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Lack of awareness towards smoking-related health risks, symptoms related to COPD, and attitudinal factors concerning smoking: an Internet-based survey conducted in a random sample of the Danish general population

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ABSTRACT

Background: Although chronic obstructive pulmonary disease (COPD) is one of the leading causes of morbidity and mortality globally, several studies have shown little awareness of COPD in the general population. The awareness of COPD in the Scandinavian countries is, however, sparsely investigated.

Objective: The aim of this study was to explore the awareness in the general Danish population of smoking-related health risks and symptoms related to COPD and attitudinal factors concerning smoking.

Design: Adults aged 18 years or older were randomly selected to reflect the background population. An Internet-based questionnaire was conducted in January–February 2015.

Results: A total of 1002 answered the questionnaire (515 males; 487 females). In total, 17.7% were current smokers (men: 15.5%–women: 19.9%). More smokers and ex-smokers knew the symptoms of COPD compared to never-smokers ($p < 0.001$). Ex-smokers had undergone more pulmonary function tests than smokers and never-smokers ($p < 0.001$) and significantly more men than women who had undergone pulmonary function test.

Ex-smokers were more likely to rate cancer as the most feared disease ($p = 0.026$) than the smokers. Of the smokers, 28% did not regard COPD as a deadly disease and significantly more smokers than ex-/never-smokers believed that smoking cessation should not be mandatory before treatment of COPD and asthma ($p < 0.001$).

Conclusion: Overall, smokers, ex-, and never-smokers had little knowledge of COPD regarding aetiology, symptoms, and severity thus emphasizing the necessity of early detection of COPD and more focus on spirometry in general practice, especially amongst smokers.

There is a great discrepancy between the attitude of smokers and ex-/never-smokers towards mandatory smoking cessation before receiving treatment of smoking-related diseases.

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Introduction

Globally, chronic obstructive pulmonary disease (COPD) is one of the leading causes of morbidity and mortality. In 2015, COPD was the fourth leading cause of death in the world and is expected to increase even further in the next decades [1]. The prevalence is estimated to range from 8 to 14% [2–4] and there is a considerable economic burden to health systems caused by COPD [5].

The primary cause of COPD is tobacco smoking and the risk of developing COPD among smokers is more than 40% [6]. Despite a massive effort with several campaigns to promote smoking cessation/preventing the initiation of smoking as well as banning smoking in public places in Denmark since 2007, approximately 17% of the Danish population above 15 years were daily smokers in 2016 with no difference between genders. Although this was a decline from 26% in 2005, the number of daily smokers in Denmark seems to have stagnated since 2010 [7,8]. Smoking cessation reduces the risk of developing COPD and the relative risk of dying from COPD [9,10]. Ex-smokers constituted 30.7% of the adult Danish population in 2015 [8].

COPD is a slowly progressing chronic disease where patients often fail to acknowledge the symptoms in the early stages leading to a delayed diagnosis. Time of debut of COPD is often unclear to the patient and even patients with severe/end-stage COPD often accept symptoms (e.g.

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breathlessness) and disabilities as a life condition rather than an illness [11]. Moreover, patients with COPD are often under-or misdiagnosed [6,12–14]. Therefore, increased awareness in the general population about COPD is an important factor in the diagnosis.

As there are no validated methods to evaluate the awareness of COPD in the general population, several studies have sought to investigate this by using different methods and questionnaires. Thus, the results are not directly comparable; however, they all find a lack of awareness of COPD in both the general and the high-risk population (smokers) [15–22].

The awareness of COPD in the Scandinavian countries is sparsely investigated and the aim of this study was to explore the awareness in the general Danish population of smoking-related health risks and symptoms related to COPD and attitudinal factors concerning smoking.

Methods

The study was performed by Voxmeter A/S, a company experienced in interviews and data collection [23]. Voxmeter's web panel includes only respondents who have been randomly selected in the Danish population and recruited over the phone by a professional interviewer. Each person is identified by a person specific number to ensure no repeated participants.

The study population was selected from Voxmeter's web panel to reflect the Danish population above 18 years who has Internet access. The interview was conducted as an Internet questionnaire in January and February 2015 by gathering data on background characteristic (e.g. age, gender, educational level, smoking status), knowledge of COPD, and opinion towards treatment. Ethical approval of the study was not obtained as the study was solely based on the questionnaire and the participants were ensured complete anonymity.

