

Trends in COPD prevalence and exacerbation rates in Dutch primary care

Erik WMA Bischoff, Tjard RJ Schermer, Hans Bor, Pete Brown, Chris van Weel, Wil JHM van den Bosch

ABSTRACT

Background

Changes in the burden of chronic obstructive pulmonary disease (COPD) and its exacerbations on primary health care are not well studied.

Aim

To identify trends in the prevalence of physician-diagnosed COPD and exacerbation rates by age, sex, and socioeconomic status in a general practice population.

Design of study

Trend analysis of COPD data from a 27-year prospective cohort of a dynamic general practice population.

Setting

Data were taken from the Continuous Morbidity Registration Nijmegen.

Method

For the period 1980–2006, COPD and COPD exacerbation data were extracted for patients aged ≥ 40 years. Data were standardised for the composition of the Continuous Morbidity Registration population in the year 2000. Regression coefficients for trends were estimated by sex, age, and socioeconomic status. Rate ratios were calculated for prevalence differences in different demographic subgroups.

Results

During the study period, the overall COPD prevalence decreased from 72.7 to 54.5 per 1000 patients per year. The exacerbation rate decreased from 44.1 to 31.5 per 100 patients, and the percentage of patients with COPD who had exacerbations declined from 27.6% to 21.0%. The prevalence of COPD increased significantly in women, in particular those aged ≥ 65 years with low socioeconomic status. Decreases in exacerbation rates and percentages of patients with exacerbations were independent of sex, age, and socioeconomic status.

Conclusion

The decline in COPD prevalence and exacerbation rates suggests a reduction of the burden on Dutch primary care. The increase of the prevalence in women indicates a need to focus on this particular subgroup in COPD management and research.

Keywords

chronic obstructive pulmonary disease; family practice; prevalence; trends.

INTRODUCTION

The prevalence of chronic obstructive pulmonary disease (COPD) and its subsequent burden on health care differ from country to country but is extensive in most populations.¹ COPD exacerbations contribute substantially to the burden by generating the majority of costs due to the use of healthcare services² and by provoking significant impact on patients' health status.³ In the Netherlands, the burden of COPD mainly affects GPs as most patients with COPD are managed in primary care; as such, there is a growing need to identify changes in the burden and to redirect care to those demographic subgroups that are at highest risk of COPD and its exacerbations. In this context, trend studies may be very useful. So far, most COPD trend studies have used data from national health surveys to estimate trends in the general population,^{4,5} and so their results may not reflect the burden in general practice.

A recent trend study using data from a general

EWMA Bischoff, MSc, MD, GP, junior researcher; TRJ Schermer, PhD, epidemiologist, senior researcher; H Bor, BSc, statistician; C van Weel, PhD, MD, FRCGP, GP and professor in general practice; WJHM van den Bosch, PhD, MD, GP and professor in general practice, Department of Primary and Community Care, Radboud University Nijmegen Medical Centre, Nijmegen, The Netherlands. P Brown, medical student, Imperial College, London, UK.

Address for correspondence

Erik WMA Bischoff, Department of Primary and Community Care, HAG 117, Radboud University Nijmegen Medical Centre, PO Box 9501, 6500 HB Nijmegen, The Netherlands. E-mail: e.bischoff@hag.umcn.nl

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How this fits in

Changes in the burden of chronic obstructive pulmonary disease (COPD) on primary care are not well studied. This long-term trend study demonstrated a decrease in the overall prevalence of physician-diagnosed COPD and in exacerbation rates in Dutch general practices. However, the prevalence of COPD has increased in women, in particular those aged ≥ 65 years with low socioeconomic status. These results indicate the need to focus more on this subgroup in COPD diagnosing, management and research.

