioeconomic status group**

	Healthy	Asthma−	OR	95% CI	*p* Value	Asthma−	Asthma+	OR	95% CI	*p* Value
Age *n* = 18,617										
6–7	28.5	44.8	2.03	1.75–2.36	0.0005	44.8	59.2	1.78	1.31–2.42	0.0005
13–14	28.9	43.8	1.91	1.61–2.79	0.0005	43.8	58.2	1.78	1.35–2.35	0.0005
Adults	21.7	29.7	1.52	1.34–1.73	0.0005	29.7	42.2	1.73	1.37–2.18	0.0005
Gender *n* = 18,617										
Female	25.4	39.0	1.87	1.64–2.09	0.0005	39.0	51.9	1.68	1.35–2.09	0.0005
Male	24.7	35.7	1.69	1.50–1.91	0.0005	35.7	51.1	1.88	1.52–2.31	0.0005
Education adults *n* = 9386										
Primary	17.5	31.8	2.20	1.56–3.12	0.0005	31.8	42.4	1.57	0.89–2.79	0.0005
Secondary	24.6	39.6	2.02	1.70–2.63	0.0005	39.6	54.5	1.82	1.33–2.50	0.0005
Higher	29.4	39.9	1.59	1.37–1.84	0.0005	39.9	56.3	1.94	1.47–2.55	0.0005
Monthly income *n* = 12,027										
<200 €	19.4	32.7	2.01	1.44–2.81	0.0005	32.7	38.2	1.27	0.68–2.36	0.444
201–349 €	22.6	35.7	1.90	1.42–2.54	0.0005	35.7	48.9	1.72	1.06–2.80	0.028
350–500 €	26.6	37.2	1.63	1.29–2.05	0.0005	37.2	54.1	1.99	1.33–2.97	0.001
501–700 €	27.1	36.3	1.53	1.22–1.92	0.0005	36.3	60.0	2.63	1.70–4.09	0.0005
701–999 €	28.4	40.2	1.69	1.37–2.09	0.0005	40.2	61.6	2.38	1.56–3.64	0.0005
>1000 €	31.1	41.7	1.58	1.23–2.03	0.0005	41.7	58.0	1.92	1.19–3.10	0.007

Asthma−, participants with symptoms of asthma and who are not aware of their disease; asthma+, participants aware of asthma.

Table 5 **Antiallergic home prophylaxis in relation to hospitalization due to asthma, wheezing, or shortness of breath (*n* = 3089)**

	Antiallergic Prophylaxis	No Antiallergic Prophylaxis	*p* Value
Spent a night in hospital	24.9	18.8	<0.05
Regular appointments with a hospital doctor	4.8	2.2	<0.05
Your general practitioner	7.1	5.2	<0.05
A nurse	3.8	1.7	<0.05
Clinical or laboratory tests	18.1	12.2	<0.05

Data are presented as percentages.

pecially visible in the group of healthy ($p < 0.0005$) and asthma-aware ($p = 0.051$) respondents. Diagnosed and undiagnosed respondents who reported the lowest income did not differ in terms of preventive measure use ($p = 0.444$). The remaining income ranges showed that those aware of their disease use preventive measures more often than those with asthma symptoms but who are unaware of their diagnosis.

Tables 3 and 4 present a detailed sociological and economic analysis of preventive measure use.

The Correlation Between Hospitalizations Due to Respiratory Problems and the Use of Prophylaxis

Table 5 presents the correlation between the use of preventive measures and the rates of hospitalization, medical consultations, the need to receive rescue interventions, or undergo assessments. Respondents who used preventive measures demonstrated a higher hospitalization rate than those who used no prophylaxis ($p < 0.05$).

DISCUSSION

Prevention is the first step in the management of most diseases and is of particular importance in the case of allergies and asthma.[1,4,16,17] All management standards emphasize the importance of prophylaxis in adequate asthma control and flare-up prevention. Current guidelines show few actions in asthma prevention strategy. The main goals of prevention are to reduce exposure to allergens that may potentially exacerbate the disease and to avoid trigger factors (*e.g.*, cigarette smoke). Although there have been studies indicating a correlation between high levels of exposure to an allergen and early sensitization, there is no robust evidence as to the efficacy of allergen elimination as a

