

# Prevalence of asthma and COPD in general practice in 1992: Has it changed since 1977?

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## SUMMARY

**Background.** Asthma and COPD are common diseases of the airways which are mainly diagnosed and treated in general practice.

**Aim.** Various studies have reported an increase in the morbidity of asthma and COPD. There are two possible reasons for such an increase. The first is an apparent increase caused by using different criteria in defining asthma/COPD, and by increased awareness of the disease by doctors and patients. The second is a real increase caused by an increase in the prevalence of airway pathology. The aim of this study was to determine the cause of the observed increase in morbidity.

**Method.** In 1977, a sample of 2328 adults from the general population were screened for asthma and COPD. Those screened were then divided into five sub-groups (grades 1–5), according to severity of: (1) respiratory symptoms; and (2) loss in FEV<sub>1</sub>. The number of patients who were not known to the general practitioner prior to the screening as having asthma or COPD grades 1–5 were also assessed. In 1992, we studied a different sample of 1184 adults of the general population in the same area. We used the same criteria as in 1977 to analyse our results. The number of patients not known to the general practitioner prior to the screening was also studied.

**Results.** The overall prevalence (grades 1–5) of asthma and COPD has increased from  $\pm 19\%$  in 1977 to  $\pm 31\%$  in 1992 (range 21–42). The main reason for this is an increase in prevalence of very mild to moderate asthma and COPD (grades 1–3) from 17% in 1977 to 27% in 1992. The prevalence of severe cases (grades 4–5) increased from 2% in 1977 to 4% in 1992. In 1992, around 65% of the patients were not known to the general practitioner as having any grade of asthma or COPD. This was only slightly lower than the 72% in 1977. All patients with a severe disease (grade 5) were known to the general practitioner.

**Conclusions.** There is a real increase in the prevalence of asthma and COPD, caused predominantly by an increase in the number of mild cases. The percentage of patients not known to the GP were predominantly mild cases.

**Keywords:** asthma; COPD; prevalence; screening.

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## Introduction

ASTHMA and COPD are common chronic diseases of the airways that are mainly diagnosed and treated in general practice. In the Dutch health-care system, every inhabitant is registered at a local general practice. The general practitioner (GP) is the provider of basic medical care to an average of 2500 people and is the gateway to specialized care. Therefore, it is important that each GP knows the population in their practice.

The prevalence of asthma and COPD in the general population has been compared to an iceberg. The visible part of the iceberg represents patients known to either the GP or the pulmonologist and specialized asthma centres (registered morbidity). The submerged part represents people with respiratory symptoms and other objective signs of asthma and COPD who are not known to the health-care system but who are detected during screening surveys. Its numbers result from under-diagnosis<sup>1</sup> and under-presentation by the patient. This under-presentation may be explained by the absence of a good correlation between respiratory symptoms and lung function.<sup>2</sup>

Various studies have reported an increase in the morbidity and mortality of asthma.<sup>3–6</sup> This is alarming, especially with the abundance of adequate treatment currently available. It is difficult to assess the incidence and prevalence of chronic respiratory diseases.<sup>7</sup> The use of various definitions has been shown to be a probable cause for this discrepancy in prevalence data.<sup>8</sup> The percentage of patients not known to the GP also varies for the different studies and can be assumed to be because of the same reason. Therefore, it is important to know whether the increase in prevalence is caused by a real increase in the pathology of the airways, or whether it is an apparent increase caused by better means of detection or merely reflects a change in diagnostic criteria applied. This is summarized in Figure 1. Figure 1A shows the situation several years ago, with the tip and the submerged parts of the iceberg representing the detected and undetected cases, respectively. Figure 1B represents a possible explanation for the increase in morbidity by increased awareness on the part of the doctor and patient, or by better methods of detection. In this case, a decrease in the percentage of persons not known to the GP could be expected owing to an upward shift of the iceberg. Another possible explanation for the increase in morbidity is shown in Figure 1C; in this case, it results from an overall increase in the prevalence of asthma and COPD.

