

Household Costs Associated with Objectively Diagnosed Allergy to Staple Foods in Children and Adolescents

Jennifer L.P. Protudjer, PhD^{a,b,c,*}, Sven-Arne Jansson, PhD^{a,d,*}, Marianne Heibert Arnlin, PhD^{e,f}, Ulf Bengtsson, MD, PhD^g, Ingrid Kallström-Bengtsson, BSc^h, Birgitta Marklund, PhD, MSocSc, RNMTⁱ, Roelinde Middelveld, PhD^{a,c}, Georgios Rentzos, MD^g, Ann-Charlotte Sundqvist, RN^j, Johanna Åkerström, RD^g, Eva Östblom, MD, PhD^{i,k}, Sven-Erik Dahlén, MD, PhD^{a,c}, and Staffan Ahlstedt, PhD^a Stockholm, Umeå, Gothenburg, and Kalmar, Sweden

What is already known about this topic? Amongst children and adolescents, parent-reported allergies to a wide variety of foods are associated with substantial household costs, including out-of-pocket costs and lost opportunity costs.

What does this article add to our knowledge? Total annual costs are higher for households with a child or adolescent with an objectively diagnosed allergy to staple foods compared with controls. Amongst children only, overall direct and indirect costs are also higher. Intangible costs are adversely affected for both age groups.

How does this study impact current management guidelines? As the drivers of various household costs have different impacts on children and on adolescents, discussions on the impacts of objectively diagnosed allergy to staple foods should be age group-specific.

BACKGROUND: We previously reported that indirect and intangible costs burden households with a food allergic adult. We now extend our investigation to households with food allergic children and adolescents.

OBJECTIVE: The objective of this study was to estimate direct, indirect, and intangible costs of food allergy in households with a child and/or adolescent with objectively diagnosed allergy to staple foods (cow's milk, hen's egg, and/or wheat), and to compare these costs with age- and sex-matched controls.

METHODS: Direct and indirect cost parent-reported data collected via the Food Allergy Socio-Economic Questionnaire of 84 children (0-12 years) and 60 adolescents (13-17 years) with objectively diagnosed allergy to staple foods ("cases") and age- and sex-matched controls (n = 94 children; n = 56 adolescents) were compared. Annual household costs were calculated. Total

household costs included direct plus indirect costs. Intangible costs included parent-reported health of their child and/or adolescent, standard of living, and perceptions of well-being. **RESULTS:** Amongst cases, total household costs were higher by €3961 for children and €4792 for adolescents versus controls ($P < .05$), and were driven by direct (eg, medications) and indirect (eg, time with health care professionals) costs. For children only, a history of anaphylaxis was associated with higher direct costs than no anaphylaxis (€13,016 vs €10,044, $P < .05$). Intangible costs (eg, parent-reported health of a child and/or adolescent) were significantly impacted amongst cases versus controls ($P < .01$). **CONCLUSION:** Households with a child and/or adolescent with objectively diagnosed allergy to staple foods have higher total household costs than controls. Direct and indirect costs were significantly higher for cases versus controls amongst

^aThe Centre for Allergy Research, Karolinska Institutet, Stockholm, Sweden

^bDepartment of Medical Epidemiology and Biostatistics, Karolinska Institutet, Stockholm, Sweden

^cThe Institute of Environmental Medicine, Karolinska Institutet, Stockholm, Sweden

^dDepartment of Public Health and Clinical Medicine, Umeå University, Umeå, Sweden

^eSwedish Council on Health Technology Assessment, SBU, Stockholm, Sweden

^fDepartment of Learning, Informatics, Management and Ethics, and Medical Management Centre, Karolinska Institutet, Stockholm, Sweden

^gAllergy Unit, Sahlgrenska University Hospital, Gothenburg, Sweden

^hThe Swedish Asthma and Allergy Foundation, Stockholm, Sweden

ⁱDepartment of Health and Caring Sciences, Linnaeus University, Kalmar, Sweden

^jSachs' Children and Youth Hospital, Södersjukhuset, Stockholm, Sweden

^kDepartment of Clinical Research and Education Södersjukhuset, Karolinska Institutet, Stockholm, Sweden

* Shared first authorship.

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Corresponding author: Staffan Ahlstedt, PhD, Centre for Allergy Research, Karolinska Institutet, Stockholm, Sweden. E-mail: staffan.ahlstedt@ki.se. 2213-2198

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Abbreviations used

AAI-Adrenaline autoinjector
EQ-5D-EuroQol Health Questionnaire, 5 Dimensions
FA-EcoQ-Food Allergy Socio-Economic Questionnaire
HRQL-Health-related quality of life
IgE-Immunoglobulin E
95% CI-95th percent confidence interval

children only. Amongst both age groups, such allergy adversely impacted intangible costs. © 2015 The Authors. Published by Elsevier Inc. on behalf of the American Academy of Allergy, Asthma & Immunology. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/3.0/>) (J Allergy Clin Immunol Pract 2015;3:68-75)

