

# Awareness of risk factors among persons at risk for lung cancer, chronic obstructive pulmonary disease and sleep apnea: A Canadian population-based study

Shannon L Walker MD FRCPC<sup>1</sup>, David L Saltman MD PhD FRCPC<sup>2</sup>, Rosemary Colucci BA<sup>3</sup>, Lesli Martin BA<sup>4</sup>;  
for The Canadian Lung Association Advisory Committee

SL Walker, DL Saltman, R Colucci, L Martin; for The Canadian Lung Association Advisory Committee. Awareness of risk factors among persons at risk for lung cancer, chronic obstructive pulmonary disease and sleep apnea: A Canadian population-based study. *Can Respir J* 2010;17(6):287-294.

**OBJECTIVE:** To assess awareness among persons at risk for lung cancer, chronic obstructive pulmonary disease (COPD) and sleep apnea regarding symptoms and risk factors of the disease, and their attitudes regarding the disease and toward those who are affected.

**METHODS:** A quantitative hybrid telephone and Internet survey of a representative population of Canadian adults at risk for at least one of the three diseases was conducted. To measure the awareness and attitudes of First Nations, Inuit and Métis people to these diseases, a proportionate number were also surveyed.

**RESULTS:** A total of 3626 individuals were contacted. Of these, 3036 (84%) were eligible to participate. Of those at risk for lung cancer and COPD, 65% and 69%, respectively, were due to tobacco smoke exposure. Among those at risk, 72% believed that they were informed about lung cancer compared with 36% for COPD and 56% for sleep apnea. Most respondents were knowledgeable about the common symptoms of lung cancer, COPD and sleep apnea, but were less aware of the impact lifestyle choices could have on the development of these disorders and the availability of treatment. Most of the participants (77%) believed that smoking was an addiction rather than a habit (19%). There were no significant differences in the awareness of risk factors, symptoms and attitudes toward all three lung diseases between First Nations, Inuit and Métis people and the general population.

**CONCLUSIONS:** Canadians are reasonably aware of risk factors and symptoms for lung cancer and sleep apnea. However, there is poor awareness of COPD as a disease entity. There is a lack of appreciation for the impact lifestyle choices and changes can have on lung diseases.

**Key Words:** Awareness; COPD; Lung cancer; Risk; Sleep apnea

Chronic respiratory diseases are a major cause of morbidity and mortality in Canada. According to statistics from the Public Health Agency of Canada in 2008, 847,000 Canadians 35 years of age or older self-reported a diagnosis of chronic obstructive pulmonary disease (COPD) (1). COPD is estimated to affect as many as three million Canadians including approximately 1.6 million who are undiagnosed (2). Recent population studies (3) have documented a COPD prevalence of 17% to 20% of the population, and values approaching 50% in the elderly. COPD is associated with a rising mortality rate and is the only common cause of death with this distinction. It is projected to be the third leading cause of death in Canada and worldwide by 2020 (4). A recent report on the burden of

**La sensibilisation aux facteurs de risque chez les personnes vulnérables au cancer du poumon, à la maladie pulmonaire obstructive chronique et à l'apnée du sommeil : Une étude canadienne en population**

**OBJECTIF :** Évaluer la sensibilisation des personnes vulnérables au cancer du poumon, à la maladie pulmonaire obstructive chronique (MPOC) et à l'apnée du sommeil aux symptômes et facteurs de risque de la maladie ainsi que leurs attitudes au sujet de la maladie et des personnes qui en sont atteintes.

**MÉTHODOLOGIE :** Les chercheurs ont mené une enquête téléphonique hybride par téléphone et par Internet auprès d'une population représentative d'adultes canadiens vulnérables à au moins l'une des trois maladies. Pour mesurer la sensibilisation et les attitudes des populations inuites, métisses et des Premières nations, ils ont également sondé un nombre proportionnel de cette population.