The aim of this study was to investigate the prevalence of asthma/COPD and the percentage of adult patients currently not known to the GP compared with that of several years ago. We investigated this by means of a screening survey conducted in 1992 and a comparison of the results with a screening survey conducted in 1977. The results of the survey in 1992 were analysed by the same criteria used in 1977.

## Methods

This study is a comparison between a population survey (screening) for asthma/COPD in 1992 and a population survey in 1977, performed in the same suburban region of the eastern part of the Netherlands.

*Population survey in 1992*

In 1992, we screened a sample of the adult population from the sex-age register of 10 general practices (city and rural) around the city of Nijmegen, the Netherlands, for symptoms and signs of asthma and COPD. This was the initial stage of a longitudinal study conducted by the Departments of General Practice and Pulmonology of the University of Nijmegen on the early detection, monitoring, and intervention of asthma and COPD in general practice (DIMCA project). The respective GPs were then asked to exclude all persons who fulfilled at least one of the five exclusion criteria: congestive heart failure, lung disease other than asthma/COPD, serious morbidity with reduced life-expectancy, or severe physical or mental handicap. Patients with asthma/COPD dependent on corticosteroids were also excluded from the screening. This last group was further included in the analyses of the present study. All other subjects were invited to take part in this survey. Those not responding to the first letter were sent a reminder. The screening took place at the office of the respective GP and was done by investigators who had undergone prior training in administering questionnaires and testing lung function. All participants gave their consent in writing after being fully informed of the study.

*Recruitment bias*

In order to investigate the presence of a recruitment bias, a random sample of persons who refused to take part in the study were asked to consider taking a simplified version of the screening test at their own homes. Most patients refused to take part initially because of the use of bronchodilators (medication) during the reversibility test and the inconvenience caused by having to visit the office of the general practitioner for the screenings test.

*Respiratory symptoms and lung function*

Symptoms were assessed by means of a modified Dutch version of the MRC questionnaire.<sup>9</sup>

The FEV<sub>1</sub> was measured by means of a portable Microspiro HI-298 (Chest corporation, Tokyo, Japan).<sup>10</sup> After sufficient instructions, the subject was asked to perform three forced expi-

ratory manoeuvres from maximum inspiration. The FEV<sub>1</sub> corresponding to the manoeuvre with the highest sum of the FEV<sub>1</sub> and FVC was recorded as the FEV<sub>1</sub> at that moment.

*The degree of reversibility of the airway obstruction*

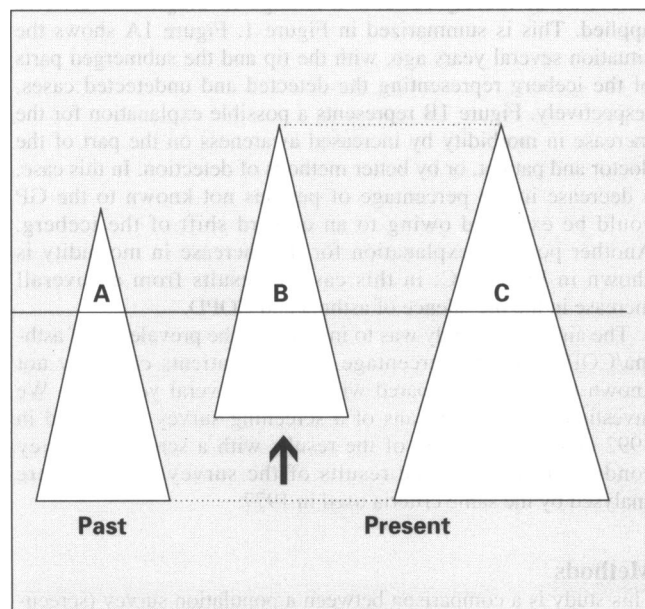
The subject was administered 800 µg salbutamol by inhalation, immediately after the base-line measurements. The FEV<sub>1</sub> was measured again after 15 min. The degree of reversibility was defined as the change in FEV<sub>1</sub> as a percentage of the predicted value.<sup>11</sup>