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Direct, indirect, and intangible health care costs are likely higher amongst households with children and adolescents who have food allergy compared with control households. Societal direct and indirect costs related to pediatric food allergy have been estimated to be nearly 25 billion dollars in the United States,¹ thereby placing considerable demand on health care resources. In Europe, these costs have not yet been estimated. Although the prevalence of food allergy amongst children and adults appears to be similar,² these costs for society are disproportionately higher in childhood than adulthood.³ For households, food allergy-related costs are also highest in the first year after diagnosis⁴ and amongst those less than 4 years of age.³ Children with food allergies have higher costs related to office visits and outpatient department visits than adults.³ Others have shown that heightened parental anxiety regarding their child's food allergies⁵ and poor health-related quality of life (HRQL)⁵ may contribute to these higher costs in food allergic children. However, much research in this field has focused on children and adolescents as a single group,^{3,4} or was restricted only to children,⁶ despite suggestions that the two age groups will likely behave differently due to their developmental stages.⁵

Previous reports on food allergy-associated costs are separated into direct and indirect costs,^{1,3} and include socioeconomic costs and lost time and productivity, respectively. Intangible costs, which include health status (including HRQL), standard of living, and perceptions of well-being, also warrant consideration.⁷ Although difficult to assess monetarily, these costs are estimated to be high.^{7,8}

On the basis of an algorithm to estimate costs of immunoglobulin E (IgE)-mediated food allergy to society,⁷ we recently identified that the total annual costs for households with one food allergic adult were €8164 higher than those for age- and sex-matched controls.⁸ Notably, the driving factor was indirect, rather than direct, costs. Intangible costs were also higher in households with one food allergic adult, compared with controls.⁸ We now extend this work to households with children and adolescents. The objective of this study was to estimate the direct, indirect, and intangible costs of food allergy in households with a child or adolescent with objectively diagnosed allergy to the staple foods such as cow's milk, hen's egg, and/or wheat, and to compare these costs with age- and sex-matched controls.

METHODS

Study design and participants

This study involved outpatients from the allergy clinic at Sachs' Children and Youth Hospital, Södersjukhuset, in Stockholm, Sweden, with a specialist's diagnosis of allergy to the staple foods such as cow's milk, hen's egg, and/or wheat. These staple foods were selected as they are difficult to avoid in a typical Swedish diet. Participants were identified from medical records and recruited in 2010-2012 by a pediatric nurse who specialized in allergy. Inclusion criteria were a convincing history of allergy to at least one staple food ascertained either by a positive food challenge with evident symptoms, or by food-specific IgE antibody levels associated with a 95% probability for food allergy in a double-blind placebo-controlled food challenge and a convincing history of allergy to the same food.⁹ Most cases also had parent-perceived and/or doctor-diagnosed allergies to foods other than these staple foods. Participants were excluded if they had an unclear food allergy diagnosis, coeliac disease, diabetes, or a malignancy, or did not understand Swedish. Parents of cases responded to questions about whether their child had experienced "difficulty breathing," and/or "inability to stand," and/or "collapse" and/or "loss of consciousness" as a result of food allergy. Such symptoms were used to define anaphylaxis in our study population, as these symptoms align with the current criteria for anaphylaxis.^{10,11} Information on concomitant allergic disorders (asthma, allergic rhinitis, allergic conjunctivitis, eczema) was obtained for both cases and controls. In total, households of 133 children (0-12 years) and 86 adolescents (13-17 years) who fulfilled the criteria were sent the Food Allergy Socio-Economic Questionnaire (FA-EcoQ; described in detail below), of which 144 (65.5%) were included after 2 reminders (Figure 1). Both cases and controls received 2 movie passes on the return of completed questionnaires.

A convenience sample of 226 age- and sex-matched children and adolescents whose parents reported no allergy to cow's milk, hen's egg, and/or wheat in the household were recruited from the same geographical area via advertisements on websites, notice boards, and e-mailing lists. This strategy was applied for convenience of recruitment, and paralleled that used to recruit controls for our study of household costs of objectively diagnosed allergy to staple foods in adults.⁸ Exclusion criteria for controls paralleled those of cases. The age-matching was done in 2-year intervals, so that the controls were born in the same year plus/minus 1 year as the cases. A total of 150 control families (66.4%) were included (Figure 1).

Eighty-four children (58.8% boys; mean age 6 years) and 60 adolescents (69.0% boys; mean age 14 years) served as cases. Ninety-four children (57.4% boys; mean age 7 years) and 56 adolescents (66.1% boys; mean age 15 years) served as controls. There were no statistically significant differences in mean household income between cases and controls for either age group.

Questionnaires

The FA-EcoQ parent version was used to collect data for this study. First, this validated questionnaire, developed by the European Union's project, "The Prevalence, Cost and Basis of Food Allergy across Europe" (EuroPrevall),¹² was translated into Swedish as per World Health Organization guidelines¹³ and piloted to ascertain comprehension. From this, we were able to capture total household, direct, indirect, and intangible costs (defined below). To facilitate integration with the existing

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