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Prevalence of asthma and allergies in children

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The prevalence rates of symptoms of asthma and allergic rhinoconjunctivitis in children aged 6–7 years and 13–14 years

The summary gives an overview on the prevalence of asthma and allergic rhinoconjunctivitis symptoms in children as found in the International Study of Asthma and Allergies in Childhood (ISAAC) *(1)*.

KEY MESSAGE

ISAAC found that asthma and rhinoconjunctivitis symptoms cause a significant burden of disease and that the prevalence of both is rising in European children. Allergic and asthmatic symptoms are associated with, among other things, indoor and outdoor air quality.

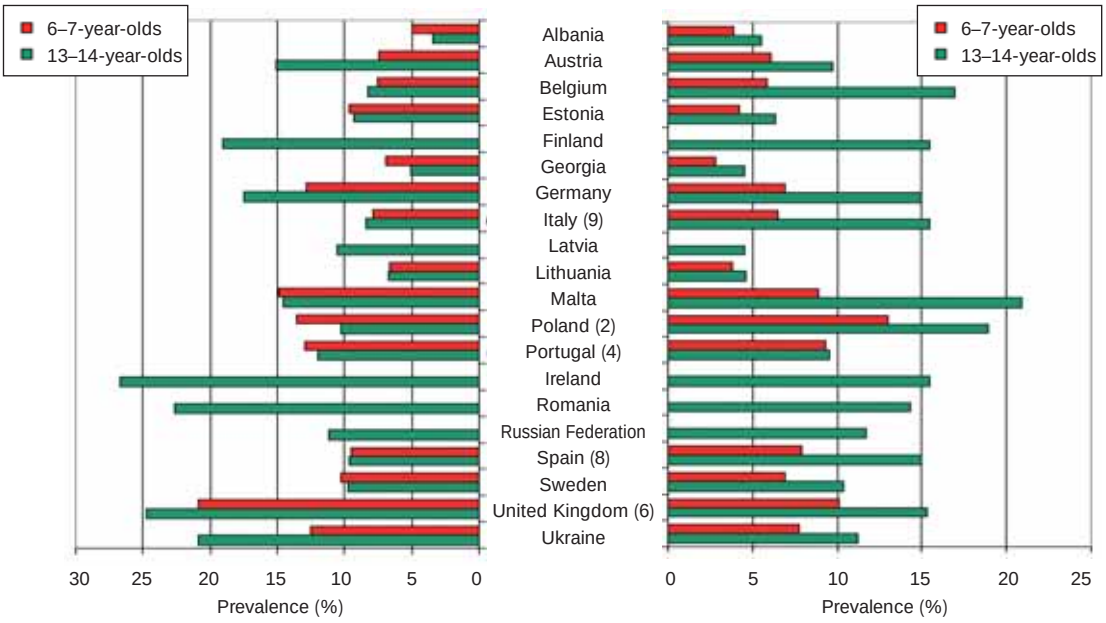
In 1999–2004, asthma prevalence in children across the European study centres varied from less than 5% to over 20%. Policies that promote early identification of the disease, ensure adequate treatment and, in particular, improve air quality, help to reduce this burden.

RATIONALE

Prevalence of asthma and allergies among children has become an increasing problem in the last few decades. Asthma has become the most common chronic disease among children and is one of the major causes of hospitalization among those younger than 15 years of age *(2)*. As more people are sensitized to allergens, allergic diseases may increase in Europe in the coming years.