**RÉSULTATS :** Au total, les chercheurs ont communiqué avec 3 626 personnes. De ce nombre, 3 036 (84 %) étaient admissibles à participer. Parmi les personnes vulnérables au cancer du poumon et à la MPOC, 65 % et 69 %, respectivement, l'étaient en raison d'une exposition à la fumée du tabac. Chez les personnes vulnérables, 72 % pensaient être informées à l'égard du cancer du poumon, par rapport à 36 % à l'égard de la MPOC et à 56 % à l'égard de l'apnée du sommeil. La plupart des répondants connaissaient les symptômes courants du cancer du poumon, de la MPOC et de l'apnée du sommeil, mais moins les répercussions possibles des choix relatifs au mode de vie sur l'apparition de ces troubles et la disponibilité du traitement. La plupart des participants (77 %) pensaient que le tabagisme était une intoxication plutôt qu'une habitude (19 %). Il n'y avait pas de différences significatives quant à la sensibilisation aux facteurs de risques, aux symptômes et aux attitudes envers les trois maladies pulmonaires entre les populations inuites, métisses et des Premières nations et l'ensemble de la population.

**CONCLUSIONS :** Les Canadiens sont raisonnablement au courant des facteurs de risque et des symptômes de cancer du poumon et d'apnée du sommeil. Cependant, ils sont peu sensibilisés à la MPOC comme entité pathologique et sont peu conscients des répercussions des choix relatifs au mode de vie et des modifications qui y sont apportées sur les maladies pulmonaires.

COPD to Canada's health system (5) showed that COPD was the most common cause of admission and readmission to hospital compared with other chronic diseases. However, awareness of COPD was found to be as low as 17% among Canadians when compared with awareness of other major diseases such as breast cancer (95%), HIV/AIDS (95%) and Alzheimer's disease (94%) in a Canadian COPD awareness assessment completed in 2005 (6). Smoking remains the single most significant cause of COPD, and smoking cessation is the most effective means of reducing the risk of developing the disease or slowing its progression (7,8).

Lung cancer is the leading cause of cancer death in Canada. Similar to COPD, it is strongly linked to tobacco use, making

<sup>1</sup>Respiratory and Internal Medicine, Pentiction Regional Hospital, Pentiction, British Columbia; <sup>2</sup>Discipline of Oncology, Memorial University, St John's, Newfoundland; <sup>3</sup>Health Advocacy Consultant; <sup>4</sup>Leger Marketing, Toronto, Ontario

Correspondence: Dr Shannon L Walker, Department of Internal Medicine, Pentiction Regional Hospital, 102-550 Carmi Avenue, Pentiction, British Columbia V2A 3G6. Telephone 250-493-0887, fax 250-493-7484, e-mail westviewmed@shawbiz.ca

Reprint requests: Ms Amy Henderson, The Lung Association – National Office, 300 – 1750 Courtwood Crescent, Ottawa, Ontario K2C 2B5. Telephone 613-569-6411 ext 265, fax 613-569-8860, e-mail ahenderson@lung.ca

**TABLE 1**  
**Factors used to define the risk groups (lung cancer, chronic obstructive pulmonary disease [COPD] and sleep apnea)**

Risk factor	Risk group		
	Lung cancer	COPD	Sleep apnea
Smoking	✓	✓	✓
Exposure to secondhand smoke	✓	✓	✓
Past smoker	✓	✓	✓
Exposure to dust or chemicals	✓	✓	
Exposure to asbestos or radon	✓		
Personal history	✓	✓	✓
Family history	✓	✓	✓
Frequent, long-lasting chest infections	✓	✓	
Chronic cough	✓	✓	
Shortness of breath/wheezing	✓	✓	
Severe or untreated asthma		✓	
Obesity			✓
Swollen tonsils/adenoids			✓
Chronic bronchitis	✓	✓	
Snoring			✓
Thick neck or small jaw			✓
Exposure to smoke from wood stoves		✓	

it one of the most preventable malignancies. Awareness of the risk factors for various types of cancer among the general population has been studied in many countries (9-11). The public appears to be aware of smoking as a risk for cancer, but they are far less perceptive about the role of other modifiable lifestyle factors such as obesity, physical activity and diet (12,13). To date, there is insufficient evidence to support the regular screening of individuals considered to be at high risk for developing lung cancer, further emphasizing the need for primary prevention and recognition of disease symptoms (14).