*Patient characteristics of persons already diagnosed and treated by the general practitioner*

We analysed various patient characteristics, such as age, gender and lung function, of people who had been diagnosed by the GP at the time of the screening, and who were using non-steroidal medication for asthma/COPD. The patients on steroids (excluded from screening) were not considered for this analysis as this medication might have influenced the medical status of these patients. We compared the patient characteristics of those using (non-steroidal) medication with that of patients not using medication in order to learn more about the type of patient the GP considers in need of medication.

*Comparison with survey in 1977 and analysis*

A survey by Huygen *et al* on asthma and COPD, published in 1977, served as a comparison.<sup>12</sup> This survey included patients above the age of 6 years ( $n = 4623$ ), registered in one general practice, and followed a two-step approach. First, all participants had to complete a five-item questionnaire enquiring about shortness of breath, cough and phlegm production, wheezing, and asthma attacks. Those with at least one positive answer were invited for a follow-up study which consisted of a respiratory symptoms questionnaire<sup>9,12</sup> and a lung function test (FEV<sub>1</sub>). All participants were then divided into six groups (grades 0–5) according to the severity of symptoms and the deficit in FEV<sub>1</sub>,<sup>9</sup> which were accepted Dutch criteria at that time (Table 1). The prevalence of the different grades of asthma/COPD were report-



**Figure 1.** (A) Prevalence of asthma and COPD in the past, (B) increase in prevalence by improved detection, and (C) real increase in prevalence.

**Table 1.** A summary of the criteria of severity of asthma/COPD used in 1977. The results of the 1992 survey were analysed with the same criteria.\*

Severity	Symptoms and signs
Grade 0	Respiratory symptoms absent (chronic cough, chronic expectoration, dyspnoea, wheezing, asthma attacks, episode of bronchitis) and FEV <sub>1</sub> > 95% predicted value
Grade 1	At least one of the above symptoms positive and FEV <sub>1</sub> > 95% predicted value
Grade 2	At least 1 of the above symptoms positive or FEV <sub>1</sub> 85–95% predicted value
Grade 3	Grade 1 symptoms and FEV <sub>1</sub> > 95% predicted value or FEV <sub>1</sub> < 85% predicted value
Grade 4	Grade 1 symptoms and FEV <sub>1</sub> 75–90% predicted value
Grade 5	Grade 1 symptoms and FEV <sub>1</sub> < 75% predicted value

\*FEV<sub>1</sub>, forced expiratory volume in 1 s.

ed along with the rate of cases diagnosed before in routine general practice care.

For the purpose of this study, the data from the 1977 survey were restricted to adult subjects between 25 and 70 years of age ( $n = 2328$ ). The 1992 questionnaire contained all questions used in 1977. The data were analysed in the same two-step manner as performed in 1977 and expressed in the six degrees of severity. All patients in the 1992 sample on maintenance corticosteroid treatment were included in the present study and allocated to severity degree 5. We compared the prevalence, severity and percentage of cases diagnosed in routine general practice care in 1992 and 1977.

### Statistical analysis

The differences between patients using medication (non-corticosteroid) and those not using any medication was tested by means of the unpaired Student's *t*-test (normally distributed variables) or by the ( $\chi^2$  test (class variables)). *P*-values less than 0.05% were considered significant.

The 95% confidence intervals were calculated for the prevalence of asthma/COPD for the sample in 1977 and the 10 samples in 1992. Chi-squared tests for proportion were applied to compare the prevalence of each sample in 1992 with that in 1977.

