



Long-term trends of asthma, allergic rhinitis and atopic eczema in young Finnish men: a retrospective analysis, 1926–2017

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Asthma and allergic conditions have been on an almost linear rise in young Finnish men since the 1960s. The prevalence increase slowed down in the 2000s and may be levelling off in the 2020s. <https://bit.ly/30DbsqS>

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ABSTRACT The aim of this study was to assess the long-term time trends of the prevalence of asthma, allergic rhinitis and atopic eczema in young Finnish men.

A retrospective analysis was carried out on cross-sectional data from the Finnish Defence Forces taken from call-up examinations of candidates for military conscription and examinations of conscripts discharged from service because of poor health. Roughly 1.7 million men aged 18–19 years (98% of men of conscription age) were examined from 1966 to 2017. A proportional but unknown number of young men were examined from 1926 to 1961.

The main outcome measures were asthma recorded at call-up examination as the main diagnosis in 1926–2017 and any diagnosis in 1997–2017, exemption or discharge from military service due to asthma, and allergic rhinitis and atopic eczema recorded as the main diagnosis in 1966–2017 and any diagnosis in 1997–2017.

During 1926–1961 the prevalence of asthma remained low at between 0.02% and 0.08%. A linear rise began between 1961 and 1966, with a 12-fold increase in the prevalence from 0.29% in 1966 to 3.44% in 2001. Thereafter, the prevalence of asthma as the main diagnosis stabilised but continued to increase to 5.19% in 2017 if secondary diagnoses of asthma were included. Exemption rates from military service due to asthma have similarly increased but fluctuated more. The prevalence of allergic rhinitis increased from 0.06% to 10.70% and atopic eczema from 0.15% to 2.90% during the period 1966–2017.

In Finland, an increase in asthma and allergic conditions among young men became evident in the mid-1960s. The increase slowed in the 2000s and may be levelling off in the 2020s.

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Introduction

Globally, the prevalence of asthma is still on the rise and people in all world regions are affected [1]. However, the increase in asthma and allergy prevalence may be levelling off in Europe, although it remains high [2–5]. In Finland, recent questionnaire data showed a slight increase [6] or levelling off [7] in asthma and allergy prevalence. We have previously reported asthma and allergy time trends from 1926 to 2003 in young Finnish men [8, 9]. We observed a steep rise in asthma and allergic rhinitis beginning in the early 1960s. The prevalence of atopic eczema seemed to have already reached a plateau by the 1980s.

Here, we assess the trends of asthma during a 91-year period from 1926 to 2017, and allergic rhinitis as well as atopic eczema from 1966 to 2017 in young men conscripted for military service in Finland.

Methods

Roughly 98% of Finnish men are examined during call-up to determine their fitness for compulsory military service. Each conscript's diagnostic codes are registered and held by the Finnish Defence Forces database.

Since 1972 the medical examination has been carried out in two stages. First, the candidate is examined by a general practitioner in a local health centre with access to medical records. Fitness is judged on the basis of the candidate's medical history, a questionnaire completed by the candidate and the findings of a clinical examination. When necessary, the candidate is referred to a specialist for further evaluation. He is then re-examined at call-up by the local physician the year prior to military service. Before 1972, the call-up examination was carried out by local physicians appointed by the army.

Medical diagnoses for each person in Finland are made according to contemporary diagnostic criteria by a licenced physician and are upheld in the patient's medical records. At call-up, if the person has multiple diagnoses, the order (primary, secondary, tertiary, quaternary) is determined by the physician according to the eligibility to serve.

The present cross-sectional yearly data consist of all Finnish conscripts from 1926 to 1939, 1961 and from 1966 to 2017. The population comprises mainly 18- and 19-year-old Finnish men. No data for women are included because their service in the military is voluntary. Possible duplicate data, *i.e.* from persons who were re-evaluated for military eligibility, are excluded. For “disabling asthma”, diagnostic codes are gathered from the exempted person's final follow-up examination, in which the reason for exemption is marked as the primary diagnosis.

The data for 1926–1939 and 1961 were obtained from the Finnish Defence Forces annual reports from the Finnish war archives. Since 1966, diagnoses have been registered systematically for each individual and reported annually. Since 1997, data from secondary, tertiary and quaternary diagnoses have also been recorded in addition to the primary diagnosis. Further details of the call-up process have been described previously [8]. During 1966–2017, roughly 1.7 million men were examined.