practice network demonstrated a constant rise of physician-diagnosed COPD in women.⁶ This could be caused by the increase of tobacco use in women relative to men in the past few decades. The risk of developing COPD in smokers is related to the lifetime cumulative dose, which explains the finding that it is mostly diagnosed in people aged ≥ 65 years and is highly unlikely in those aged < 40 years.⁵ Independent from smoking, socioeconomic status is an important risk factor for COPD.⁷ In addition, factors linked to socioeconomic status, such as respiratory tract infections, housing conditions, air pollution, and diet each contribute to the risk of having exacerbations.^{8–10} Obviously, sex, age, and socioeconomic differences are important factors that can influence trend changes of COPD and exacerbations. Although these factors are well registered in general practice registration networks, their roles have not been well studied in COPD trend studies in primary care.

In this article, long-term trends in physician-diagnosed COPD prevalence and COPD exacerbations in the period 1980–2006 are reported by prospectively studying a dynamic cohort from the Continuous Morbidity Registration Nijmegen. The aim was to identify trend changes in COPD prevalences and COPD exacerbation occurrence rates in different subgroups of the general practice population.

METHOD

Setting

The Continuous Morbidity Registration of the Department of Primary and Community Care of the Radboud University Nijmegen Medical Centre is a prospective cohort study in which four Dutch general practices with a registered practice population of approximately 15 000 subjects in the Nijmegen area have participated since 1967. It is a relatively stable practice population that reflects the Dutch healthcare system, that is, all patients are registered with a GP and all access to care is through referral by the GP.¹¹ Since its founding, the Continuous Morbidity Registration Nijmegen has

served as a successful practice-based research network for many primary care studies.¹²

The GPs of the Continuous Morbidity Registration practices record all diagnoses of all new episodes of illness in a standardised way, based on the E-list that is used to register morbidities in general practice¹³ and the International Classification of Health Problems in Primary Care.¹⁴ Recurrence of an episode after successful treatment or natural recovery (that is, a patient reporting that respiratory symptom aggravation recurred after a period in which exacerbation symptoms had returned to baseline level) is considered as a new episode. Chronic conditions such as COPD are coded annually after the year of initial diagnoses.¹⁵ Diagnoses made by specialists after referral are reported back to the GP and are entered in the database. The validity of the recorded diagnoses in the Continuous Morbidity Registration has been shown to be well above 80% in a variety of conditions.^{16,17}

Subjects and definition of variables

Patients diagnosed with COPD were identified for the period 1980–2006 and were included in the annual prevalence rates from the first year of diagnosis. All patients were retrieved from the database with the E-list codes 'chronic bronchitis', 'lung emphysema', and 'COPD'. In the Continuous Morbidity Registration, COPD exacerbation was defined as an acute episode of respiratory symptom worsening, for which the patient, registered with a diagnostic code compatible with COPD, consulted the GP. Diagnosed exacerbations were recorded separately by adding a unique code for exacerbations to the diagnostic code for COPD or by using the E-list code 'acute bronchitis' or 'chronic bronchitis' in patients previously diagnosed with COPD. Exacerbation follow-up contacts were not considered as new events.

A small and, in time, significantly decreasing proportion of patients aged < 40 years was observed in the Continuous Morbidity Registration. Given this small proportion and the opinion that COPD is highly unlikely in subjects aged < 40 years, trend analyses were limited to data from patients with COPD who were aged ≥ 40 years. Age was grouped into two bands: 40–64 years and ≥ 65 years. Socioeconomic status was determined by classifying the occupation of the patient using the Netherlands Standard Classification of Occupations 1992.¹⁸ The coded occupations were ranked into low, medium, and high socioeconomic status. Due to very low prevalence rates and small group sizes in the high socioeconomic status group, the medium and high socioeconomic status groups were joined in the