Statistical analysis

Data were presented as percentage or means, as appropriate. Means were compared with unpaired Student's *t*-test. Percentages were compared using Pearson's chi-square test. When assessing questionnaire domains with continuous input options, responses were grouped in major response groups as appropriate and as indicated when reporting the results. Data analyses were performed using Stata version 14 (StataCorp, College Station, Texas, US).

Results

A total of 3000 questionnaires were set out and 1002 individuals answered the questionnaire (515 males; 487 females). The study population was comparable to the Danish background population concerning gender, age, and geography with minor variation. Long/Middle higher education was overrepresented in the study population and short higher as well as primary and lower secondary education were underrepresented in the study population. No comparable data on smoking status among the ex-smokers were available. The demographic characteristics are summarized in Table 1.

Smoking status showed that 15.5% of males and 19.9% of females were current-smokers. In total, 17.7% of the population was current-smokers (Table 1). Mean age was 47.2 years for smokers (95% CI: 45.0–49.5 years) and 47.7 years for never-smokers (46.1–49.2 years), while ex-smokers, with a mean age of 56.5 years (95% CI: 55.1–58.0 years), were significantly older than the other groups ($p < 0.001$).

Significantly more smokers and ex-smokers knew the symptoms of COPD compared to those who had never-smoked ($p < 0.001$). However, 13.0% of the smokers and 15.5% of the never-smokers did not know the symptoms of COPD. Ex-smokers had undergone significantly more pulmonary function tests than smokers and never-smokers ($p < 0.001$); there was no significant difference between the latter two ($p = 0.710$).

There were no significant differences between the three groups when asked whether or not it is people's own fault when they develop COPD ($p = 0.241$). One-third of the smokers disagreed that COPD was self-inflicted.

Regarding age and gender, we found significantly more men than women and elderly (>55 years) than young (18–54 years) who had undergone pulmonary function test. An overweight of men and younger persons agreed that it is people's own fault if they develop COPD. More women than men and elderly than the young knew the symptoms of COPD. Significantly more in the young group thought of COPD as a deadly disease, but there was no difference between genders (Table 2).

Table 3 shows which diseases smokers, ex-smokers, and never-smokers fear the most. Rating cancer as the most feared disease was significantly more common among ex-smokers than among smokers ($p = 0.026$). There was no significant difference between never-smokers and smokers ($p = 0.061$). Ex-smokers and never-smokers equally often rated cancer highest ($p = 0.579$). COPD was equally often rated as the most feared disease among never-smokers and ex-smokers ($p = 0.993$) and was significantly more often rated highest among smokers (smokers *vs.* ex-smokers = 0.044, smokers *vs.* never-smokers = 0.031). Statistics are not shown in the table.

Among smokers, 28% did not regard COPD as a deadly disease, which is significantly more than in the ex- and never-smoking groups ($p = 0.012$). A large

Table 1. Demography of the Danish population and the study population.

Demography*N* (%)		Background population*	Study population
Gender			
	Male	2792,279 (49.6)]	515 (51.4)
	Female	2834,956 (50.4)	487 (48.6)
Age (years)			
	18–34	1171,863 (26.3)	195 (19.5)
	35–44	753,265 (17.0)	149 (14.9)
	45–54	805,921 (18.1)	194 (19.4)
	55–64	692,028 (15.6)	211 (21.1)
	65–75	611,679 (13.7)	221 (22.1)
	75–	415,055 (9.3)	32 (3.2)
Education		(20–69 years)	(18 years+)
	Primary and lower secondary education	777,282 (21.4)	147 (14.7)
	Upper secondary education	338,741 (9.3)	98 (9.8)
	Short higher education	1405,189 (38.7)	217 (21.7)
	Middle higher education	616,847 (17.0)	359 (35.8)
	Long higher education	311,222 (8.6)	163 (16.3)
	Unknown	181,570 (5.0)	18 (1.8)
Region			
	Capital region of Denmark	141,3478 (31.1)	327 (32.6)
	Region Zealand	653,415 (14.5)	129 (12.9)
	The South Denmark region	956,750 (21.4)	215 (21.5)
	Central Denmark Region	1010,918 (22.7)	228 (22.8)
	The North Denmark region	466,701 (10.3)	103 (10.3)
Smoker/Ex-smoker	Gender		
	Male	18.6	80 (15.5)/202 (39.2)
	Female	15.5	97 (19.9)/158 (32.4)
	Total	17.0	177 (17.7)/360 (35.9)
	Age (years)		
	18–34/16–34	14.2	43 (22.1)/34 (17.4)
	35–44	16.3	28 (18.8)/41 (27.5)
	45–54	21	45 (23.2)/59 (30.4)
	55–64	21.4	33 (15.6)/98 (46.3)
	65–74	16.9	27 (12.2)/110 (49.8)
	>75	12	1 (3.1)/18 (56.3)