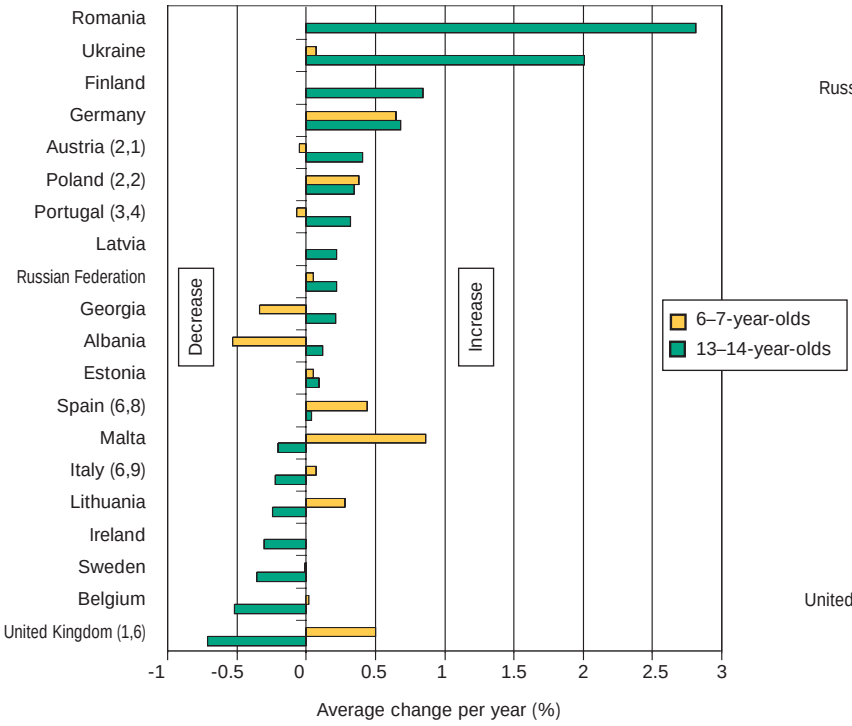
Fig. 1. Prevalence of asthma symptoms in children aged 6–7 years and 13–14 years, ISAAC Phase Three, 1999–2004

Fig. 2. Prevalence of allergic rhinoconjunctivitis symptoms in children aged 6–7 years and 13–14 years, ISAAC Phase Three, 1999–2004



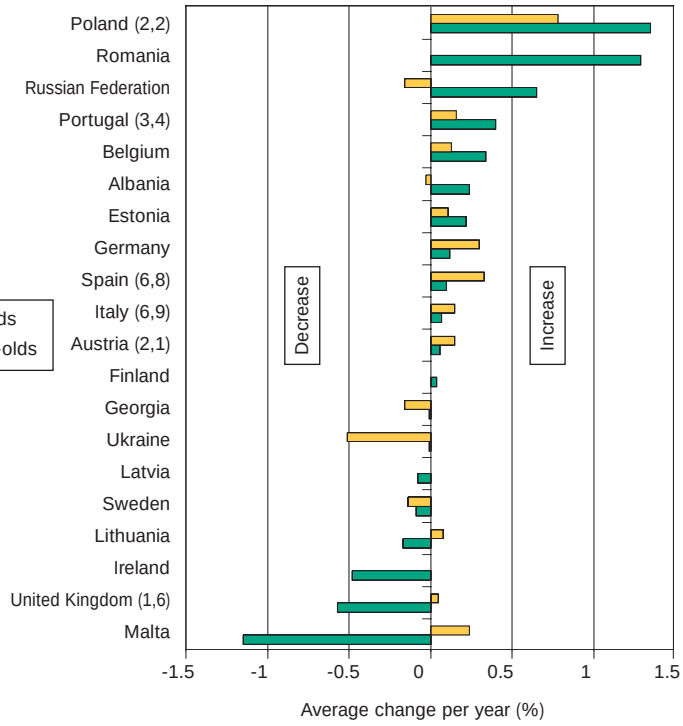
Note. As the data were collected from specific centres only, prevalence figures are not country-representative. When data were collected from more than one centre, the number of centres is given in brackets.

Fig. 3. Annual change in prevalence of asthma in children between ISAAC Phase One (1992–1998) and Phase Three (1999–2004)



Note. The numbers of centres in countries for children aged 6–7 years and 13–14 years are given in brackets. Where there is no number, the data were collected from one centre.

Fig. 4. Annual change in prevalence of allergic rhinoconjunctivitis in children between ISAAC Phase One (1992–1998) and Phase Three (1999–2004)



Note. The numbers of centres in countries for children aged 6–7 years and 13–14 years are given in brackets. Where there is no number, the data were collected from one centre.