It is estimated that as many as 24% of middle-age adult men and 9% of women experience sleep-disordered breathing, while 2% of middle-age women and 4% of men have sleep apnea (15). People who are affected by sleep apnea are often not aware of their disease. Undiagnosed sleep apnea can lead to serious health and economic sequelae including an increased risk for heart attack, high blood pressure, stroke, depression, memory difficulties and excessive daytime sleepiness, with adverse personal and occupational outcomes. There is also an increased risk of motor vehicle accidents, especially those involving personal injury (16).

The aim of the present survey was to study a representative sample of the Canadian population for lung cancer, COPD and sleep apnea to better understand how persons at risk for these diseases perceived symptoms and risk factors of the disease. In addition, attitudes regarding the disease and toward those who suffer from it were examined. We also explored the perspectives of Canadians who are at risk for these diseases with respect to the lifestyle choices that put them at risk for disease and the options they have for decreasing their chances of being affected by these disorders.

## METHODS

The Canadian Lung Association (CLA) presented the current study proposal to the National Lung Health Framework to

explore self-awareness of risk factors for major lung diseases in Canada in a population group most at risk.

Table 1 lists a series of risk factors that were defined by the CLA Advisory Committee to identify persons at risk for lung cancer, COPD and sleep apnea.

A quantitative survey was subsequently developed and conducted among Canadians with at least one of the identified risk factors.

To ensure that a representative sample of the Canadian population was included in the present study, the survey was conducted using a hybrid of telephone and Internet surveys. The survey was performed by an experienced contractor (Leger Marketing, Canada). A sample size of 3000 was estimated to be sufficient to obtain a margin of error of 5% or less. The telephone and Internet surveys commenced on April 12 and 16, 2010, respectively, and both were completed on April 28, 2010.

Survey field staff received in-depth training before proceeding to a practice phase. During practice sessions, interviewers worked with one another to role-play a simulated survey. Interviewing was allowed to commence only when the supervisor was satisfied that each interviewer was able to conduct a proper, professional interview. Intensive monitoring, editing and verification were conducted throughout the field process in accordance with the standards of the Market Research and Intelligence Association (17).

Respondents were classified as being at risk for lung cancer, COPD or sleep apnea according to their responses to the survey questions. If a respondent had no risk factors identified at initial questioning, the survey was ended; these persons were not included in the study results. Due to the length of the survey, once risks were determined, each participant was only asked questions about one disease for which they were at risk. If they were at risk for more than one of the three diseases, they were questioned about the disorder for which they had the most risk factors. If the number of risk factors was equal, they were randomly selected to receive questions about only one of the diseases, with quotas to ensure that all three diseases received representation.

While it was important that the study be representative of the Canadian population as a whole, it was necessary to understand the attitudes and perceptions of the First Nations, Inuit and Métis people (FNIMP). For this reason, a higher than proportionate number of FNIMP were surveyed (115 in total). The results of this cohort were analyzed separately, but weighted against the entire sample population to ensure that they were representative of the Canadian population so as to not introduce bias with regard to the FNIMP population.

## RESULTS

The risk factors used to define the three risk groups are shown in Table 1. A total of 3626 participants were contacted and agreed to participate in the study. Of these, 403 did not qualify for the survey because they were not at risk for any of the diseases being studied; 10 were younger than 18 years of age and therefore, were not eligible; and 170 were eligible but refused to participate, resulting in 3036 participants (84%) who completed the survey. The 3036 respondents were representative of the Canadian population. The characteristics of the survey participants are shown in Table 2.