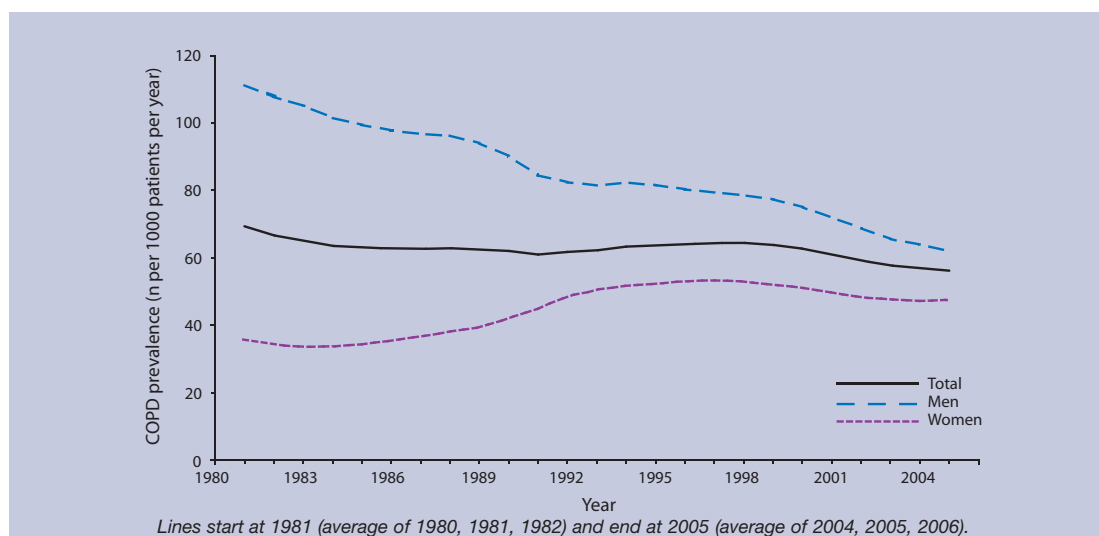


Figure 1. Trends in prevalence (n per 1000 patients per year), of physician-diagnosed COPD by sex; 3-year moving averages for the period 1980 to 2006.

trend analyses and will be presented as 'medium to high socioeconomic status'.

Statistical analyses

The number of patients with COPD and the frequency of exacerbations per patient were counted annually. Prevalence and exacerbation rates were standardised for the composition of the Continuous Morbidity Registration population in the year 2000 by age, sex, and socioeconomic status. Univariate regression analyses were conducted on the annual COPD prevalences and exacerbation rates using SPSS (version 16.0.2., SPSS Inc, Chicago). Regression coefficients for trends (RC trends) should be interpreted as the annual change in prevalence per 1000 patients per year. An RC trend was considered statistically significant if the 95% confidence interval (CI) did not include 0 and if $P < 0.05$.

Rate ratios (RRs) were calculated by dividing the annual prevalence or occurrence rate of two different subgroups (that is, males versus females, medium to high socioeconomic status versus low socioeconomic status, 40–64 years versus ≥ 65 years).

In the exacerbation data an apparent split was observed in 1986 that may have been caused by a change in the registration of exacerbations; therefore, regression analyses were conducted on exacerbation data from 1986 onwards. Figures 2 and 3 presenting exacerbation rates also show data from 1980 to 1985.

Prevalence rates are presented as the number of COPD cases per 1000 patients per year and exacerbation rates as the number of exacerbations per 100 patients with COPD per year.¹⁵ The presented Figures 1–3 show 3-year moving average

