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The Finnish Allergy Program 2008-2018: Society-wide proactive program for change of management to mitigate allergy burden

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A 10-year national program to improve prevention and management of allergic diseases and asthma was implemented in Finland (population 5.5. million) in 2008-2018. The main aim was to reduce the long-term burden of these conditions. The strategy was changed from traditional avoidance to tolerance and resilience of the population. Health was endorsed instead of medicalization of mild symptoms. Disease severity was reevaluated, and disabling clinical manifestations were given high priority. For health care, 5 quantitative goals and 1 qualitative goal were set. For each of the goals, specific tasks, tools, and outcome evaluation were stipulated. During the program, 376 educational sessions gathered 24,000 health care participants. An information campaign targeted the lay public, and social media was used to contact people. In the 10 years of the program, the prevalence of allergic diseases and asthma leveled off. Asthma caused fewer symptoms and less disability, and 50% fewer hospital days. Food allergy diets in day care and schools decreased by half. Occupational allergies were reduced by 45%. In 2018, the direct and indirect costs of allergic diseases and asthma ranged from €1.5 billion to €1.8 billion, with the 2018 figures being 30% less than in the respective figures in 2007. The Finnish proactive and real-world intervention markedly reduced the public health burden of allergic disorders. The allergy paradigm was revisited to improve management with systematic education. (J Allergy Clin Immunol 2021;148:319-26.)

Key words: *Allergen avoidance, allergy prevention, allergy program, asthma program, tolerance*

Allergy is a systemic, immunologic, and heterogenous disorder, with variable organ manifestations that change during the life span. They cause a fair amount of disability and costs both for individuals and for society. There are no reports of coordinated action plans to combat allergic conditions in a defined population. In Finland (population 5.5 million), several successful national public health programs to control respiratory diseases have been completed.[1] The Finnish Asthma Program 1994-2004 was successful and deployed in many countries.[2] The latest action plan, the Finnish Allergy Program 2008-2018, was initiated to further reduce the burden on individuals and society by emphasizing prevention.

The Finnish Allergy Program was based on an extensive review[3] of the new knowledge regarding immune regulation and the importance of nature relatedness.[4-7] The main aim was to transform the strategy from avoidance to tolerance and resilience. It focused on allergy health (ie, having a good life despite

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Abbreviation used
NGO: Nongovernmental organization

allergies). Reducing unnecessary treatments and measures was important, especially in children and families. Severe allergy and asthma were given attention. Goals for health care, such as standardizing diagnostics,[8] halving the prevalence of food allergy diets, and reducing the total costs of allergic diseases and asthma by 20%, were set.

The program has now been completed, and it represents a successful change management initiative at the country level. In this review, we present the program's main outcomes and discuss the possibilities of scaling up the experience for other countries and extending it into the future.

SENSE OF URGENCY

In Finland and globally, the incidence of asthma and allergic diseases has been increasing for decades.[9,10] Currently, 30%-40% of Finnish schoolchildren and young adults appear to be sensitized to 1 or more common allergens.[11] The problem was already discernible in the 1980s, when the first allergy management guideline in Finland was published,[12] and also in 1998, when a consensus report was prepared.[13] The numbers of patients with allergy and asthma grew in the 1990s, and neither children nor adults received satisfactory allergy care. The 10-year Finnish Asthma Program was based on new information on asthma, primarily as an inflammatory disease.[14] In a relatively short period, management was improved and costs were reduced by better early diagnostics and by turning from β_2-agonists to inhaled corticosteroids as the first-line medications.[15,16] But the main problem of how to prevent asthma and allergic diseases in the first place remained.

At the population level, avoidance and fear of all exposure leads to (1) an increased need for treatment, (2) social consequences such as isolation and impairment of daily living, and (3) even serious allergic reactions if exposure (eg, to foods) occurs unexpectedly. Avoidance of allergens is always important for individual patients, especially in cases of severe food allergy, but it requires justified grounds and better-defined time limits. Concern and medicalization became visible as new allergy day care centers, allergy schools, and allergen-free working environments were demanded. At the same time, large trials indicated that the avoidance of allergens to prevent clinical symptoms may not be feasible in the long term.[3] Psychosocial factors should also be addressed, as they play an important role in patient decisions and adherence to treatment. Tolerance and resilience are immunologic, psychological, and societal.[17]

The allergy paradigm was revisited, and loss of immune balance was regarded as more important than any possible new risk factor. At the population level, endorsing tolerance, especially in children, adolescents, and families, was regarded as central.[18] A major change of attitude was needed among health professionals, patients, and the lay public.

To be effective at a public health level, a program needs to change management and have a societal impact. In this review, the program is presented according to the classical change management model of Kotter,[19] as an example for many other noncommunicable diseases. Allergic diseases are a model of a life course approach, as they often start at birth and usually persist throughout life.