**TABLE 2**  
Characteristics of the survey participants

Characteristic	Total	Risk group		
		Lung cancer	COPD	Sleep apnea
Region				
Alberta	8	8	8	8
Manitoba	4	4	4	4
New Brunswick	2	2	2	2
British Columbia	9	9	9	9
Quebec	29	29	29	29
Prince Edward Island	1	1	1	1
Saskatchewan	5	5	4	5
Newfoundland and Labrador	2	1	2	2
Ontario	38	37	37	37
Nova Scotia	3	3	3	3
Northwest Territories	<1	<1	<1	<1
Type of community				
Urban	64	62	62	64
Rural	37	38	39	37
Male sex				
	50	50	50	51
Age, years				
18-34	18	18	19	17
35-44	15	14	14	14
45-54	23	24	24	24
55-64	23	24	24	24
≥65	20	20	19	21
Yearly income, \$				
<40,000	23	24	24	22
40,000 to 79,000	32	33	33	32
≥\$80,000	26	25	25	27
Employment				
Full time	45	44	44	45
Part time	10	10	10	10
Homemaker	5	5	5	5
Student	6	6	6	5
Retired	29	30	29	30
Between jobs	4	4	4	3
Marital status				
Married/common-law	65	64	64	67
Divorced or separated	10	11	11	10
Widowed	5	5	5	5
Single	19	19	19	17
Education				
Less than high school	29	30	31	29
College	32	33	33	32
Undergraduate degree	23	22	21	22
Graduate degree	15	14	13	15

Data presented as %. COPD Chronic obstructive pulmonary disease

**Lung cancer awareness**

A total of 980 of those surveyed were at risk for lung cancer. Forty-six per cent of the participants had at least one risk factor for lung cancer; 32% had two and 23% had three or more. Sixty-five per cent of those at risk were due to tobacco smoke exposure (27% current smokers, 29% past smokers and 9% secondhand smoke [SHS] exposure). Nearly one-half (48%) claimed exposure to dust, chemicals, asbestos or radon. Seventy-two per cent either knew a little (52%) or a lot (20%) about the causes, symptoms and treatment of lung cancer. Smokers were less aware of the symptoms of lung cancer than nonsmokers

**TABLE 3**  
Awareness levels of lung cancer symptoms: Smokers versus nonsmokers

Symptom	Smoking exposure, %		
	Current (n=275)	Past (n=395)	Never (n=301)
Cough persists or gets worse	74	79	81**
Coughing up blood	74	79	80
Being short of breath	75	79	79
Long-lasting chest infections	61	65	74**
Feeling tired	59	67*	70**
Wheezing	66	67	68
Getting lots of chest infections	57	58	67**
Losing weight without trying	50	64**	61**
Ongoing pain in back or shoulder	38	41	44
Losing your voice	37	32	35
Swollen neck or face	27	23	27

Question asked: 'Please tell me if you think each thing on this list is a symptom of lung cancer'. Base: Those at risk for lung cancer (n=980). \*Denotes significant difference at P=0.05; \*\*Denotes significant difference at P=0.01

**TABLE 4**  
Awareness levels of lung cancer causes: Smokers versus nonsmokers

Cause	Smoking exposure, %		
	Current (n=275)	Past (n=395)	Never (n=301)
Smoke a pack per day for 10 years or more	70	78*	88**
Near secondhand smoke	53	69**	77**
Exposed to asbestos	66	77**	76**
Smoking one pack per day for 10 years, but quitting 5 or more years previously	38	39	66**
Exposed to dust or chemicals	51	66**	63**
Family history of lung cancer	53	49	54
Smoking marijuana	30	50**	54**
Exposed to radon	44	50	51
Smoking (occasionally)			
Cigarillos	31	44**	51**
Cigarettes	33	46**	49**
Marijuana	18	30**	27**

Question: Base: 'I am going to read a list of things. I want you to tell me if these things could cause lung cancer.' Base: Those at risk for lung cancer (n=980). \*Denotes significant difference at P=0.05; \*\*Denotes significant difference at P=0.01

(Tables 3 and 4). Most participants considered tobacco exposure to be a primary cause of lung cancer; however, occasional tobacco smoke and marijuana smoke use was believed to be a less likely cause. Cigarillo use was believed by the majority (61%) of respondents to be as risky as smoking cigarettes. Seventy-four per cent of subjects believed that asbestos exposure was a cause of lung cancer, but only 49% believed radon exposure was a risk factor.

Smokers were less likely to believe that there was a continued risk for lung cancer if they quit smoking, and more likely to believe their body would be healthy again if they quit. However, smokers were more likely to believe that there was no way to control the risk of cancer than nonsmokers (current smoker 20% [95% CI 13.75% to 26.25%]; past smoker 11% [95% CI 6% to 17%]; never smoked 13% [95% CI 7.8% to 18.2%]).