PRESENTATION OF DATA

The data in Figures 1–4 are not indicative of prevalence in all European countries as only selected centres (represented by cities/regions) participated in the study. Thus, the intra-country comparison shows the differences between the centres. The highest prevalences of asthma symptoms in children aged 6–7 years (>20%) and 13–14 years (>25%) were found in Ireland and the United Kingdom. The lowest asthma rates for both age groups were found in Albania (<5%). Allergic rhinoconjunctivitis symptoms were reported by children aged 13–14 years most frequently in Malta (>20%).

Among children aged 13–14 years, the greatest increases in prevalence between ISAAC Phase One (1992–1998) and Phase Three (1999–2004) were found in Romania and Ukraine for asthma, and Poland, Romania and the Russia Federation for rhinoconjunctivitis. The prevalence of asthma and rhinoconjunctivitis fell in Ireland, Malta and the United Kingdom.

Where countries have multiple study centres, the average prevalence is given. Table 1 shows centre-specific prevalence.

HEALTH – ENVIRONMENT CONTEXT

It is estimated that 20% of the world population suffer from allergic diseases *(3)*. Recent reviews suggest that the prevalence of allergic diseases is increasing throughout Europe and is no longer restricted to specific seasons or environments *(2,4)*. Asthma is an inflammatory disorder of the bronchial airways produced by allergies, viral respiratory infections and airborne irritants, while genetic factors predispose to develop asthma *(2)*. Allergic rhinoconjunctivitis is characterized by sneezing, nasal congestion and itching of the nose, eyes or throat. As with other allergic disorders, this is due to an exaggerated response of the body's immune system when exposed to specific non-infectious particles.

In the development of both asthma and allergic rhinoconjunctivitis, there is a complex interaction of genetic and environmental factors. A possible explanation is the "hygiene hypothesis". This suggests that increased hygiene and the resulting lack of exposure to various microorganisms in early life affect the immune system so that individuals' ability to fight off certain diseases is weakened and they are more susceptible to autoimmune diseases *(5)*.

Good management of asthma can control the disorder and enable people to enjoy a high quality of life. Early diagnosis and appropriate treatment lead to much better disease control and outcomes. Allergy can be progressive, and neglecting its symptoms may lead to a worsening of the disease. Medication is not the only way to control asthma and allergies. It is also important to avoid triggers that irritate and inflame the airways. Primary prevention to reduce the level of exposure to common risk factors, particularly tobacco smoke, frequent lower respiratory infections during childhood and air pollution (indoor and outdoor), is an important step.

Poor outdoor air quality, exposure to indoor allergens and a stressful lifestyle have been connected with the prevalence of asthma and allergic rhinoconjunctivitis *(6)*. An increasing trend in the prevalence of asthma and allergies is particularly apparent in urban areas, where children have been found to have more allergic reactions to outdoor and indoor allergens *(7)*. The use of fossil fuels as well as higher volumes of road traffic in cities are thought to contribute to this *(8,9)*. Recent evidence supports a causal relationship between exposure to air pollution and exacerbation of asthma, mainly due to exposure to particulate matter (PM) and ozone *(9)*. There is little evidence, however, to support a causal association between the prevalence or incidence of asthma and air pollution in general. The incidence of allergic symptoms in children is associated with exposure to allergens in indoor environments with poor air quality *(10)*. This includes biomass combustion products, high humidity

Table 1. Range of prevalence between centres in countries with more than one ISAAC centre