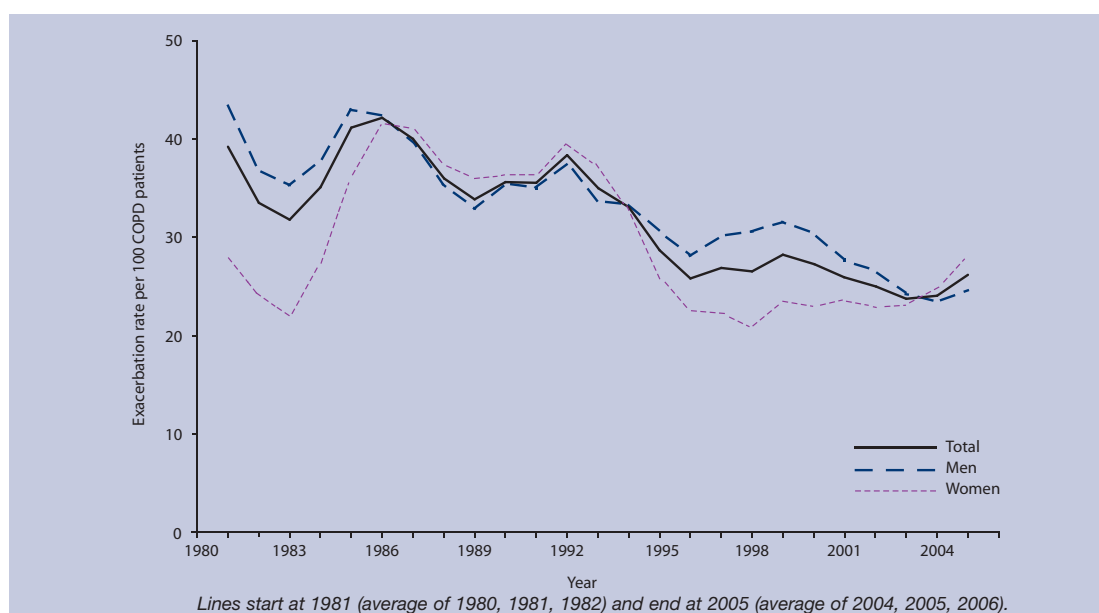


Figure 2. Trends in exacerbation rates (n per 100 patients per year) of patients with physician-diagnosed COPD; 3-year moving averages for the period 1980 to 2006. Trends were analysed for the period 1986–2006.

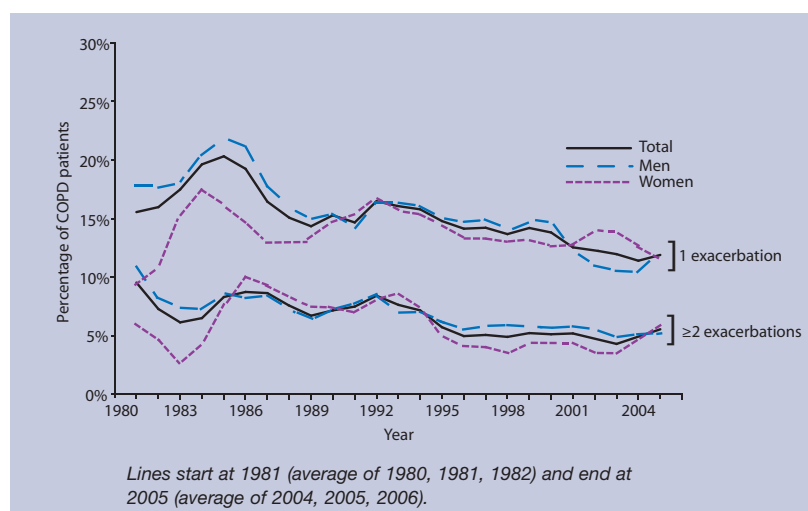


Figure 3. Trends in COPD patients with exacerbations (% of total COPD patients): 3-year moving averages for the period 1980–2006. Trends were analysed for the period 1986–2006.

rates to reduce the effect of random variation in consecutive calendar years.