*Demographics of Denmark in 2014. StatBank Denmark. http://www.statistikbanken.dk/statbank5a/default.asp?w=1366.

group of smokers (18.1%), ex-smokers (16.1%), and never-smokers (21.3%) did not know if they regard COPD as a deadly disease (Table 2).

Of current and ex-smokers, 86.9% believed that persons with lifestyle diseases should have the same access to treatment as persons with non-lifestyle diseases, which was significantly more than among never-smokers (80.7%) (p = 0.009) (Figure 1C).

Significantly more smokers (27.7%) than ex-smokers (10.6%) and never-smokers (6.9%) believed that smoking cessation was an individual decision even in cases where smoking cessation played a major role regarding successful outcome of treatment (p for trend <0.001). The majority of smokers (61.6%), ex-smokers (58.1%), and never-smokers (61.3%) believed that smoking cessation should be mandatory before treatment in cases where smoking cessation played a major role in treatment outcome, whereas significantly more ex- and never-smokers also believed that smoking cessation should be mandatory before the start of even minor or expensive treatments (Figure 1A).

Significantly more smokers than ex-smokers and never-smokers believed that smoking cessation should not be mandatory before initiation of treatment for COPD and asthma (p < 0.001) (Figure 1B).

Discussion

This study provides new and relevant knowledge about the awareness in the general Danish population of smoking-related health risks and symptoms related to COPD.

Tobacco smoking is the most important risk factor for developing COPD. However, one-third of the smokers in our study disagreed that COPD to a great extent is caused by exposing one-self to risk factors indicating a great lack of knowledge of the main aetiology of COPD. This is supported by the study by Menezes et al. [24] reporting that 31% of a cohort of 4343 patients with COPD somewhat disagreed/strongly disagreed that smoking is the cause of most cases of COPD. We found that the smokers feared COPD more than the ex- and never-smokers, but the figures were however low (5.1 *vs.* 1.9%).

The relatively high level of general knowledge of COPD in the population is not supported by Soriano et al. who found a low knowledge of COPD symptoms (17%) in the general Spanish population [22]. This difference could be due to the way the questions are asked. In our study, we do not ask into the specific symptoms and there is no incorporated pitfall in the

Table 2. Knowledge of COPD in the study population.

		Smoking status							Gender					Age (years)				
Question	*N* (%)	Smoker		Ex-smokers		Never smokers		*p*-Value	Men		Women		*p*-Value	18–54		>55		*p*-Value
Do you know the symptoms of COPD?																		
	Yes	153	86.4	321	89.2	379	81.51		422	81.9	431	88.5		434	80.7	419	90.3	
	No	23	13.0	30	8.3	72	15.5	<0.001*	75	14.6	50	10.3	$p = 0.028$	92	17.1	33	7.1	$p < 0.001$
	I don't know	1	0.6	9	2.5	14	3		18	3.5	6	1.2		12	2.2	12	2.6	
Sum		177	100.0	360	100.0	465	100		515	100.0	487	100.0		538	100.0	464	100.0	
Have you ever had a pulmonary function test performed?																		
	Yes, once	31	17.5	90	25.0	119	25.6		124	24.1	116	23.8		106	19.7	134	28.9	
	Yes, several times	50	28.2	119	33.1	96	20.6	<0.001**	151	29.3	114	23.4	$p = 0.047$**	116	21.6	149	32.1	$p < 0.001$**
	No	95	53.7	143	39.7	236	50.8		228	44.3	246	50.5		305	56.7	169	36.4	
	I don't know	1	0.6	8	2.2	14	3		12	2.3	11	2.3		11	2.0	12	2.6	
Sum		177	100	360	100.0	465	100		515	100.0	487	100.0		538	100.0	464	100.0	
Do you think that it is people's own fault when they develop COPD?																		
	Agree	94	53.1	168	46.7	226	48.6		207	52.4	218	44.8		282	52.4	206	44.4	
	Disagree	58	32.8	145	40.3	169	36.34	$p = 0.241$	169	32.8	203	41.7	$p = 0.004$	179	33.3	193	41.6	$p = 0.005$
	I don't know	25	14.1	47	13.1	70	15.1		76	14.8	66	13.6		77	14.3	65	14.0	
Sum		177	100.0	360	100.0	465	100		452	100.0	487	100.0		538	100.0	464	100.0	
Do you regard COPD as a deadly disease?																		
Yes		95	53.7	232	64.4	273	58.7		290	56.3	310	63.7		304	56.5	296	63.8	
No		50	28.2	70	19.4	93	20	$p = 0.035$***	114	22.1	99	20.3	$p = 0.193$	128	23.8	85	18.3	$p = 0.018$
I don't know		32	18.1	58	16.1	99	21.3		111	21.6	78	16.0		106	19.7	83	17.9	
Sum		177	100	360	100.0	465	100		515	100.0	487	100.0		538	100.0	464	100.0	