TABLE I. Key messages of the Finnish Allergy Program 2008-2018

- Endorse health, not allergy
- Strengthen tolerance
- Adopt a new attitude to allergy, and avoid allergens only if mandatory
- Recognize and treat severe allergies early, and prevent exacerbations
- Improve air quality, and stop smoking

PROGRAM PLANNING

Vision

A 10-year program was planned, implemented, and monitored to change the management strategy at the national level to care pathways centered around the patient. Health professionals needed help to adapt new ideas and improve the provision of care, patients needed to be involved for shared decision making, and the lay public needed to be informed. This was achieved in close collaboration with policymakers (the Finnish Institute for Health and Welfare) to provide a new national strategy and create grounds for future initiatives.

Background

Allergy management is split into several specialities in the medical discipline. The position of allergology as a main speciality, subspeciality, or additional training courses varies from one country to another. In most countries, a coordinated public health approach to management of allergies is lacking. Are specialists providing support for general practitioners and for those working at the grassroots level? Do private sector and public health professionals have the same goal? Overall, allergy services seem widely inadequate.[20] Finland was no exception, with cooperation being problematic both between primary and secondary care and between different specialities. However, Finland's small population with a relatively high level of education and well-organized public health care established a population management model and took steps from treatment to prevention.

Organizing the program

After a consensus meeting involving clinicians with different specialities, epidemiologists, nutritionists, immunologists, patients, citizens, and health officials, a group of experts prepared the 10-year program, which was launched in April 2008 (see Fig E1 in this article's Online Repository at www.jacionline.org).[21,22] The coalition continued as a program steering group. The organization was kept simple and without hierarchies. Strategies were chosen, and goals were set.

The key messages targeted all citizens (Table I). For health professionals, 6 goals (5 of which were quantitative) and indicators were tailored (Table II). Each goal had its specific tasks, tools, and evaluation methods. The tasks were the activities or the targets in pursuing the goal (what to do), and the tools were those used to perform the tasks (how to do it). The outcomes were evaluated and verified. The program linked allergy not only with clinical disease but also with allergy health. Mild symptoms, especially in childhood, were regarded as a normal immune

TABLE II. Main goals and key results of the Finnish Allergy Program 2008-2018

Finnish Allergy Program goals	Program outcomes	Potential impact on planetary health
1. Prevent allergy Indicator: asthma, rhinitis, and atopic eczema prevalence reduced by 20%	Prevalence of allergic rhinitis and asthma leveled off and symptoms decreased	Changes in environment and lifestyle are primary causes of allergic diseases, asthma, and other NCDs. They are largely prevented by nature relatedness, active mobility, and sustainable diet, which have large planetary impacts
2. Improve tolerance/resilience Indicator: prevalence of food allergy diets reduced by 50% - Strengthen immunity by increasing contact with natural environments and by following healthy diets (eg, the traditional Mediterranean or Baltic diet) - Use antibiotics only out of necessity	Prevalence of food allergy diets in day care decreased by 43%-65% In Finland, new recommendations regarding healthy diets for families and children were launched in 2019 Contact with nature has been improved (eg, in day care by adopting the concept of Nature Step)	The biodiversity hypothesis of health should be applied in everyday life - Turn cities green - Conserve and regenerate nature - Use healthy food and sustainable food production for human and planetary health - Protect populations from epidemics of infection (antibiotic resistance)
3. Improve allergy diagnostics Indicator: allergy testing practiced in certified testing centers	All major allergy diagnostic centers have been educated, certified, and audited	Quality control improves patient care, saves societal resources, and reduces the planetary impact on health care
4. Reduce work-related allergies Indicator: incidence of occupational allergies reduced by 50%	Incidence of occupational allergies was reduced by 45%	Better control of working conditions saves lives, affects quality of life, and increases productivity. It also has a major impact on planetary health
5. Focus on severe forms of disease and treat them early Indicator: asthma-related emergency department visits reduced by 40%	During the program, asthma-related emergency department visits decreased by 6% (by 53% in children), and 35% in the 2000s. Hospital days decreased by 50%, and by 73% in the 2000s.	Fewer hospitalizations and medications save societal resources and reduce carbon footprint of health care, with planetary impact
6. Reduce allergy and asthma costs Indicator: Allergy costs reduced by 20%	Health care and disability costs decreased by 30% (€200 million) in 2018 compared with in 2007	Enormous potential for global savings resulting from prevention and better care of individuals with NCDs

NCD, Noncommunicable disease.
The program's measures are reflected in Planetary Health to illustrate the potential of systematic changes in health care.

development and not as a reason for special guidance or intervention.[18]

In 2008, the relevance and acceptance of the key messages were tested among 744 health professionals via e-mail (response rate 71%). General practitioners scored "strengthen tolerance" at 9.1 on a scale of 4 to 10.[23] Allergy practice left much room for improvement (eg, the availability of allergen immunotherapy was poor [score 5.4]).