RESULTS

Trends in COPD

In 1980, a total of 423 patients aged ≥ 40 years with physician-diagnosed COPD could be detected in the Continuous Morbidity Registration population. The prevalence per 1000 patients per year was 72.7. In 2006, the number of patients with COPD had decreased to 317 with a prevalence of 54.4 patients per 1000 patients per year. Figure 1 shows trends in COPD prevalence for the total cohort and for men and women separately. In 1980, COPD prevalence in men was higher than in women ($RR = 3.1$), but decreased from 115.2 patients per 1000 patients per year to 59.0 patients per 1000 patients per year ($RC\ trend = -1.92$, 95% $CI = -2.06$ to -1.77) in 2006. In contrast, the COPD prevalence in women increased from 37.5 patients per 1000 patients per year in 1980 to 47.2 patients per 1000 patients per year in 2006 ($RC\ trend = 0.73$, 95% $CI = 0.49$ to 0.96),

thereby closing the gender gap ($RR = 1.2$). Table 1 presents prevalence estimates by sex combined with age and socioeconomic status.

In men and women the prevalence rates were highest in patients aged ≥ 65 years with a low socioeconomic status. The strongest increase in COPD prevalence was observed in women of low socioeconomic status aged ≥ 65 years (prevalence difference 1980–2006 = 46.5 per 1000 patients per year, $RC\ trend = 2.55$, 95% $CI = 2.02$ to 3.09), while the strongest decrease in COPD prevalence was demonstrated in men of low socioeconomic status aged ≥ 65 years (prevalence difference 1980–2006 = -134.1 per 1000 patients per year, $RC\ trend = -5.17$, 95% $CI = -6.23$ to -4.12). In all male subgroups the COPD prevalence trends showed a statistically significant decrease in the regression analyses.

Trends in COPD exacerbations

From 1980 until 2006, a total of 2831 exacerbations were recorded by the GPs in the Continuous Morbidity Registration practices. Figure 2 presents trend curves for the annual exacerbation rates in the total COPD population and in men and women separately. The trend curve in the total COPD cohort showed a gradual decline from 1986 onwards, from 45.2 to 31.5 exacerbations per 100 patients with COPD. The estimated trend regression coefficient showed a decrease of 0.82 exacerbations per 100 COPD patients per year (95% $CI = -1.14$ to -0.50). This trend was also observed in men ($RC\ trend = -0.77$, 95% $CI = -1.09$ to -0.45) and women ($RC\ trend = -0.94$; 95% $CI = -1.41$ to -0.46) when analysed separately. The rate ratio for men versus women varied from 0.92 in 1986 to 1.26 in 1996 and 0.80 in 2006. The separate trend curves for patients aged 40–64 years and ≥ 65 years and for patients of low socioeconomic status and medium to high socioeconomic status also showed a

Table 1. Prevalence rates of physician-diagnosed COPD by sex, age and socioeconomic status for the period 1980 to 2006.

Population subgroup	Prevalence per 1000 patients per year		Prevalence difference between 1980 and 2006 (%)	Regression coefficient trend (95% CI) ^a	P-value for trend
Men					
Aged 40–64 years with low socioeconomic status	76.3	42.0	–34.3 (44.9)	–0.98 (–1.24 to –0.71)	<0.001
Aged 40–64 years with medium to high socioeconomic status	56.4	16.3	–40.1 (71.0)	–1.30 (–1.56 to –1.04)	<0.001
Aged ≥65 years with low socioeconomic status	311.5	177.4	–134.1 (43.0)	–5.17 (–6.23 to –4.12)	<0.001
Aged ≥65 years with medium to high socioeconomic status	216.7	154.3	–62.4 (28.8)	–1.55 (–2.04 to –1.05)	<0.001
Women					
Aged 40–64 years with low socioeconomic status	26.2	38.9	12.7 (48.7)	0.61 (0.44 to 0.79)	<0.001
Aged 40–64 years with medium to high socioeconomic status	17.1	13.2	–3.9 (23.2)	–0.033 (–0.20 to 0.13)	0.680
Aged ≥65 years with low socioeconomic status	88.8	135.3	46.5 (52.4)	2.55 (2.02 to 3.09)	<0.001
Aged ≥65 years with medium to high socioeconomic status	58.7	88.5	29.8 (50.7)	2.25 (1.85 to 2.65)	<0.001

^aThe regression coefficient trend reflects the annual change in prevalence per 1000 patients per year.

statistically significant decline. After combining sex with age and socioeconomic status, the number of exacerbations became too small to estimate trend regression coefficients.