## Results

### Population survey in 1992

One thousand nine hundred and eighty-eight subjects of ages 25–70 years were randomly selected from the 10 practices (Table 2). The general practitioners excluded 239 (12%) on basis of the exclusion criteria; 29 out of the 239 subjects were excluded because of the use of inhaled corticosteroids for their asthma/COPD. In total, 1749 subjects were invited, of whom 1155 (66%) consented to participate in this survey. The 29 patients using inhaled-steroids for asthma/COPD were also considered for analysis. They had been excluded from screening because steroids are known to alter the normal course of lung function and symptoms in patients. These patients had previously been diagnosed and treated by the respective GP. Therefore, the total study population consisted of 1184 subjects.

### Recruitment-bias

We found 34 randomly chosen non-participants who were willing to take the simplified version of the screening test. The demographic and clinometric characteristics of the non-participants were compared with that of the participants. There were no significant differences between the two groups.

### Patient characteristics of persons previously diagnosed and treated by the general practitioner

There were 58 subjects who were under treatment for asthma/COPD. Twenty-nine had been excluded from screening on the grounds of corticosteroid dependency, and 29 of the total screened were receiving non-steroid treatment (Table 3). This last group did not differ from the total sample screened in age and gender, but had a significantly lower FEV<sub>1</sub>-predicted (83 versus 97%;  $P < 0.001$ ), lower vital capacity, lower FEV<sub>1</sub> and a significantly higher reversibility (10% versus 3%;  $P < 0.001$ ).

### Prevalence of asthma/COPD in 1992

The total prevalence of asthma/COPD (grades 1–5) was 306/1000 screened (Table 4). The prevalence for each of the 10 practices varied from 210/1000 to 420/1000 (Table 5). Most cases were mild (grades 1 and 2: prevalence of 203/1000).

Moderate cases (grade 3) accounted for 68/1000 and a prevalence of 35 was found for severe cases (grades 4 and 5).

### Percentage of persons with asthma/COPD grades 1–5 who were not known to the general practitioner in 1992

Out of the 362 cases identified at the survey, 65% had not been diagnosed before in general practice (Table 4). For the mild (grades 1–2) and moderate (grade 3) cases, this was 73 and 70%, respectively. Most of the severe cases (grades 4 and 5) had already been diagnosed: a first-time diagnosis was made in only 7%. No new cases with a severity grade 5 were found.

### Comparison of 1992 and 1977

The total prevalence of asthma/COPD in 1992 was substantially

**Table 2.** Number of subjects involved in the surveys in 1977 and 1992. In 1992, 1155 subjects were screened and 29 were excluded from screening because of the use of inhaled corticosteroids.

	1992	1977
Sample size	1988	4623
Excluded from screening	239	0
Number of persons invited	1749	4623
Number of participants	1184	4342
Number of adult participants (age 25–70)	1184	2328

**Table 3.** A comparison of patient characteristics within the 1992 survey: the 1155 patients screened were considered for this analysis. Patients using medication (non-corticosteroid) at the time of the screening versus the rest. The standard deviations have been presented within parentheses.

Patient characteristics	Using medication	Rest
Number	29	1126
Age (years)	43 (13)	43 (12)
Sex percentage (male:female)	38:62	45:55
Vital capacity (ml)	3644 (823)*	4081 (1054)
FEV <sub>1</sub> (ml)	2744 (757)*	3253 (838)
FEV <sub>1</sub> % of predicted	83% (17)*	97% (14)
Reversibility	10.1% (10.3)*	3.1% (3.7)

\*  $P < 0.05$ .

**Table 4.** The severity and prevalence of asthma/COPD in 1992 compared with 1977. The number of cases per grade of severity as a percentage of the total prevalence has been presented. The percentage of cases not detected in routine care (unknown to GP) is also presented.