COMMUNICATING THE CHANGE OF VISION

The program was implemented through educational and information campaigns that had 2 targets: (1) health professionals and (2) patients, families, and the lay public. In Finland, as in all Nordic countries, the health sector is mainly publicly funded[24] (see The Finnish Health Care System section in this article's Online Repository at www.jacionline.org). The private sector is smaller than the public sector and complements the latter, especially in larger cities.

The Finnish Lung Health Association, a nongovernmental organization (NGO) for professionals, was responsible for the education of health care providers (see Table E1 in this article's Online Repository at www.jacionline.org). To improve allergen tolerance, simple guidance was provided (see Table E2 in this article's Online Repository at www.jacionline.org). In 11 years, approximately 24,000 participants from across the country gathered in 376 educational sessions.

Two patient NGOs, the Allergy, Skin and Asthma Federation and the Organization of Respiratory Health, with about 60,000 members carried out the information campaign, which targeted patients, risk groups, and the lay public from 2011 to 2015 (see Table E1).

MEASURING HEALTH OUTCOMES

For outcome evaluation, the Finnish health care registers provided invaluable data sources, especially the hospital admission register of the Institute for Health and Welfare and the drug reimbursement register of the Social Insurance Institute. For work-related diseases, verified cases are registered by the Finnish Institute of Occupational Health. For outcome evaluation, the baseline period was 2000 to 2010, depending on the survey, source, and method.

The Finnish Anaphylaxis Register was established in 2000 at the Helsinki University Central Hospital.[25] Physicians (mostly allergists) from across the whole country voluntarily report cases of severe allergic reactions and causative agents, if identified. A 1-page questionnaire for medical professionals is available on the Internet.

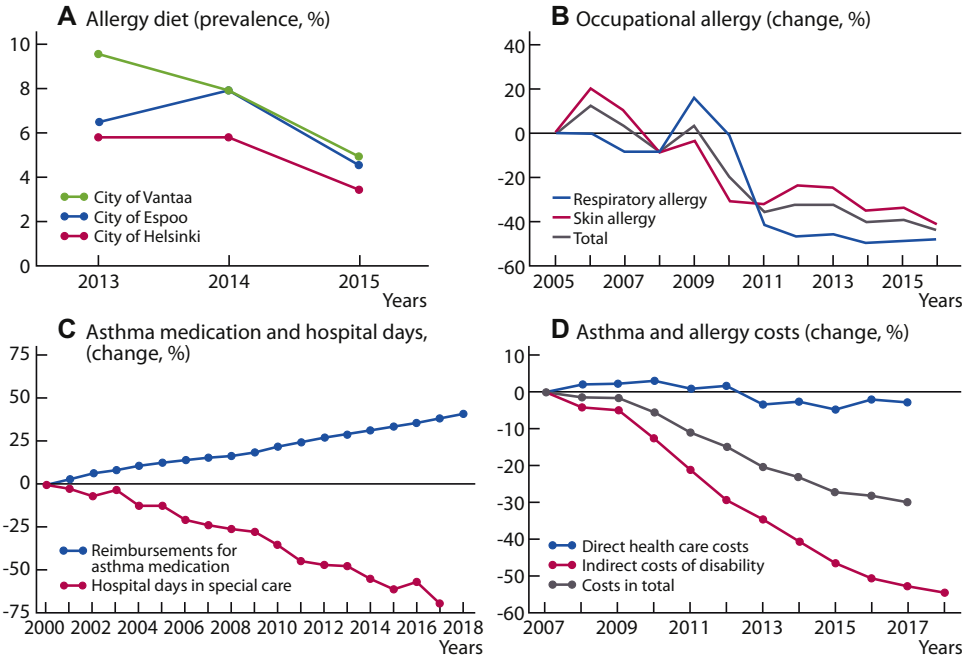


FIG 1. A-D, Main outcomes of the Finnish Allergy Program 2008-2018. **A,** Reduction of prevalence of allergy diets in day care in 3 cities.[29] **B,** Reduction of cases of occupational respiratory and skin allergies. **C,** Increase in the number of patients entitled to reimbursement for regular asthma medication and decrease in the number of hospital days in specialist care. **D,** Direct health care and disability costs in 2007-2018.

Allergy and asthma costs were analyzed from all data sources in collaboration with government officials.[26] The cost analysis included outpatient visits, private physician appointments, occupational health services, hospital days, rehabilitation, and drugs. Disability preventing individuals from working was followed through national registers. Short-term sickness-related absences and reduced working capacity were estimated by a questionnaire survey.

CHANGE FOR THE BETTER

The main 10-year outcomes are summarized in Table II.