DO NOT COPY

means to reducing the risk of developing an allergic disorder; thus, such recommendations should not be taken without reservations.[16,18,19] A recent metaanalysis showed ineffectiveness of special antidust mite covers in primary and tertiary asthma prevention.[20] Other methods of reducing exposure to HDMs as a means of asthma prevention also fail to show a consistently beneficial effects. Especially questionable is the use of HDM elimination as primary prophylaxis, as seen in healthy individuals.[16,21,22] Another controversy surrounds classifying the presence of a dog or a cat as a potential allergen source and asthma-exacerbating factor. There have been reports suggesting the need to avoid these pets to prevent early sensitization, as well as reports contradicting this premise and indicating instead a protective effect of the presence of these animal allergens in the child's environment. A significant reduction in the levels of animal allergens has been observed in the houses of people who got rid of their pet.[23,24] Independent in-house allergens potentially affecting the course of asthma include cockroaches, flooding, wet or moist walls, mold, or fungi. Studies indicate that molds, fungi, and wet or moist walls are risk factors for developing asthma.[25,26]

Despite these inconsistencies, the current guidelines that are conveyed to patients (especially to those already diagnosed) recommend the use of prophylactic measures. Secondary and tertiary prevention of asthma are particularly commonly recommended.

However, despite many years of promoting prevention, the actual use of preventive measures in asthma patients and in healthy individuals has never been evaluated. We believe our study to be the first one to compare the rates of prophylaxis use in asthma-aware patients, individuals who only reported symptoms but are unaware of their disease, and healthy individuals. In a slightly simplified way, any actions taken by healthy individuals and aimed at reducing exposure to in-house antigens, limiting contact with furry animals, and limiting exposure to cigarette smoke may be described as primary prevention. Secondary prevention comprises similar actions undertaken by individuals who exhibit signs and symptoms of asthma (but have not been diagnosed and are unaware of their disease). And finally, tertiary prevention can be used by patients diagnosed with asthma. According to the above definitions, our studies assessed the use of all three types of prevention.

Interestingly, despite the existence of well-established, clear, and relatively simple preventive measures, up to 71.6% of respondents failed to undertake any of the actions listed in the questionnaire, and only 17.2% reported more than one. The most common action was removal of the rug from a room, and the least common action was getting rid of the dog or cat. The type of prophylaxis most commonly observed in our study was tertiary prevention (*i.e.*, prophylactic actions used by asthma patients aware of their disease), with 51.5% of patients from this group undertaking actions to limit in-house allergens. The undiagnosed symptomatic group had 37.5% of respondents report taking such actions and in the healthy respondent group that rate was only 25.1%. Studies show that symptomatic respondents take prevention more seriously and use it. An increased use of preventive measures in diagnosed versus symptomatic but disease-unaware patients may indicate that the reason for more frequent allergen-limiting actions is disease awareness. Hence, it is a secondary factor that causes patients to reach for relatively simple measures affecting their health and well-being.

The most common form of prevention aimed at limiting HDM allergen exposure was the removal of the rug from the room where the respondent spends his or her time during the day. This action was reported in all three prevention groups, although it was taken considerably more often by respondents diagnosed with asthma (28.0%) versus undiagnosed symptomatic individuals (17.5%) versus healthy individuals (11.7%). Special antidust mattress covers were the least commonly used form of prevention.

Adults were found to use preventive measures less often than children, with no differences between the groups of 6–7 and 13–14 year olds. We observed an increased use of allergy prevention measures by the more affluent respondents. This tendency was even more pronounced in the symptomatic only and disease-aware groups.

What is noteworthy is the fact that the results of our analysis of prophylaxis use in hospitalized patients with respiratory problems were contrary to expectations. Respondents who observed preventive measures exhibited higher rates of hospitalization (systematic examinations, procedures, check-ups, clinical assessments, or laboratory tests) than those who did not observe preventive measures. This seems to be explained by a greater care of one's own health exhibited by these individuals, the willingness to maintain constant and close control. At the same time, a question arises whether all visits and assessments were justified and truly necessary, or were only a result of motivation toward prophylaxis.

In conclusion, we can state that the most common type of prophylaxis is tertiary prevention, meaning prophylactic actions undertaken by patients diagnosed with asthma and aware of their disease. Adults do not use preventive measures as often as children or adolescents do. Higher rates of prevention-oriented behavior were observed in groups characterized by higher levels of education and household income.