*p for trend <0.001. Active smokers and ex-smokers significantly differed from never-smokers. Active smokers *versus* ex-smokers: $p = 0.104$.
**'Once or several times' were tested against 'no.' Active smokers and never-smokers significantly differed from ex-smokers (p for trend <0.001). Active smokers *versus* never-smokers: $p = 0.710$.
***p for trend = 0.035. Smokers differed significantly from ex-smokers and from never-smokers. Ex-smokers *versus* never-smokers: $p = 0.504$.

Table 3. The most feared diseases in the study population.

	Total	%	Smokers	%	Ex-smokers	%	Never-smokers	%
1	Cancer	69.20	Cancer	62.1	Cancer	71.7	Cancer	69.9
2	Psychiatric disorder	10.10	Psychiatric disorder	11.3	CVD	7.8	Psychiatric disorder	11
3	Other	7.00	Other	11.3	Psychiatric disorder	8.3	Other	6.9
4	CVD	5.50	COPD	5.1	Other	5.0	CVD	4.5
5	COPD	2.50	CVD	3.4	Osteoporosis	2.8	Allergy	1.9
6	Osteoporosis	1.90	Allergy	2.3	COPD	1.9	COPD	1.9
7	Allergy	1.60	Arthritis	1.7	Allergy	0.8	Arthritis	1.5
8	Arthritis	1.30	Osteoporosis	1.7	Arthritis	0.8	Osteoporosis	1.3
9	Diabetes	1.00	Diabetes	1.1	Diabetes	0.8	Diabetes	1.1

Question: What disease do you fear the most?

CVD: Cardiovascular disease.