Country	Asthma symptoms Phase Three: range between centres		Allergic rhinoconjunctivitis symptoms: range between centres	
	6–7-year-olds	13–14-year-olds	6–7-year-olds	13–14-year-olds
Italy	5.4 – 9.7	4.1 – 11.4	6.2 – 7.1	9.3 – 22.2
Poland	12.5 – 14.5	9.4 – 11.2	11.1 – 14.5	18.4 – 19.3
Portugal	–	9 – 14.6	–	7.1 – 10.5
Spain	7.1 – 12.4	7.1 – 13.7	6.6 – 11.1	10.5 – 18.7
United Kingdom	10.2 – 20.9	9.7 – 27.8	6.9 – 10.1	10.4 – 17.6

and moulds, dust mites, pets and environmental tobacco smoke (ETS) *(1)*. Children who are more frequently exposed to poor indoor air may be at greater risk of being affected by outdoor pollutants. Exposure to ETS can cause new cases of asthma in children who have not previously shown symptoms. Additionally, in asthmatic individuals it can trigger asthma attacks and make asthma symptoms more severe *(11)*.

Additionally, there seems to be a parallel development between climate change and the increasing prevalence of asthma and allergies in children. As warmer temperatures and early spring are related to increased airborne pollen, sensitization to pollen allergens is likely to have doubled during the last three decades, particularly in young people in many areas in Europe *(12)*.

POLICY RELEVANCE AND CONTEXT

The failure to diagnosis asthma and allergic diseases leads to inadequate disease control and, consequently, higher treatment costs. In the management of asthma and allergies it is, therefore, important to raise the population's awareness of the disease, the best management strategies and the importance of risk factors and behaviour in the prognosis. Many studies have shown that asthma is under-diagnosed, which often leads to delayed treatment *(2)*. As environmental conditions contribute to asthma and allergies, the use of medication is not the only way to reduce the burden: policies that improve indoor and outdoor air quality are likely to have positive effects. Many countries also have web pages informing the public about proper preventive behaviour, such as avoiding house-dust allergens by using mattress covers or not keeping pets.

The Global Alliance against Chronic Respiratory Diseases (GARD), a voluntary alliance of internationally recognized organizations and institutions, is part of WHO's activities to prevent and control asthma and allergic conditions. GARD includes the Global Initiative for Asthma (GINA), which was formed in 1992 by WHO and the National Heart, Lung and Blood Institute in the United States. It also includes the Global Initiative on Allergic Rhinitis and its impact on Asthma (ARIA), in which WHO is a participant. The WHO Practical Approach to Lung Health (PAL), a strategy designed to help primary health care workers improve their management of respiratory symptoms, is used in GARD's implementation strategy *(2)*. World Asthma Day is an annual event organized by GINA to improve asthma awareness and care around the world. The Prevention of Allergy and Allergic Asthma Project is an outcome of the joint meeting between WHO and the World Allergy Organization *(3)*. This approach focuses mainly on different preventive measures for allergy and allergic asthma.

In 2004, the Fourth Ministerial Conference on Environment and Health adopted the Children's Health and Environment Action Plan for Europe, which includes four regional priority goals to reduce the burden of environment-related diseases in children *(13)*. One of the goals (RPG III) aims to prevent and reduce respiratory diseases due to outdoor and indoor air pollution, thereby contributing to a reduction in the frequency of asthmatic attacks, and to ensure that children can live in an environment with clean air.

As asthma is a reducible and preventable disease, the European Community action plan in the field of Public Health (2003–2008) aims to evaluate the impact of possible health policy interventions on its prevalence *(14)*.

ASSESSMENT

Globally, the prevalence of asthma and allergies has increased over the last few decades. However, the ISAAC study, which focused on children, showed wide variations in the prevalence of symptoms of asthma, allergic rhinoconjunctivitis and eczema. In general, the study found the highest asthma prevalence in English-speaking developed countries (Australia, Ireland, New Zealand, the United Kingdom and the United States). Differences between countries may be due to factors such as lifestyle, dietary habits, socioeconomic differences and environmental or climate factors *(7,15)*. Additionally, awareness of the disease can affect its prevalence and severity in a population *(15)*.