Prevalence

During the program, the prevalence of allergy and asthma in Finnish conscripts leveled off.[27] In the country's capital Helsinki, the incidence of physician-diagnosed asthma leveled off, and between 2006 and 2016, the incidence of allergic rhinitis decreased slightly.[28]

Tolerance

We attempted to reduce unnecessary food allergy diets in children. In 3 cities (Helsinki, Espoo, and Vantaa [total population around 1.2 million]), the prevalence of allergy diets in day care decreased by 43% in 2 years[29] (Fig 1, *A*). In the rural municipality of Lieto (18,000 inhabitants) in southwestern Finland, the rate of reduction was 65%,[30] and, in some regions, it even reached 80%. No anaphylactic reactions were observed in these settings.

Allergy diagnostics

To improve the quality of testing, a strategy was devised to standardize skin prick testing. A total of 31 allergy centers that together performed around 90% of all testing in Finland were educated, audited, and certified.

Work-related allergies

Between 2007 and 2016, the number of verified cases of occupational allergic diseases (asthma, rhinitis, allergic alveolitis, allergic and irritant contact dermatitis, protein contact dermatitis, and contact urticaria) fell by 45%. The reduction was not explained by changes in the workforce (Fig 1, *B*).

Severe asthma and allergy

The preceding Finnish Asthma Program[15] was effective, and it was expected that the Finnish Allergy Program might not lead to further improvements. In the 2000s, the number of asthma-related emergency department visits decreased by 35% (by 77% in children younger than 5 years), but it decreased by no more than 6% during the new program. However, the number of asthma-related hospital days decreased by 73% in the 2000s and by 50% during the new program (Fig 1, *C*). In 2000s, the number of patients with asthma who were entitled to reimbursement for regular medication has increased by 40%, indicating improving treatment coverage.

Today, asthma causes less severe symptoms than in earlier years. In 2016, 41% of patients with physician-diagnosed asthma had been symptom-free during the previous year (31% in 2006 versus 24% in 1996).[28] In 2016, 2.5% of individuals with asthma

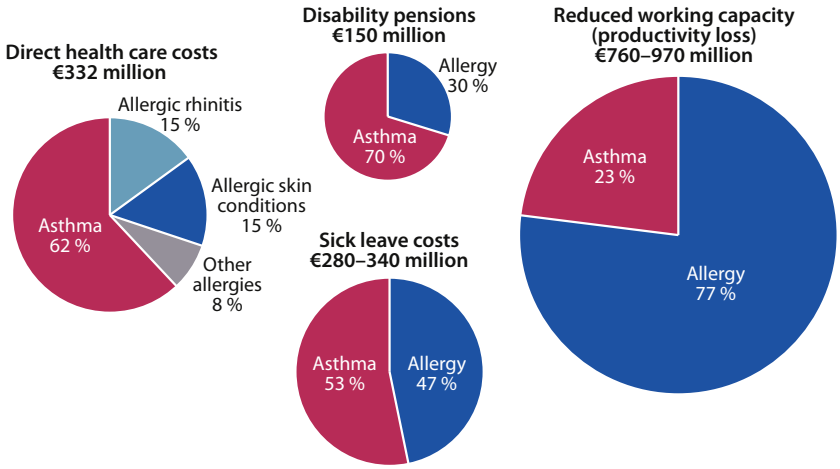


FIG 2. Distribution of asthma and allergy costs in Finland in 2018. Direct health care costs and indirect costs caused by disability and productivity loss. The total costs of asthma and allergic diseases ranged from €1.5 billion to €1.8 billion.

regarded their symptoms as severe, as compared with 4% in 2010 and 10% in 2001.[31] In the 2000s, annual asthma deaths decreased from 117 to 74, and in the population younger than 60 years, an average of 7 asthma deaths per year were recorded.

In Finnish children younger than 20 years, the rate of hospital admission due to asthma was 51% less in 2014 than in 2005, whereas the rate remained stable in Sweden.[32]

During the period from 1999 to 2011, the rates of hospital admission due to allergic reactions among children younger than 20 years in Finland were compared with those in Sweden.[33] The rates doubled in Finland but almost tripled in Sweden. In 17 years (1996-2013), anaphlyaxis caused 56 deaths in Finnish adults and no deaths in children.[34]

Costs

From 2000 to 2011, the direct health care costs caused by allergic diseases and asthma, together with costs of disability rendering individuals unable to work, decreased by 9%.[26] A comparison of the years 2007 and 2018 and use of comparative data revealed that these costs fell by 30% (approximately €200 million) (Fig 1, *D*). In 2018, the total cost of allergic diseases and asthma in Finland ranged from €1.5 to €1.8 billion (Fig 2).

A simple example of combating medicalization was the policy regarding milk allergy in preschool children, who used to be entitled to reimbursement for hypoallergenic milk products if a doctor had documented the need. The criteria were revisited in 2006. After that, use of special formulas was reimbursed only if the diagnosis was based on milk challenge performed at a pediatric outpatient clinic. Following revision of the instructions, the number of children needing the hypoallergenic products decreased by 70% and the cost decreased by €4.5 million (according to a comparison of the years 2007 and 2018).