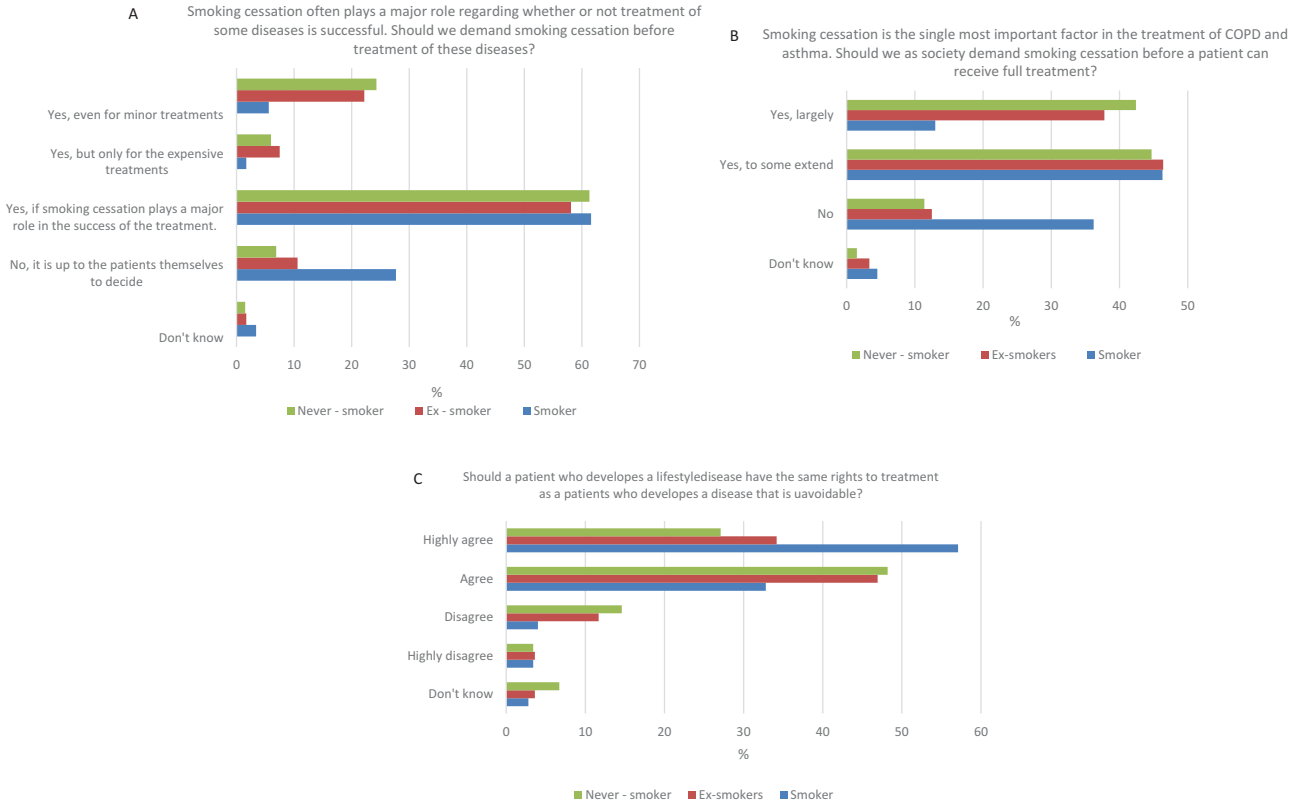

Figure 1. Questions about smoking cessation and treatment of lifestyle diseases.

questionnaire. The question regarding symptoms of COPD was self-estimated by 'yes,' 'no,' or 'I don't know,' which could lead to an overestimation in the group who answered 'yes.'

The short higher and primary/lower secondary education were underrepresented in the study population (Table 1). This could induce bias because knowledge about – and attitude towards – health-related questions in the lower socioeconomic groups might be lower than average. As smoking is more prevalent in these groups, our results tend to overestimate the actually general awareness of COPD as the study population is better educated and has some Internet skills. This indicates that awareness of COPD in Denmark among smokers – even in the more well-educated groups – is low.

We found that 46% of the smokers had undergone one or more pulmonary function tests with no significant difference between smokers and never-smokers. Spirometry is an essential tool in diagnosing COPD; however, the use of spirometry in medical practice in Denmark varies widely and is in general too low – despite a high degree of availability. An increase in the use of spirometry in patients with respiratory symptoms has been recorded in some studies [12,22]. In the study by Ulrik et al. [25] among Danish general practitioners, the number of performed spirometries is very low – especially when taking into account that spirometry is a well-paid procedure. We find that 20% of never-smokers self-estimate that they have had more than one spirometry performed. In the light of the above, this number seems very high indeed. It might be due to recall-

bias, over-estimation, or maybe because they are not completely sure what a spirometry is and therefore get the answer wrong.

It is unclear why no more than half of the smokers have had a pulmonary function test performed and even more so, why there are just as many smokers as never-smokers who have had it performed. Jones et al. found that opportunities to diagnose COPD at early stages are being missed several years ahead of diagnosis. They emphasize the importance of prioritizing educating of nurses and doctors to identify people at risk (including comorbidity) and patients with lower respiratory symptoms, so spirometry can be performed early on [26].

Surprisingly, the ex-smokers had undergone significantly more pulmonary function tests compared with the two other groups. This could be explained by ex-smokers being significantly older than the other groups. Spirometry can be used as a tool when promoting smoking cessation and especially individualized feedback of 'lung age' has been shown to be effective [27]. Thus, it could be speculated that having a pulmonary test performed would actually motivate smokers to quit. This question was not included in the questionnaire.

Although the prevalence of COPD is increasing among women, men are more likely to be diagnosed with COPD than women. This can be due to difference in clinical presentation (e.g. less phlegm in women) and a notion among health-care providers of COPD as a male disease. We found that more men than women had undergone pulmonary function test which could advocate a need for more focus on diagnosing COPD in women [28].