DO NOT COPY

Appendix 1 **Questions and answers of ECAP questionnaire used in this analysis**

Risk Factors Related to HDM	
Does the room which you use most at home during the day	
Have fitted carpets covering the whole floor?	Yes
Contain rugs?	Yes
Have upholstered or soft furnishings?	Yes
Does your bedroom	
Have fitted carpets covering the whole floor?	Yes
Contain rugs?	Yes
Have upholstered or soft furnishings?	Yes
Do you have	
Bedding without feathers?	Yes
Feather quilt?	Yes
Feather pillow?	Yes
Risk factors related to pet	
Do you keep a cat?	Yes
Was there a cat in your home	
During your first year of life?	Yes
When you were aged 1–4 years?	Yes
When you were aged 5–15 years?	Yes
Do you keep a dog?	Yes
Was there a dog in your home	
During your first year of life?	Yes
When you were aged 1–4 years?	Yes
When you were aged 5–15 years?	Yes
Risk factors related to house condition	
Are there cockroaches in the building where you live?	Yes
Has there been any water damage to the building or its contents, for example, from broken pipes, leaks, or floods?	Yes
Within the last 12 months have you had wet or damp spots on surfaces inside your home other than in the basement?	Yes
Has there ever been any mold or mildew on any surface, other than food, inside the home?	Yes
Within the last 12 months has there ever been any mold or mildew on any surface, other than food, inside the home?	Yes
Risk factors related to smoking	
Have you ever smoked for as long as a year?	Yes
Do you now smoke, as of one month ago?	Yes
Have you been regularly exposed to tobacco smoke in the last 12 months?	Yes
Do people smoke regularly in the room where you work?	Yes
Did your mother smoke cigarettes when you were a kid?	Yes
Did your father smoke cigarettes when you were a kid?	Yes
Did your mother smoke cigarettes when you were an infant?	Yes
Preventive actions	
How many activities have you taken to preventive allergy?	0, 1, 2, >3
Do you launder the quilt and pillow from your bed?	No
Do you launder the quilt from your bed?	Yes
Do you launder the pillow from your bed?	Yes
Have you taken any of the next measures to reduce allergen or exposure to allergen in your home:	
...changed from carpet to a wooden or other smooth surface on floor of the room you use most?	Yes

DO NOT COPY

Appendix 1 **Continued**

...changed from carpet to a wooden or to a smooth surface on floor of your bedroom?	Yes
...bought a new carpet for the room you use most?	Yes
...bought a new carpet for your bedroom?	Yes
...used antidust-mite sprays?	Yes
...put an allergy-proof cover on your mattress?	Yes
Is your cat allowed inside the house?	Yes
Is your cat allowed in the bedroom?	Yes
Is your dog allowed inside the house?	Yes
Is your dog allowed in your bedroom?	Yes
Have you sold, given away, or destroyed a pet dog or cat?	Yes
Have you stopped or cut down smoking?	Yes
Prophylaxis and hospitalization	
Have you spent a night in hospital because of breathing problems?	Yes
Are you given regular appointments to be seen by a hospital doctor for your asthma, wheezing, or shortness of breath?	Yes
Are you given regular appointments with your general practitioner for your asthma, wheezing, or shortness of breath?	Yes
Are you given regular appointments with a nurse for your asthma, wheezing, or shortness of breath?	Yes
Have you had any clinical or laboratory tests because of asthma wheezing or shortness of breath in the last 12 months?	Yes