CONCLUSIONS

All citizens were included in the program for changing the strategy from avoidance to tolerance, endorsing health instead of allergy, and prioritizing severe clinical manifestations.[23,35] A large-scale educational effort—both for health professionals and for the lay public—was carried out. Finland has a functional public health care sector; however, the private sector, especially for children and working-age people, covers almost half of all outpatient visits. Thus, our results are applicable to most countries with developed health care.

During the program, the prevalence of allergy and asthma leveled off, but the possible impact of primary prevention remains to be verified. Asthma and eczema but not allergic rhinitis have also leveled off in Sweden, even without any specific program.[36] The prevalence of allergy diets decreased by half, mainly because the new guidelines changed practices and mild symptoms did not entitle individuals to special diets. The incidence of occupational allergic diseases decreased by almost half, and this was not caused by changes in the workforce. Asthma appeared to cause fewer and milder symptoms as well as fewer hospital days, but the number of emergency visits decreased less than expected. A steady increase in the number of patients entitled to reimbursement for regular medication indicated better coverage of individuals with asthma with effective treatment. Allergic reactions caused more emergency visits and hospital admissions. This was predicted, as anaphylaxis was one of the main educational themes. The number of deaths due to anaphylaxis remained low and did not increase.

The total annual costs of allergic diseases and asthma decrased by almost a third, mostly because ability to work was affected less by the conditions (ie, disability costs were lower). This development has been exceptional in Finland.[37] For example, the number of patients with diabetes increased by 70% and costs increased by 50% in 2002-2011. The same applied to mental disorders, which since 2016, have been the reason for about half of all the disability pensions. The Finnish experience has also been different from the global trend regarding asthma and allergy, the burden of which has remained high or has even been increasing, both in developed and developing countries.[38-40] This indicates that prevention is ineffective and new approaches are required.

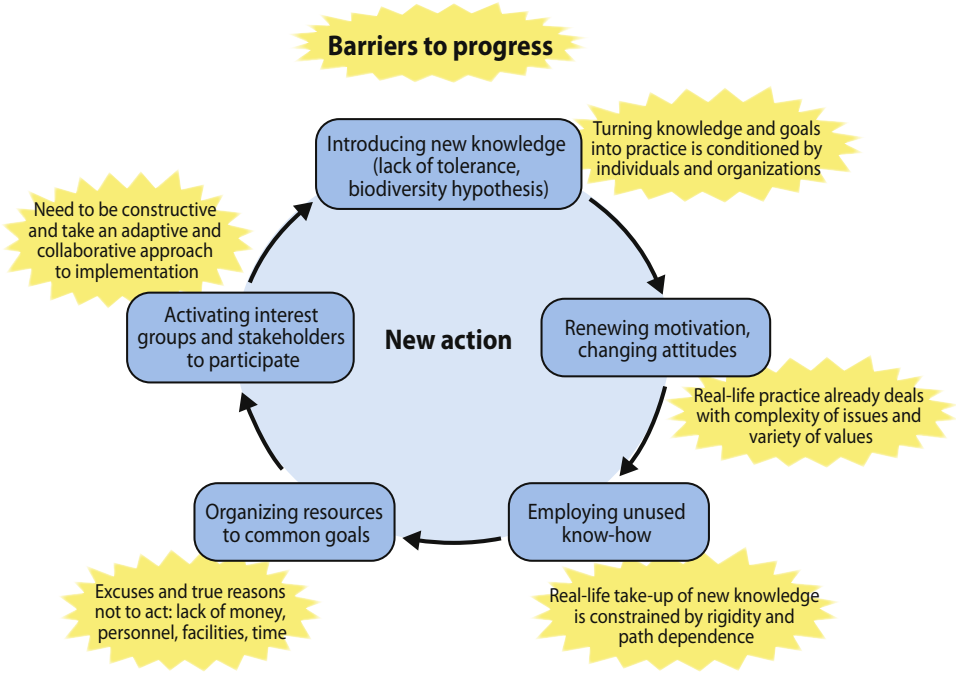


FIG 3. The barriers to implementation. The 2 key words are motivate and organize.

The Finnish real-world, long-term intervention has indicated that attitudes can be changed, treatment and prevention improved, and costs reduced. Program-specific changes are difficult to estimate on account of the open design without controls. All Finnish citizens were included. Comparison with other countries is also difficult, as similar systematic prevention campaigns or programs have not been implemented elsewhere. Nevertheless, the rates of severe allergic reactions and asthma-related hospital admissions among children have indicated more favorable trends in Finland than in Sweden.[32,33] Globally, emphasis has been placed more on improving allergy and asthma awareness and management guidelines in Europe, the United States, Australia, New Zealand, and South Korea.[2,41-43] The Finnish program has certainly increased awareness, but it has also turned ideas of prevention into action. In 2012, Chang suggested that allergy programs from each country be compared and an international network be organized.[44]

Adopting new knowledge in real-world conditions is constrained by rigidity and path dependence (Fig 3). To convince others, educators must be dedicated experts. The task becomes easier when the critical mass for change accumulates. Regional opinion leaders are in a key position to disseminate new practices. In Finland, networking of allergy experts with primary care doctors and nurses, as well as with pharmacists, has been the key to effective implementation.