Severity	Prevalence (per 1000)		Distribution of cases (% of total prevalence)		Unknown to GP (% of prevalence)	
	1992	1977	1992	1977	1992	1977
Grades 1–2	203	151	67	79	73	80
Grade 3	68	17	22	9	70	61
Grades 4–5	35	22	11	12	7	31
Total (1–5)	306	190	100	100	65	72

**Table 5.** A comparison of the prevalence in 1977 with that of the 10 separate samples (95% CI) and the aggregated total in 1992. The prevalence (practices) and the 95% CIs (presented as a percentage) are given for each sample. The results of the chi-squared test for comparing the prevalence in 1977 versus each sample in 1992 are shown in far-right column.

Sample	Number of subjects screened	Number of cases found	Prevalence (%)	95% CI	Comparison of proportions ( <i>P</i> -value)
1977	2328	443	19.0	17–21	–
1992: 1	215	60	27.9	22–34	0.002
1992: 2	111	31	27.9	19–36	0.019
1992: 3	127	40	31.5	23–40	0.001
1992: 4	114	38	33.3	25–42	0.002
1992: 5	89	34	38.2	28–49	0.000
1992: 6	100	21	21.0	13–29	0.610
1992: 7	106	25	23.6	15–32	0.239
1992: 8	109	33	30.3	21–39	0.004
1992: 9	107	45	42.0	33–52	0.000
1992: 10	106	35	33.0	24–42	0.000
1992: 1–10	1184	362	30.6	28–33	0.000

higher than in 1977 (306/1000 versus 190/1000). Table 5 shows that eight out of the 10 practices screened in 1992 had a significantly higher prevalence than the practice in 1977. The main reason for this increase in prevalence is an increase in mild to moderate forms of asthma and COPD (grades 1–3). The prevalence of grades 1–3 has increased from 168/1000 in 1977 to 271/1000 in 1992 (Table 4). Out of the 362 cases identified in the 1992 survey, 35% had previously been diagnosed in routine general practice compared with only 28% of the cases in 1977. This was particularly true for the most severe cases (93 versus 69%).

## Discussion

In this study, we compared the results of a population survey on asthma and COPD, conducted in 10 general practices in 1992, with the results of a survey in one practice in 1977. This study indicates an increase in the prevalence of asthma/COPD from 1977 to 1992. The main reason for this is an increase in the prevalence of mild to moderate asthma and COPD (grades 1–3). A substantial number of cases found during the survey had not been picked-up in routine patient care. In 1992 and in 1977, most of the more severe cases had already been detected. There is a trend towards greater detection in recent years (especially of the more severe cases), and this may point to greater asthma (and COPD) awareness.

For all ages, population surveys have reported a prevalence of 10–30%.<sup>1,13</sup> In general practice morbidity registration, prevalences of 30/1000 are consistently given.<sup>14–16</sup> This same discrepancy between cases present in the population (screening) and identified in routine general practice care (presented morbidity) came forward from this study.

The prevalence of asthma and COPD are influenced by the age and gender of the population, cigarette smoking, social class, urbanization, and probably the level of air pollution. These factors will have influenced the comparison made in this study. The surveys of 1977 and 1992 were held under comparable conditions in the same suburban region of the east of the Netherlands. The majority of patients in both surveys were working class. The patients in 1992 had been recruited from practices other than the one involved in the 1977 survey, and therefore, the 1977 results will not have influenced the awareness of their general practitioner of undetected asthma/COPD. Selective participation could not be demonstrated in the 1992 survey, and in 1977, the complete population of one general practice had been invited for participation, of whom 90% completed both stages of the survey.