We included raw pseudonymised data obtained from the Finnish Military registers and collected all diagnoses relating to asthma, allergic rhinitis or atopic eczema in each year's International Classification of Diseases coding system. Data processing and statistics were performed in software from Statistics Finland's remote access use (FIONA), a system employing LibreOffice.

Results

From 1966 to 2017, between 30 381 (2016, minimum) and 36 386 (1975, maximum) men were annually examined in the call-up process. The exact number of examined men in 1926–1939 and 1961 was not available but according to the Finnish Defence Forces reports it was proportional, *i.e.* ~98% of men of conscription age.

The prevalence of asthma remained low during the first 35-year period (1926–1961). Between 1961 and 1966 a slight increase was noticed, which accelerated 12-fold during the next 35 years (1966–2001), from 0.29% to 3.44%. Since 2001, the prevalence of asthma as a main (primary) diagnosis has remained stable. However, the total prevalence when including all diagnoses from 1997 still showed an increase up to 2012. Thereafter, the prevalence stabilised, being 5.19% in 2017 (figure 1a, supplementary table S1).

The percentage of men who prior to military service were excluded from the service because of disabling asthma increased from 1966 (0.10%) to 1988 (0.65%). Since then, the exemption rate has fluctuated from 0.17% to 0.79%. The proportion of men who started in service but were then discharged due to asthma exacerbation increased until 2009, after which the rate decreased slightly, from 1.05% to 0.87% by 2017 (figure 1a).