On the basis of the Finnish experience, allergy programs or campaigns have been considered in other European countries (eg, Germany, Norway, Poland, Portugal, and Sweden). However, the fragmented allergy care has delayed consensus and effective implementation even though the World Health Organization alliance Global Alliance against Chronic Respiratory Diseases and the European Federation of Allergy and Airways Diseases Patients' Associations have endorsed the program from the beginning. To appear truly useful, long-term public health programs need to be supported by all essential stakeholders, as they have major societal impact. Also, in the era of social media, health care professionals cannot ignore patient and public views.

We conclude that revisiting the allergy paradigm has profoundly changed allergy management in Finland, mitigated the individual and societal burden of these common disorders, and opened new perspectives to preventive medicine. Importantly, the health care system has changed and improved its practicies without extra resources, as part of its everyday work. The educational campaigns have been funded separately (see the section on funding).

FUTURE IMPLICATIONS: FROM SOCIETAL IMPACT TO PLANETARY HEALTH

The Finnish Allergy Program is relevant in promoting sustainable development goals. It highlights the potential of systematic campaigns to combine human health and health of the environment. Emphasis on tolerance or resilience can evolve to preventive strategies, which are essential for halting the growing burden not only of allergies but also of noncommunicable inflammatory diseases in general.

The need to protect the natural environment—and to apply biodiversity hypothesis of health in everyday life—becomes evident.[45] Interestingly, a recent intervention by a Finnish group showed that increasing urban environmental biodiversity enriches the commensal microbiome and promotes balanced immunoregulation in children.[46]

The traditional discussion of risk factors widens to consider protective factors associated with healthy lifestyle and nature relatedness.[47,48] Human health is dependent on the state of natural systems—defined as planetary health[49]—which has been actively endorsed by the Finnish Allergy Program[50] (Table II).

Nature Step was an overarching theme in the 2018 meeting of the Global Alliance against Chronic Respiratory Diseases in Helsinki.[51] Consequently, to enhance health and environmental awareness in day care, Nature Step to Wellbeing was implemented in Finland by 3 governmental organizations.[52] The use of vegetables and fruits was increased (the Institute for Health and Welfare), food waste was minimized (the Natural Resources Institute), and outdoor activities were endorsed (Environment Institute). New guidelines for early childhood education that emphasize nature contacts have been introduced throughout the country.

Health care systems have a large carbon footprint and many environmental impacts. Improving the care of individuals with severe disease reduces not only human suffering but also the need for societal resources. Citizen empowerment and person-centered care are enhanced by the digital transformation of health and care,[53] as was also recognized during the COVID-19 pandemic, with major impacts on the environment.

The program message to improve air quality includes strategies to reduce traffic- and industry-derived air pollution through active and public mobility, as well as nature-based solutions in cities. These strategies have large co-benefits for human health and for the environment. As people live mostly indoors, quality of the indoor climate is an essential health determinant. The Indoor Air and Health Program 2018-2028 has commenced in Finland on the footsteps of the allergy campaign.[54] Progress in and attainment of the predefined quantitative goals will be monitored throughout.

The Finnish Allergy Program has called for a stop smoking policy. Indeed, Finland has declared an endgame[55] for smoking. When the objective of the Tobacco Act is met, less than 5% of the adult population should be consuming tobacco or nicotine products on a daily basis in 2030.[56]

The health benefits in prevention and treatment of allergic diseases and asthma have had a demonstrated societal impact and may serve as a model of planetary health for a successful change management of chronic diseases.

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THE FINNISH ALLERGY PROGRAM 2008-2018

The Finnish health care system

In Finland, as in all Nordic countries, the health sector is mainly publicly funded.[E1] The highest authority is the Ministry of Social Affairs and Health, but the municipalities (local governments) are responsible for providing health care. In addition to general practitioner services, preventive services have been established for pregnant women, mothers, and infants, as have school health care and dental care for children and young people. Primary health care is provided by about 250 health centers, including at least 3 times as many maternity and child health clinics and approximately 1000 units offering occupational health services (one-third of which are private).

Finland has a well-developed hospital sector (secondary care) with advanced specialist treatment. The municipalities also own and operate almost all of the hospitals through cooperation in 21 hospital districts. Finland has 5 university hospitals (tertiary care) and medical faculties.

The public primary care services are either free for the patient or provided for a small fee. For all public hospital services, the patient pays a small fee.

The private sector is smaller than the public sector and complements the latter, especially in larger cities. Patients pay the cost to the private provider, after which they apply for reimbursement from the Finnish Social Insurance Institution under the Health Insurance Act. Nowadays, the reimbursement covers only about 20% of the cost. Private health insurance is relatively popular among families with small children. During recent years, the private sector has enlarged its activities and become more powerful in Finland.