In the European Region, the countries with the highest prevalence of asthma and symptoms of allergy include Finland, Germany, Ireland, the United Kingdom and, recently, Romania. A lower asthma prevalence was found in Albania, Belgium, Estonia, Georgia, Italy, Lithuania, Spain and Sweden. In some countries with multiple study centres, variations in prevalence were seen in ISAAC Phase Three, particularly in Italy. Poland reported a high rate of allergic rhinoconjunctivitis symptoms but low asthma rates. This suggests that the prevalence rates of asthma may depend on awareness of asthma in the population studied *(16)*.

Overall, the correlation between the prevalence of the two symptoms was high (between 0.47 in the oldest children in Phase Three and 0.80 in the youngest in Phase One), as was the correlation between the changes in those rates (0.47–0.51).

The high prevalence of asthma symptoms is not, however, necessarily connected with increased rates of other allergic symptoms surveyed. This may be due to the different risk factors for these interrelated yet distinct disorders or to a time shift in the onset of the symptoms.

The intercountry differences observed are also likely to have been partly influenced by the validity of the written questionnaires in a variety of cultures and languages *(7)*.

The greatest year-on-year increase in asthma symptoms was seen in 13–14-year-olds in Romania and Ukraine, although considerable increases were also evident in Finland and Germany. In the countries with a high prevalence in 1992–1998 (Ireland, Sweden and the United Kingdom), a decreased prevalence was seen in 1999–2004 in 13–14-year-olds but not in 6–7-year-olds.

DATA UNDERLYING THE INDICATOR

Data source

ISAAC Phase One (1992–1998) and Phase Three (1999–2004) *(1)*.

Asher et al *(15)*.

Method of calculating the indicator

The data were taken from the publication by Asher et al *(15)*. Asthma symptoms were established by the question "Have you had wheezing or whistling in the chest in the past 12 months?" Current allergic rhinoconjunctivitis symptoms were estimated on the basis of positive answers to both questions: "In the past 12 months, have you (has your child) had a problem with sneezing or a runny or blocked nose when you (he/she) did not have a cold or the flu?" and, if yes, "In the past 12 months, has this nose problem been accompanied by itchy watery eyes?"

Country prevalence data are calculated as the centres' average.

ISAAC Phases One and Three are repeated multi-country cross-sectional surveys. Two age groups were investigated by standardized ques-

tionnaires: children aged 6–7 years (reporting by parents) and 13–14 years (self-reporting).

Geographical coverage
In the European Region the following countries were covered by ISAAC: Albania, Austria, Belgium, Estonia, Finland, France, Georgia, Germany, Greece, Italy, Latvia, Malta, Poland, Portugal, Ireland, Romania, Russian Federation, Spain, Sweden, United Kingdom, Uzbekistan. ISAAC Phase One and Three cover 66 centres in 37 countries for children aged 6–7 years and 106 centres in 56 countries for children aged 13–14 years.

Period of coverage
Data stem from ISAAC Phase One conducted in 1992–1998 (mainly in 1994–1995) and Phase Three, conducted in 1999–2004 (mainly in 2002–2003).

Frequency of update
Not determined.

Data quality
The data presented in the graph are not country-representative, as only certain centres were involved in the study (mainly the urban ones). According to the ISAAC protocol, each research centre should recruit a random sample of 3000 children aged 13–14 years through school class registers. A minimum of 10 schools (or all the schools) per centre were needed to obtain a representative sample. If a selected school refused to participate, it was replaced by another chosen at random. Case definitions and severity were established by asking about symptoms, not by reference to labels or diagnoses (although these have been recorded). Each centre could optionally recruit an additional sample of 3000 children aged 6–7 years. A participation rate of at least 90% was sought.