What could not be controlled for was the influence of active (and passive) smoking. It is likely that the national trend for a modest reduction in smoking in the past decade will also have been applicable to this region. Conversely, the levels of air pollution (motorized traffic and industrialization) have increased since 1977. In comparing morbidity between general practices, it is important to take into account practice routines, as these may be a source of bias of reported/registered morbidity. A comparison of proportions (prevalence) between the practice in 1977, and the 10 practices in 1992 separately, shows that eight practices had a significantly higher prevalence than in 1977. Five per cent of the practices could be expected to differ significantly because of chance. In our study, 80% of the practices differed significantly from that in 1977; therefore, it is highly unlikely that this increase was caused by chance. This study was based on practices affiliated with the Department of General Practice, University of Nijmegen. The practice involved in the 1977 survey had played a predominant role in morbidity registration since 1967, and had developed a routine in the diagnostic labelling of presented morbidity at the time of the 1977 survey. This probably will have facilitated the diagnosis of asthma/COPD. Therefore, the percentage of patients unknown was probably lower than in the average general practice of 1977. The practices of the 1992 survey were practices of the Department of General Practice in Nijmegen. These practices had been previously involved in a series of studies on asthma and COPD with special emphasis on early diagnosis and long-term follow-up.<sup>10,17</sup> Again, this will probably have enhanced the number of cases of asthma/COPD under care. Although it is important to be cautious when comparing morbidity rates between different practices, our data represent, in our opinion, an optimum in this respect: the information of patients diagnosed with asthma/COPD in supervised 'academic' general practice in 1977 and 1992. The 1992 survey was held outside the practice area involved in the 1977 survey, and therefore, the results were not directly influenced by the 1977 survey. However, as it was performed in the same region of the country, in our view, it is correct to compare these data and to conclude a trend towards an increased prevalence of asthma/COPD with, at the same time, a somewhat higher proportion of cases already detected in routine patient care.

Our study shows that the 'iceberg' of asthma/COPD consists mainly of patients with mild symptoms. However, there are, some patients with undetected symptoms and/or lung function deficits (grades 3–4). The patients under maintenance treatment with inhaled corticosteroids were included in the analysis.

However, it was not possible to assess the severity of the disease in these patients as the corticosteroid treatment will have influenced signs, symptoms and spirometric performance. Therefore, these patients were excluded from the initial screening. Inclusion of these patients in the most severe grade of disease was, in our perception, justified but arbitrary. It was reassuring that no new patients with a serious form of the disease (grade 5) were identified during screening: thus, all severe cases were positioned in the tip of the 'iceberg'. More attention should be paid to patients of mild and moderate severity. Our study did not address the question of why cases detected at screening had not been diagnosed before in routine general practice care. It is important to stress the fact that this is a controversial point: there is no evidence available to this group that early and preventive care will improve the long-term outcome of the disease—evidence that is already available for more severe grades of asthma/COPD.<sup>17</sup> As a consequence of this, there is no scientific basis to promote early presentation, detection and treatment of mild cases. It is our objective to pursue this question in a follow-up of this study: all patients who are found to be in need of treatment will be invited for a randomized, double-blind, placebo-controlled trial to study the effectiveness of inhaled corticosteroids for such patients detected by means of a screening survey.

One of the reported reasons for under-presentation of asthma is that people get accustomed to symptoms and do not find it necessary to consult the general practitioner.<sup>17</sup> In that particular case, the general practitioners cannot be blamed for the fact that a high percentage of patients remain unknown to them. However, it is very important that patients who do consult the general practitioner for their symptoms are diagnosed and properly treated. From our data, it can be inferred that general practitioners are more aware of asthma/COPD: a higher proportion of severe cases had been detected in 1992 compared with 1977. Our contacts with the subjects during screening gave a strong suggestion that those with respiratory abnormalities had only seldom consulted their general practitioner for these problems, indicating under-reporting of symptoms. The subjects already under treatment had significant but mild spirometric abnormalities.

We conclude that there is a real increase in the prevalence of asthma and COPD. Of these patients, nearly all of the most severe cases have been diagnosed in routine patient care. Less-severe cases form the majority of patients, and despite an overall increase of cases identified in daily (general) practice care, the percentage not known to the GP has remained high. Greater insight is mandatory for effective early intervention in this group before sound recommendations can be made to improve early diagnosis of these patients.

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## PARTNERSHIPS IN PRACTICE - DEVELOPING OCCUPATIONAL THERAPY SERVICES IN PRIMARY CARE

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