Salary or cash allowances are payable to employees during illness. Self-employed people can insure themselves against illness.

Education of health professionals

The Finnish Lung Health Association, an NGO for health professionals, was responsible for education (Table E1). A pediatrician and a nurse organized the work. The topics of the educational meetings were tailored jointly with local experts, care providers, and stakeholders. Local implementation was the key to improvement and needed time to change ideas and take up challenges, doubts, and unmet needs. The educational material and presentations in meetings were available on the Finnish Lung Health Association website (www.filha.fi). Treatment practices and guided self-management were in focus. Simple guidance to improve allergen tolerance was provided (Table E2).

During the Finnish National Asthma Program 1994-2004, a contact person network of 200 physicians and 580 nurses was created in the municipal health centers.[15] Similarly in pharmacies, 695 pharmacists were educated as asthma contact persons (94% coverage of the pharmacies). These networks were strengthened for the Allergy Program by some 200 nurses for maternity and child health clinics, as well as for schools.

At the end of the program in 2018, 76% of 565 health professionals (20% physicians) answered a questionnaire. They reported that their allergy practice had improved. Only 4.5% did not find any change. Importantly, the workload of doctors and nurses had not increased. Half of the professionals (52.5%) also estimated that patients and families were managing allergies better than before; 15% did not agree. Seventy percent concurred that the program had reached its goals; 0.4% did not.

Informing patients, families, and the lay public

Two NGOs, the Allergy, Skin and Asthma Federation and the Organization of Respiratory Health, with approximately 60,000 members, carried out an information campaign that targeted patients, risk groups, and the general public (Table E1). The idea was to change the public attitude regarding how to prevent and mitigate allergies by emphasizing both immunologic and psychologic tolerance. Safe contact with diverse natural environments was the key message. The NGOs arranged regional education for key persons and peer workers, which had a major impact on patient counseling and distribution of educational materials.

The search for advice for the majority of people is based on the media (websites, social media, magazines), as well as on peer support by friends, Internet groups, and patient organizations. Misinformation, poorly justified avoidance, and fear of all exposure are common elements of these discussions and are especially prominent in social media. Two NGO workers were responsible for the planning and implementation of 12 media campaigns for radio and the Internet in the first phase (2011-2013). Several banner campaigns were carried out, including by the biggest social media service and the largest online health and welfare service in Finland. These also included a question and answer section for people with allergy. Several clips and expert interviews were produced for the YouTube channel. The largest single campaign was executed through the national radio channel.

In the second phase (2014-2015), actions were more targeted (eg, for Finnish day care units, maternity and child health clinics, and the personnel and peer workers of patient organizations). In 2015, a website (Healthy at Work) supporting young people with allergy when selecting education and an occupation was launched in cooperation with the Finnish Institute of Occupational Health.

In a 2015 survey of 1031 citizens with allergy, more than half of those surveyed controlled their food and one-fourth took other allergies into account throughout the year. Allergy played a role in participation in outdoor activities, having or not having a pet, eating outside the home, and shopping for everyday consumer goods.

In the 2018 survey, the members of the NGOs were questionned on the program's priorities; 95% of the 1071 respondents recognized allergy health and severe allergies. Nevertheless, careful allergen avoidance at home was still important for 20% of the respondents. Attitudes and actions have changed slowly, as the answers between the 2011 and 2018 surveys differed only marginally.