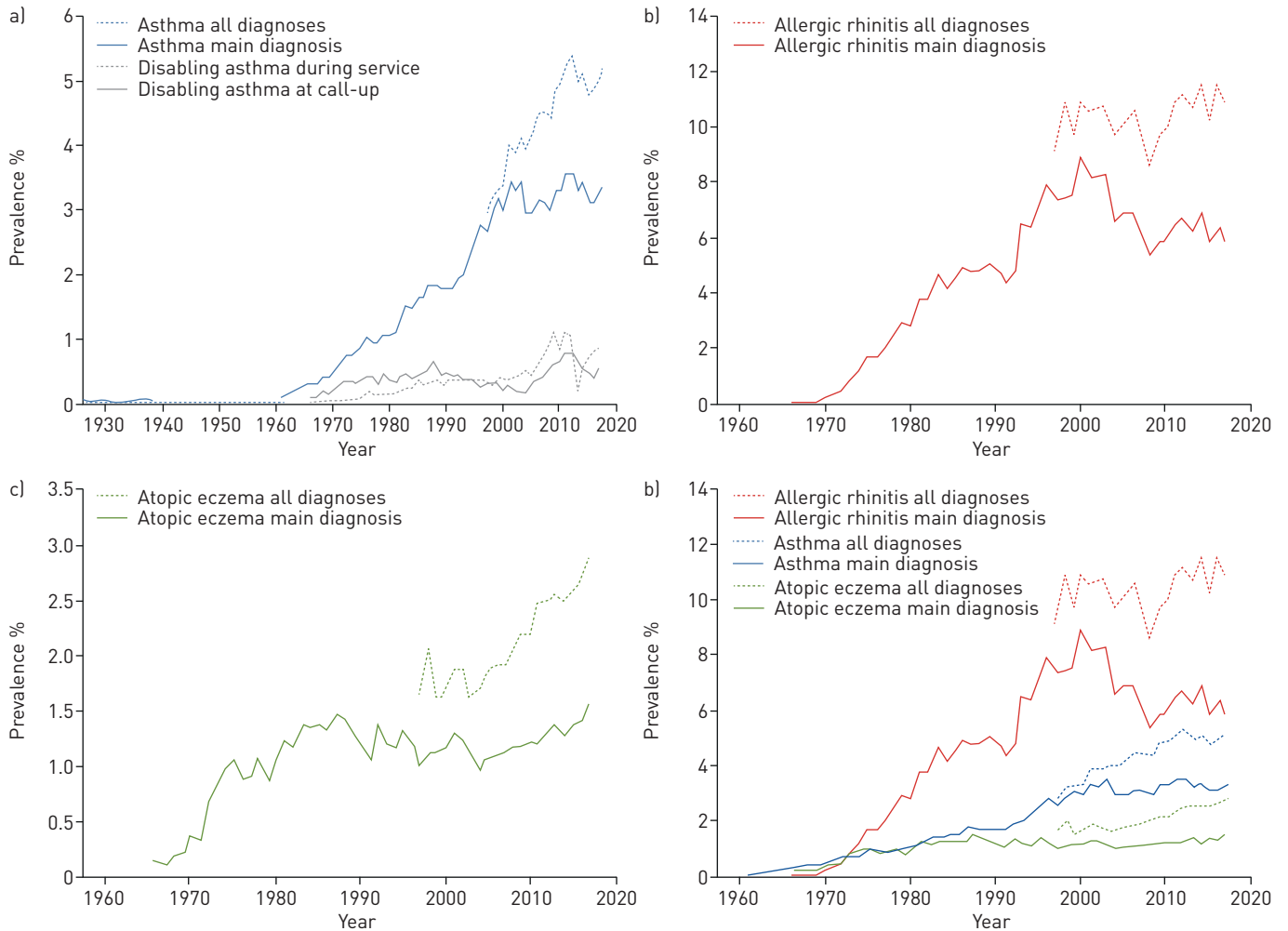


FIGURE 1 Prevalence of asthma, allergic rhinitis and atopic eczema in young Finnish men in 1926 (1966)–2017 during the call-up examination for military service. a) Asthma 1926–2017. Prevalence of disabling asthma is shown as the percentage of men discharged (of all those who started their service in each year) during service as a result of asthma (dotted green line) and as the percentage of men exempted at call-up (solid green line). b) Allergic rhinitis 1966–2017. c) Atopic eczema 1966–2017. d) Asthma, allergic rhinitis and eczema 1966–2017.

There was a 100-fold increase in allergic rhinitis as the first diagnosis between 1966 and 1993, from 0.06% to 6.46%. The prevalence reached its peak in 2000 (8.88%). During the last 17 years the prevalence has decreased slightly but remained fairly stable. This remains true even when all diagnoses are included. In 2017, the prevalence was 10.70% (figure 1b, supplementary table S2).

The prevalence of atopic eczema as a first diagnosis increased 10-fold between 1966 and 1987, from 0.15% to 1.47%, before reaching a plateau. However, if all atopic eczema diagnoses are included, a slight upwards trend can be seen after 2008, with a prevalence of 2.90% in 2017 (figure 1c, supplementary table S3).

Discussion

This long-term nationwide yearly cross-sectional dataset comprises ~98% of young Finnish men (>30 000 persons annually). Thus, the present data offers a unique and robust view of the trends in asthma and allergy-related conditions in Finland.

During 1926–1961, the prevalence of asthma in young Finnish men remained low, but since 1966 it has increased nearly 12-fold. Similar findings have been reported in Sweden [10]. After 2001, the prevalence of asthma as the main diagnosis levelled off. However, if secondary, tertiary and quaternary diagnoses (recorded only from 1997) are included, the rise continued at least until 2012. This indicates that asthma has been noted in the call-up examination, but it is increasingly asymptomatic or well controlled and thus not regarded as the main diagnosis causing potential disability. Finnish systematic attempts to improve early detection and treatment may have contributed to this favourable outcome [11].

The same may apply to diagnoses of atopic eczema, which seemed to plateau by the 1980s. Atopic eczema is often mild enough to not cause significant disability, and it may have been increasingly noted at call-up as an “add-on-diagnosis”. Thus, it has not really levelled off but continued a slow rise.

Rhinitis and rhinoconjunctivitis are the most common allergic disorders; the prevalence for both main and all diagnoses seems to flatten after the 2000s. This is in agreement with another Finnish study comparing allergic rhinitis in adults from 2006 to 2016 in Helsinki [7].

There has been some variation in the Finnish Defence Forces call-up process with regards conscript eligibility for military service, which may have affected the prevalence of conscripts excluded from military service at call-up. However, the policy has long been to recruit asthmatic men if the disease is controlled and the person is motivated for service.

Our findings are in line with the increase in allergic manifestations and atopic sensitisation, e.g. serum IgE antibodies to pollen allergens, observed in the younger generations in the Finnish population but not in Russian Karelian people [12]. This implies that the increases are largely true and only partly explained by improved awareness and diagnostics. After World War II, the Russian Karelian population maintained a small-scale agricultural lifestyle while the adjacent Finnish region underwent urbanisation and became more affluent. The changes in environment and lifestyle, affecting microbial exposure and immune regulation, seem to play a major role in the so-called post-war allergy epidemic [13, 14].

We conclude that the increase in asthma and allergy became evident in the mid-1960s in Finland among young men aged 18–19 years. The increase started to slow down in the 2000s and may be levelling off in the 2020s.

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