Figure 3 shows trends in patients with COPD who have exacerbations for the total COPD cohort and for men and women separately. In 1986, 20.4% of patients with COPD reported one exacerbation and 9.2% reported two or more exacerbations. In 2006, the percentage of patients with exacerbations had decreased to 14.6% for patients with one exacerbation (RC trend = -0.26 , 95% CI = -0.42 to -0.11) and to 6.4% for patients with two or more exacerbations (RC trend = -0.19 , 95% CI = -0.29 to -0.093). The separate trend curves for male and female patients with COPD who have exacerbations also showed a significant decrease. The trend curves by age and socioeconomic status were comparable to the trend curves by sex. Again, the number of patients having exacerbations became too small to conduct further analyses when combining sex with age and socioeconomic status.

DISCUSSION

Summary of main findings

Using data from the Continuous Morbidity Registration Nijmegen, this study demonstrated that the overall prevalence of physician-diagnosed COPD has decreased significantly during the last decades. The annual rates of exacerbations and proportions of patients with COPD who had exacerbations had also decreased. These findings suggest a reduction rather than an increase of the COPD burden on Dutch primary care.

When analysing prevalence trends by sex, age, and socioeconomic status a significant increase of COPD prevalence in women was observed, in particular in those aged ≥ 65 years of low socioeconomic status. In men, on the other hand, the prevalence of COPD had decreased, independent of age and socioeconomic status. The decreasing trend curves for exacerbation rates and percentage of patients with exacerbations were independent of sex, age, and socioeconomic status.

Strengths and limitations of the study

The strengths of the current study are the long follow-up period and the standardised way of recording COPD and COPD exacerbations in all four general practices. The decision to present prevalence rates from the period 1980 and onwards was mainly based on the validity of the data prior to 1980. As three of the four practices started with morbidity registration in 1967 and the fourth practice joined the registration network in 1971, the first years after 1967 were considered as a 'run-in

period'. When studying all COPD data in the Continuous Morbidity Registration, very low prevalence rates were found in the first years of registration followed by a sharp increase in the following years. This 'run-in period' has been confirmed by the oldest generation among the current GPs in the four practices. By choosing 1980 as a starting point there was greater confidence about the validity of the data; having 2006 as the end date meant it was possible to cover a very long and unique timeframe. In addition, the information in the Continuous Morbidity Registration may be considered as complete because diagnoses made by specialists are reported back to the GP and are also entered in the database. This makes the Continuous Morbidity Registration a unique database for long-term trend analyses. However, as this study had an observational design, it cannot prove causality and, as such, the results should be interpreted with care.

Although the population of the Continuous Morbidity Registration reflects the Dutch general population regarding sex and age,¹² the network consists of only four practices. This may have caused the limited annual number of recorded exacerbations when analysing the different subgroups of male and female patients. Although it seems reasonable to assume that changes in smoking patterns will have attributed to the changes in prevalence and exacerbations trends, there is a lack of valid information regarding smoking status in the Continuous Morbidity Registration. This is not unique for this registration network, but is a concern to all general practice research networks that rarely use uniform definitions to document current or past smoking habits.¹⁹

Since 1996, diagnosing COPD in the Continuous Morbidity Registration practices has changed from a physician-based diagnosis to a more objective diagnosis using lung-function measurements according to COPD guidelines.^{20,21} This could have provoked a change in the overall prevalence of physician-diagnosed COPD, but this was not observed in prevalence trends from 1996 onwards.