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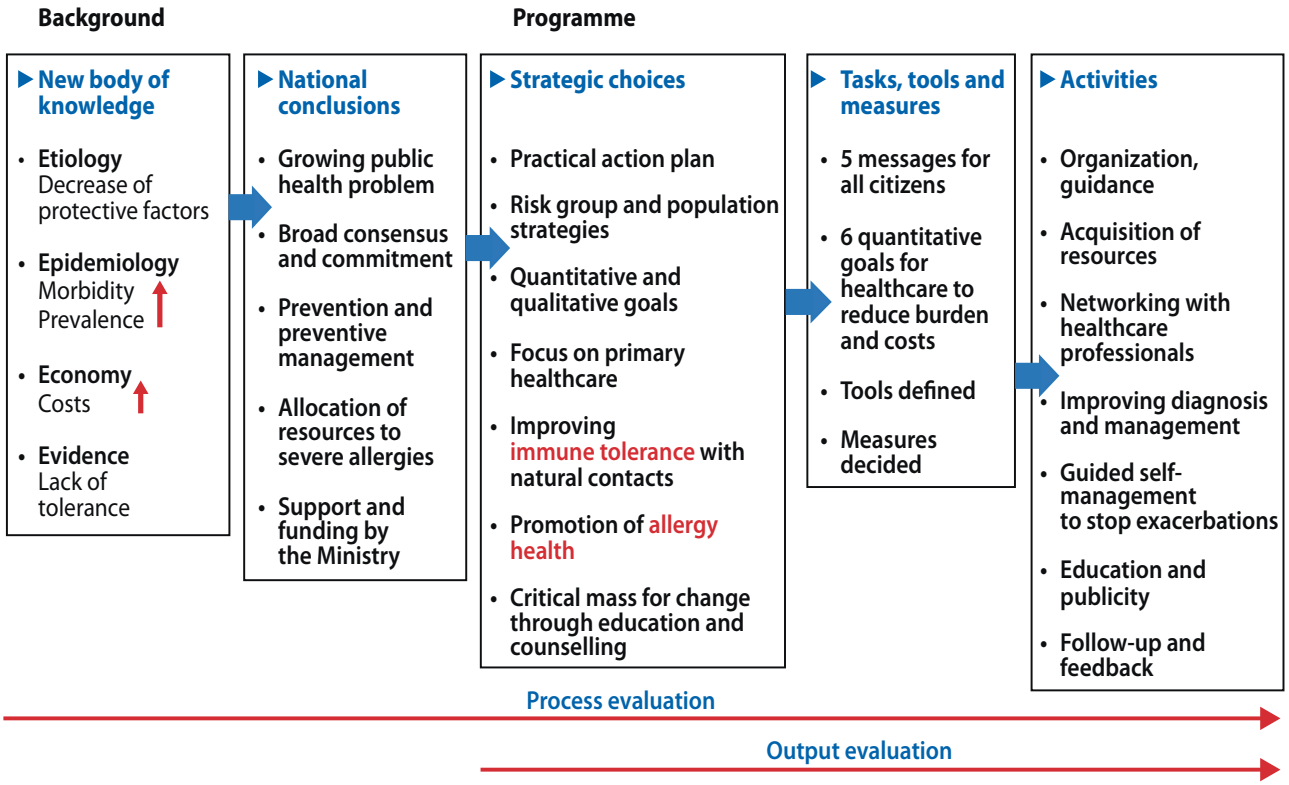


FIG E1. The strategic planning of the Finnish Allergy Program 2008-2018.

TABLE E1. Allergy program implementation for health professionals, patients, and the lay public

Health professionals

- The Finnish Lung Health Association organized education for health professionals, day care, and schools
- In 376 educational sessions, there were 24,000 participants
- Themes selected with local care providers included the following: allergy health, anaphylaxis, biodiversity (nature relatedness), di agnostics, food allergy, immunotherapy, guided self-management, severe asthma, skin conditions, and tolerance
- Services were provided free of charge and arranged at the work place during working hours
- Simple self-management guides for 10 allergic conditions were developed
- The Association of the Finnish Pharmacies ran campaigns for allergic rhinitis and atopic eczema 2009-2016

Patients and the lay public

- Two nongovernmental patient organizations carried out an information campaign in 2011-2015
- Themes included allergy health, tolerance, nature relatedness, and disease control
- Information was spread by specific campaigns, bulletins, posters, leaflets, articles, interviews, and lectures
- In 2011-2013, a new website (www.allergiaterveys.fi) was developed
- Banner campaigns for social media (www.Suomi24.fi) and health services (www.terve.fi), including a question and answer section, were developed
- Expert interviews were conducted on YouTube and national radio channel
- In 2014-2015, actions for day care (Go to Nature!), maternity units, and work places (Healthy at Work) were implemented
- It was estimated that at least 2.3 million Finns (42% of the Finnish population) were reached with the information campaigns through Internet, TV, radio, and magazines

TABLE E2. Practical advice for building and improving tolerance (primary prevention) as well as for preventing symptoms and exacerbations (secondary and tertiary prevention)

Primary prevention
Support breast-feeding and introduction of solid foods from the age of 4-6 months
Do not avoid exposure to environmental allergens (eg, foods, pets) unless it has been proved necessary
Strengthen immunity by increasing contact with the natural environment (eg, through regular physical exercise, a healthy diet such as a traditional Mediterranean or Baltic diet, and preference for local food)
Use antibiotics only when necessary (the majority of microbes are useful and build a balanced immune system)
Recognize that probiotic bacteria in fermented food or other preparations may strengthen the immune system
Do not smoke (eg, because parental smoking increases the risk of asthma in children)
Secondary and tertiary prevention
Regular physical exercise is anti-inflammatory
A healthy diet is anti-inflammatory (the Mediterranean or Baltic diet may improve asthma control)
Probiotic bacteria in fermented food or other preparations may be anti-inflammatory
Respiratory and/or skin inflammation is treated early and effectively. Maintenance treatment is titrated for long-term control
Allergen immunotherapy for more severe symptoms includes - Oral immunotherapy for foods - Sublingual tablets or drops for pollens or house dust mites - Subcutaneous injections for pollens, pets, mites, and insect venoms
Smoking should be strictly avoided (eg, because asthma and allergy drugs do not have full effect on smokers)