Studies show that COPD is a significant risk factor for death and every year 3300 deaths in Denmark are directly due to COPD, which is equivalent to 6% of all death in Denmark [29]. On top of this, COPD is listed as a contribution cause of death in 2200 extra cases. In fact, mortality and morbidity from COPD amongst smokers continue to increase whereas mortality from other smoking-associated diseases (cardiovascular diseases and lung cancer) seems to have reached a plateau since the 1980s [9].

The risk of developing any cancer, especially lung cancer, is increased in persons with COPD [30]. However, we found that almost one-third of the smokers did not consider COPD to be a deadly disease and in total 19% of the persons asked did not know if they regarded COPD a deadly disease. This knowledge gap on the serious consequences of COPD is a great concern indicating the need for more information and education about COPD.

It is well established that tobacco use increases the risk of lung cancer as well as other types of cancer. Despite this increased risk of cancer among smokers, the present study found that although cancer is the most feared disease among smokers, the level of fear is significantly lower than in the ex- and never-smokers. Other studies have also found that smokers underestimate their own risk of developing lung cancer [31]. Smokers are generally aware that smoking increases the risk of lung cancer, but they are often more optimistic about themselves than they are about other smokers. They tend to overestimate the protective effect of a healthy lifestyle (e.g. healthy diet, exercise, increased vitamin intake), underestimate their tobacco dependence giving them an illusion of control, and distancing themselves from responsibility by attributing genes as a major factor in the development of lung cancer [31,32]. These psychological obstacles are important to take into consideration when encouraging smoking cessation.

The Danish health-care system has universal health-care coverage. There are no general rules regarding smoking cessation before starting any treatment, although smoking cessation before some operations is mandatory. Smoking cessation advice is in general free of charge in Denmark. Medical aid for smoking cessation together with advice is recommended by WHO and the Danish national board of health [33]. However, in Denmark, there is no reimbursement what so ever for any kind of smoking cessation therapy. Contradictory to the fact, reimbursement is granted to lifelong medical therapy for chronic diseases caused by smoking – including the very frequent as COPD and ischemic heart disease. In the present study, we addressed the issue of smoking cessation before starting medical treatment and found a vast difference in opinions between the three groups.

Lifestyle diseases, such as COPD, are preventable and we found that a large group of the smokers and significantly more in the young group than the elderly agreed that it is people's own fault when they develop COPD (Table 2). The majority of smokers believed that smoking cessation should be mandatory before treating diseases where the effect of treatment depends on smoking cessation (Figure 1). However, 35% of the smokers did not believe that smoking cessation should be mandatory before treatment of COPD and asthma and the majority (56.6%) highly agreed that lifestyle diseases should be treated equally well as diseases that are not self-inflicted. The proportion of smokers who agreed was significantly higher than among never-smokers (26.6%). Literature regarding this issue is sparse and it is unclear if mandatory smoking cessation before treatment of smoking-related diseases has

positive and/or long-term effects on smoking cessation. This could also lead to more patients with chronic diseases receiving inadequate treatment leading to more severe disease and frequent/longer hospitalizations and thus a considerable economic burden on the social health-care system.

Strengths and limitations

The strength of the study is the large study group of 1002 persons. We found a smaller percentage of responders in the age group >75 years (3.2%) than should be expected considering the background population (9.5%). This could be explained by the fact that it can be difficult to reach the elderly when using web interviews, since their presence on the Internet is not representative.

Conclusion

Overall, both smokers, ex-, and never-smokers seemed to have little knowledge of COPD regarding aetiology, symptoms, and severity. COPD is a preventable disease and continuous efforts to increase the awareness of COPD both in the general population and among health-care providers are pivotal. Early detection of COPD is important and more focus on performing and analysing spirometry tests in general practice, especially among symptomatic smokers, is necessary.

There was great discrepancy between the attitudes of smokers, ex-, and never-smokers towards mandatory smoking cessation before receiving treatment for smoking-related diseases. It is yet to be investigated whether this would have a long-term effect on smoking cessation.

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Disclosure statement

Jens Dollerup is a former employee at GSK, but he is independent now as of September 2015, outside the submitted work. This is an epidemiological study and not related to any pharmaceutical treatment. MGS, OH, AL and AF have no conflict of interest.

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Authors contribution

GSK financed the collecting of data by Voxmeter A/S. We, the authors, were then given full access to the raw data.

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