Comparison with existing literature

Accurately estimating the prevalence of COPD very much depends on the study population and the study methods.²² Therefore, the prevalence rates in the current study should be compared with other prevalence rates based on physician-reported diagnoses. Although a higher prevalence rate was found than the UK trend study published in 2000,⁶ the finding is in line with a recent study that showed a pooled prevalence of 5.2% (95% CI = 3.3% to 7.9%).²³

The gradual decline in the prevalence of COPD between 1980 and 2006 seems to be mainly caused by the sharp decrease of the prevalence in men, independent of age and socioeconomic status. The rise of COPD prevalence in women has been reported previously.^{5,6} However, the current study is the first to actually demonstrate that the strongest increase is in women aged ≥ 65 years of low socioeconomic status. This finding is likely to reflect the increase of tobacco use in this subgroup during the last decades. Between 1960 and 1981, smoking rates have decreased sharply in Dutch men and recently smoking rates have also started to decrease in women, in particular those aged 20–34 years.²⁵ If this decline continues, the increasing prevalence of COPD in women is likely to have its peak in the next decades.

It could be questioned whether the current results reflect the true burden of the disease in primary care as GPs tend to under-diagnose COPD^{26,27} and patients may fail to present their symptoms.²⁸ A third of current smokers in general practice has undiagnosed COPD²⁹ although a substantial proportion shows respiratory symptoms that need treatment.²⁶ This implies that the true burden of COPD in primary care is far more extensive than would be expected when based on the results of the current study.

So far, there are no studies that show trends in exacerbation rates in patients in primary care. With overall annual exacerbations rates between 44.1 (1980) and 31.5 exacerbations (2006) per 100 patients with COPD, the mean exacerbation rate per patient was less than one reported exacerbation per 2 years in the current study. In addition, less than 30% of patients with COPD contributed to the total annual exacerbation rate and less than 10% could be considered as frequent exacerbators, that is, patients with COPD who have two or more exacerbations.²⁰ However, previous studies demonstrated that many patients have problems in recognising symptom aggravation³⁰ and fail to report the exacerbation to their health professional.³¹ Although there is a relationship between age and the risk of underreporting,³² no difference was found in reported exacerbations between patients aged 40–64 years and patients aged ≥ 65 years. Also, there was no confirmation of the relationship between low socioeconomic status and the risk for exacerbations reported from secondary-care studies.^{8–10}

Although there is no straightforward explanation for the declining exacerbation trends, two different developments may have contributed to these findings. Vaccines and several pharmacological treatments (such as long-acting bronchodilators and

inhaled corticosteroids) that may reduce exacerbation frequency and severity have been introduced in the last two decades;⁸ in addition, in 1992 the Dutch College of General Practitioners (NHG) introduced the first guideline on COPD management with a specific focus on the treatment of acute exacerbations.³³ This may have caused a change in the attitude of Dutch GPs towards the prevention and treatment of exacerbations.

Implications for future research and clinical practice

This study demonstrated that the prevalence of physician-diagnosed COPD has decreased in recent decades. Although this study did not investigate the prevalence of undiagnosed COPD in the practice population, GPs should be aware that many patients are still undiagnosed. The finding that the increasing prevalence of COPD in women is particularly noted in those aged ≥ 65 years with a low socioeconomic status indicates the need to focus more on this subgroup in COPD diagnosing, management, and research. The decrease in the number of recorded exacerbations and the decrease in the percentage of patients with COPD who have exacerbations are encouraging. However, as previously stated, the underreporting of worsening symptoms is a major concern in the management of patients with COPD. Improving patient understanding of the nature of an exacerbation and early recognition of its symptoms could benefit its reporting.

In conclusion, this is the first study that reports on long-term trends in COPD prevalence and exacerbation rates in primary care using unique registration data from the Continuous Morbidity Registration Nijmegen. The results from this study give more insight into trend changes in different demographic subgroups and may help GPs to redirect care and to diminish the burden of COPD.

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Ethics committee

Not applicable

Competing interests

The authors have stated that there are none

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