References

1. *ISAAC [web site]. International Study of Asthma and Allergies in childhood (http://isaac.auckland.ac.nz/, accessed 9 March 2007).*
2. *Asthma. Geneva, World Health Organization, 2006 (Fact sheet No. 307) (http://www.who.int/mediacentre/factsheets/fs307/en/index.html, accessed 7 March 2007).*
3. *Prevention of Allergy and Allergic Asthma. Geneva, World Health Organization, 2003 (http://www.worldallergy.org/professional/who_paa2003.pdf, accessed 7 March 2007).*
4. *Green RJ. Inflammatory airway disease. Current Allergy and Clinical Immunology, 2003, 16:181.*
5. *Ullrich D. Hygiene hypothesis: are we too "clean" for our own good? Milwaukee, WI, Medical College of Wisconsin, 2004 (http://healthlink.mcw.edu/article/1031002421.html, accessed 12 March 2007).*
6. *Marshall GD. Internal and external environmental influences in allergic diseases. Journal of the American Osteopathic Association, 2004, 104(Suppl 5):S1–6.*
7. *ISAAC Steering Committee. Worldwide variation in prevalence of symptoms of asthma, allergic rhinoconjunctivitis and atopic eczema: ISAAC. Lancet, 1998, 351:1225–1232.*
8. *Nicolau N, Siddique N, Custovic A. Allergic disease in urban and rural populations: increasing prevalence with increasing urbanization. Allergy, 2005, 60:1357–1360.*
9. *WHO European Centre for Environment and Health. Effects of air pollution on children's health and development - a review of the evidence. Copenhagen, WHO Regional Office for Europe, 2005 (http://www.euro.who.int/document/E86575.pdf, accessed 6 March 2007).*
10. *Bibi H et al. Comparison of positive allergy skin tests among asthmatic children from rural and urban areas living within small geographic area. Annals of Allergy, Asthma and Immunology, 2002, 88:416–420.*
11. *Fact sheet: National survey on Environmental Management of Asthma and Children's Exposure to Environmental Tobacco Smoke. Washington, DC, United States Environmental Protection Agency, 2005 (http://www.epa.gov/smokefree/pdfs/survey_fact_sheet.pdf, accessed 7 March 2007).*
12. *Environmental hazards trigger childhood allergic disorders. Copenhagen, WHO Regional Office for Europe, 2003 (Fact sheet EURO/01/03) (http://www.euro.who.int/document/mediacentre/fswhde.pdf, accessed 7 March 2007).*
13. *Children's Environment and Health Action Plan for Europe. Fourth Ministerial Conference on Environment and Health, Budapest, 23–25 June 2004 (EUR/04/5046267/7) (http://www.euro.who.int/document/e83338.pdf, accessed 2 March 2007).*
14. *Asthma. Brussels, Commission of the European Communities, Public Health Programme (2003–2008) (http://ec.europa.eu/health/ph_information/dissemination/diseases/asthma_en.htm, accessed 7 March 2007).*
15. *Asher MI et al. Worldwide time trends in the prevalence of symptoms of asthma, allergic rhinoconjunctivitis, and eczema in childhood: ISAAC Phase One and Three repeat multicountry cross-sectional surveys. Lancet, 2006, 368:733–743.*
16. *erg A et al. The effect of hydrolyzed cow's milk formula for allergy prevention in the first year of life: The German Infant Nutritional Intervention Study, a randomized double-blind trial. Journal of Allergy and Clinical Immunology, 2003, 111:533–540.*

Further information

World Allergy Organization [web site]. Milwaukee, WI, World Allergy Organization, 2007 (http://www.worldallergy.org/, accessed 7 March 2007).

Environmental Hazards and Health Effects Program. Asthma's impact on children and adolescents. Atlanta, GA, Centers for Disease Control and Prevention, (http://www.cdc.gov/asthma/children.htm, accessed 7 March 2007).

A plea to abandon asthma as a disease concept. Lancet, 2006, 368:705.

Eder W et al. The asthma epidemic. The New England Journal of Medicine, 2006, 355:2226–2235 (http://content.nejm.org/cgi/content/full/355/21/2226, accessed 7 March 2007).

WHO European Centre for Environment and Health. Exposure of children to environmental tobacco smoke. Copenhagen, WHO Regional Office for Europe, 2007 (ENHIS-2 fact sheet No. 3.4).

WHO European Centre for Environment and Health. Children living in homes with problems of damp. Copenhagen, WHO Regional Office for Europe, 2007 (ENHIS-2 fact sheet No. 3.5).

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