

# Increased prevalence of chronic obstructive pulmonary disease in a general population



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## KEYWORDS

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## Summary

**Background:** Prevalence of COPD is increasing worldwide, and there is need for regularly updated estimates of COPD prevalence and risk factors.

**Methods:** In the Norwegian Hordaland County Cohort Study (HCCS), 1664 subjects aged 35–90 yrs answered questionnaires and performed spirometry in 2003–05. We estimated COPD prevalence and analysed risk factors for COPD with logistic regression.

**Results:** In a previous study phase, prevalence of GOLD-defined COPD was 7%. Eight years later, corresponding prevalence was 14%. Seventy % of the subjects experienced respiratory symptoms. Only 1 out of 4 had a physician's diagnosis. Significant risk factors for COPD were sex, age, smoking habits and pack-years. Men had 1.7 (OR, 95% CI 1.2, 2.3) higher odds for COPD than women. Subjects above 65 yrs had 10.3 (OR, 95% CI 6.4, 16.5) times higher odds for COPD than subjects below 40 yrs. Heavy smokers had 4.2 (OR, 95% CI 2.6, 6.7) times higher odds for COPD than subjects with <10 pack-years. When compared with the previous study phase, age and smoking status had roughly the same associations with COPD prevalence. Educational level and male gender, on the other hand, had less effect on COPD prevalence in 2005 than in 1997, while pack years were more important in 2005 than in 1997.

**Conclusions:** Prevalence of GOLD defined COPD has increased from 7% to 14% in nine years. Although the risk factors remain the same, the strength of associations vary. There is still substantial under diagnosis in COPD, and better disease awareness and diagnostic routines are needed.

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## Introduction

The public has become increasingly aware of chronic obstructive pulmonary disease (COPD) during recent years. At the same time, COPD has become increasingly more prevalent across the world, and it is now estimated to be the fourth leading cause of death worldwide.<sup>1</sup>

COPD is a progressive disease characterized by persistent airflow limitation and an enhanced inflammatory response in the airways and the lungs to noxious particles or gases.<sup>2</sup> The most common symptoms are dyspnea, chronic cough and chronic sputum production. Spirometry is required to diagnose COPD patients according to international guidelines.<sup>2,3</sup> The disease usually exhibits a slow progression and COPD patients consequently often wait for many years before seeking medical advice, dismissing early symptoms as smokers cough, lack of general fitness, or simply part of the ageing process. As a result, the disease is widely under diagnosed, despite the large prevalence of symptoms affecting a substantial number of people in their everyday activities.<sup>4–7</sup>

Active cigarette smoking is by far the most important cause of this disease. But also passive smoking, occupational exposure to airborne agents, air pollution and poor indoor climate are important COPD risk factors.<sup>2,8–11</sup> In addition, other risk factors that have a more complex association with disease development and prognosis than direct inhalation are of relevance – such as socioeconomic status, nutrition, physical activity and mental well-being.<sup>12–18</sup>

International reports and guidelines unanimously state that the prevalence of COPD is increasing worldwide.<sup>2,19</sup> Thus, there is need for regularly updates of prevalence estimates in general populations to keep track of this worrying development. The COPD prevalence estimates that have been used in Norway for official reports and health care planning are based on a general population that was examined in 1996–97.<sup>20</sup> Based on the 1996 situation, COPD prevalence was estimated to be 7% in Norwegian adults, ranging from less than 3% in never-smokers to more than 17% in ever-smokers who had smoked more than 20 pack years. The 1996 prevalence was based on COPD defined according to the Global Initiative of Chronic Obstructive Lung Disease (GOLD) as a fixed ratio of forced expiratory volume in one second (FEV1) over forced vital capacity (FVC) < 0.7. Although the GOLD guidelines still advocate the fixed ratio for practical reasons, it is a fact that the FEV1/FVC declines with age and thus risks over diagnosing COPD in the elderly. Consequently the definition of COPD as a ratio less than lower limit of normal has been recommended as a replacement for the fixed ratio, among others by the American Thoracic Society and European Respiratory Society.<sup>21–23</sup>

The aim of the present study was to update prevalence estimates of COPD in a general adult population in Norway, and to examine differences in both disease prevalence and risk factor associations across time. In addition, we wanted to assess the degree of under diagnosis among COPD subjects, and the presence of respiratory symptoms in spirometry-defined COPD cases.

## Material and methods

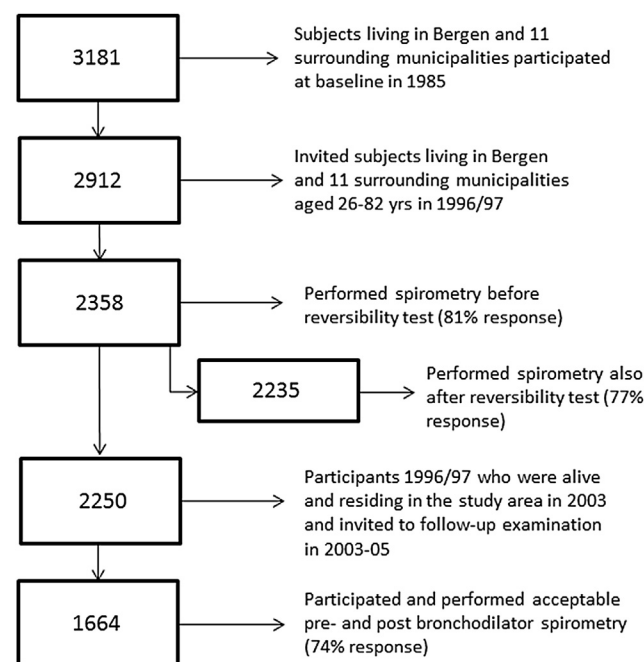
### Study population

This study is based on the second follow-up survey in the Hordaland County Cohort study (HCCS) in 2003–2005 (Fig. 1). Initially, the HCCS comprised 3181 participants from Bergen and 11 surrounding municipalities in 1985, of whom 2358 performed acceptable spirometry in the first follow-up in 1996–97 (74%).<sup>24</sup> Of these, 2250 subjects who still lived in Hordaland County in 2003–05 were invited to the second follow-up. Altogether 74% ( $n = 1664$ ), aged 35–90 yrs, of those invited performed an acceptable spirometry. Reasons for loss to follow-up have been described in detail previously.<sup>14</sup>

### Data collection

The study included extensive questionnaires and clinical examinations. Respiratory symptoms (cough and dyspnea), exposure of occupational dust and gas, educational level and smoking habits were registered using self-administered questionnaires. Occupational dust and gas exposure were defined as an affirmative answer to the question “Have you ever had a work place with much dust or gas in the air?”. Smoking habits were classified as never smokers, current smokers and ex-smokers. One pack-year was defined as 20 cigarettes a day for 1 year. Educational level was classified into primary, secondary and university. Height and weight were registered, and body mass index (BMI) was calculated based on WHO guidelines.

FVC and FEV1 were measured according to the American Thoracic Society standards with a Vitalograph 2160



**Figure 1** Flow chart of invited and participants in the Hordaland County cohort from first study phase in 1985 to last study phase in 2003–05.

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