DO NOT COPY

REFERENCES

1. World Allergy Organization (WAO) White Book on Allergy. Pawankar R, Canonica GW, Holgate ST, and Lockey RF (Ed). Milwaukee, Wisconsin. WAO, 2011.
2. European Allergy White Paper, The UCB Institute of Allergy. Allergic diseases as a public health problem in Europe. Braine-l'Alleud, Belgium. UCB Institute of Allergy, 2004.
3. Matricardi PM. The allergy epidemic. In Global Atlas of Allergy. Akdis CA, and Agache I (Ed). Zurich, Switzerland. EAACI, 112–114, 2014.
4. Bousquet J, Khaltaev N, Cruz AA, et al. Allergic rhinitis and its impact on asthma (ARIA 2008). Allergy 68(suppl. 86):8–160, 2008.
5. Van Cauwenberge P, Watelet JB, Van Zele T, et al. Spreading excellence in allergy and asthma: the GA2 LEN (Global Allergy and Asthma European Network) project. Allergy 60:858–864, 2005.
6. Asher MI, Montefort S, Bjorksten B, et al. Worldwide time trends in the prevalence of symptoms of asthma, allergic rhinoconjunctivitis, and eczema in childhood: ISAAC Phases One and Three repeat multicountry cross-sectional surveys. Lancet 368:733–743, 2006.
7. Liebhart J, Malolepszy J, Wojtyniak B, et al. Prevalence and risk factors for asthma in Poland: results from the PMSEAD study. J Investig Allergol Clin Immunol 17:367–374, 2007.
8. Bousquet J, Burney PG, Zuberbier T, et al. GA2LEN (Global Allergy and Asthma European Network) addresses the allergy and asthma 'epidemic'. Allergy 64:969–977, 2009.
9. Ciprandi G, Schiavetti I, Bellezza Fontana R, et al. Overweight and obesity as risk factors for impaired lung function in patients with asthma: A real-life experience. Allergy Asthma Proc 35: e62–e71, 2014.
10. Ostrom NK, Parsons JP, Eid NS, et al. Exercise-induced bronchospasm, asthma control, and obesity. Allergy Asthma Proc 34:342–348, 2013.
11. van Wijk RG. Socio-economic costs of asthma. In Global Atlas of Asthma. Akdis CA, and Agache I (Ed). Zurich, Switzerland. EAACI, 18–20, 2013.
12. Smith H. Psychological factors and asthma. In Global Atlas of Asthma. Akdis CA, and Agache I (Ed). Zurich, Switzerland. EAACI, 52–54, 2013.
13. Asher I, Baena-Cagnani C, Boner A, et al. World Allergy Organization guidelines for prevention of allergy and allergic asthma. Int Arch Allergy Immunol 135:83–92, 2004.
14. Variations in the prevalence of respiratory symptoms, self-reported asthma, and use of asthma medication in the European Community Respiratory Health Survey (ECRHS). Eur Respir J 9:687–695, 1996.
15. Sybilski AJ. Raciborski F, Lipiec A, et al. Epidemiology of atopic dermatitis in Poland according to ECAP study (Epidemiology of Allergic Disorders in Poland). J Dermatol. 2014 Dec 6. doi: 10.1111/1346–8138.12731.
16. Global Atlas of Allergy. Akdis CA, and Agache I (Ed). Zurich, Switzerland. EAACI, 2014.
17. From the Global Strategy for Asthma Management and Prevention. Global Initiative for Asthma (GINA) 2012. Available from www.ginasthma.org. Last accessed: September 20, 2014.
18. Marinho S, Simpson A, and Custovic A. Allergen avoidance in the secondary and tertiary prevention of allergic diseases: Does it work? Prim Care Respir J 15:152–158, 2006.
19. Arshad SH. Primary prevention of asthma and allergy. J Allergy Clin Immunol 116:3–14; quiz 15, 2005.

20. Arroyave WD, Rabito FA, Carlson JC, et al. Impermeable dust mite covers in the primary and tertiary prevention of allergic disease: A meta-analysis. Ann Allergy Asthma Immunol 112: 237–248, 2014.
21. Toelle BG, Ng KK, Crisafulli D, et al., Childhood Asthma Prevention Team. Eight-year outcomes of the Childhood Asthma Prevention Study. J Allergy Clin Immunol 126:388–389, 389.e1–3, 2010.
22. Sun Y, and Sundell J. Life style and home environment are associated with racial disparities of asthma and allergy in Northeast Texas children. Sci Total Environ 409:4229–4234, 2011.
23. Chen CM, Tischer C, Schnappinger M, and Heinrich J. The role of cats and dogs in asthma and allergy-a systematic review. Int J Hyg Environ Health 213:1–31, 2010.
24. Portnoy J, Kennedy K, Sublett J, et al. Environmental assessment and exposure control: A practice parameter-furry animals. Ann Allergy Asthma Immunol 108:1–15, 2012.
25. Peters JL, Levy JI, Muilenberg ML, et al. Efficacy of integrated pest management in reducing cockroach allergen concentrations in urban public housing. J Asthma 44:455–460, 2007.
26. Sahakian NM, Park JH, and Cox-Ganser JM. Dampness and mold in the indoor environment: Implications for asthma. Immunol Allergy Clin North Am 28:485–505, 2008. □

DO NOT COPY

Copyright of Allergy & Asthma Proceedings is the property of OceanSide Publications Inc. and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.