**TABLE 4**  
**Awareness levels of chronic obstructive pulmonary disease (COPD), emphysema or chronic bronchitis**

Awareness	COPD, emphysema or chronic bronchitis		
	COPD	Emphysema	COPD, emphysema or chronic bronchitis
Know a lot	9	1	9
Know a little	27	25	30
I don't know much	23	31	28
I don't know anything	28	29	32
Never heard of (the disease listed in column heading)	13	14	<1

Data presented as %

Fifty per cent of persons at risk for lung cancer believed that if one had been a heavy smoker and quit, there was still a high risk of lung cancer, while only 9% disagreed and 35% were neutral. Only 25% of persons responded that once one had quit smoking for a few years, the body would then be healthy again. Sixty-one per cent of respondents disagreed with the statement "People won't get lung cancer if they don't smoke and if they stay away from second-hand smoke", while only 11% agreed.

Twenty-three per cent of respondents believed that, because of smoking, patients were responsible for having developed lung cancer, while 39% disagreed. Only 21% of respondents believed that there was a negative stigma attached to, and discrimination toward, people with lung cancer. While current smokers (27% [95% CI 21% to 33%]) were more likely to believe that there was negative stigma toward lung cancer patients than past smokers (19% [95% CI 14% to 24%]) or those who had never smoked (20% [95% CI 14.8% to 25.2%]), smoking behaviour did not appear to affect the likelihood of believing that lung cancer patients were responsible for their disease. Only a minority (18%) of those at risk for lung cancer agreed that there was no real treatment to help someone with lung cancer, while 41% disagreed.

#### COPD awareness

Persons at risk for COPD were surveyed if they had one or more of the risk factors or symptoms listed in Table 1. A total of 868 persons surveyed were found to have at least one risk factor for COPD. No persons were found to be at risk for COPD only; they were also found to be at risk for lung cancer or sleep apnea or, more often, both. Of those found to be at risk for COPD, 69% were due to exposure to tobacco smoke: current smoker (29%), past smoker (30%) or SHS exposure (10%). Other documented exposures were past (24%) and current (12%) marijuana use, and indoor wood smoke (14%). More than one-half of persons experienced exposure to dusts or chemicals at work. Only a small proportion of Canadians – 10% or less – noted a family history of lung disease or COPD as a risk factor.

Assessing knowledge about COPD was challenging because not all persons at risk for COPD were aware of the disease terminology 'COPD' or 'chronic obstructive pulmonary disease'. This, in fact, was the case with 13% of the respondents in the present cohort, who were then asked about the condition using one of the other names associated with COPD such as 'emphysema' or 'chronic bronchitis'. Only 39% (approximately two-fifths) of persons at risk for COPD knew at least a little or a lot about the disease by any of its three names, but the remaining

60% of persons at risk for COPD, knew very little to nothing about the disease (Table 4). Women and older individuals seemed to be more knowledgeable about the disease (women 39% [95% CI 34.3% to 43.7%] versus men 32% [95% CI 27.3% to 36.7%]; 55 years of age or older 42% [95% CI 36.8% to 47.2%] versus younger than 55 years of age 31% [95% CI 26.7% to 35.3%]). Smokers (current 43% [95% CI 36.6% to 49.4%] and past 39% [95% CI 33.8% to 44.2%]) claimed to have more knowledge than nonsmokers (27% [95% CI 21.1% to 32.9%]).

Canadians at risk for COPD appeared to appreciate the major symptoms associated with COPD. More than 60% identified shortness of breath, wheezing, prolonged cough or prolonged chest infections as being possible symptoms of COPD. There appeared to be no difference in knowledge about symptoms of COPD between smokers and nonsmokers. However, 27% of persons either did not know (22%) or did not agree (5%) that smoking a pack of cigarettes per day for 10 years or more was a potential cause of COPD. One-quarter of the respondents were further uncertain about the risk associated with marijuana or cigarillo use, SHS exposure or smoking intermittently as potential causes of COPD. Approximately one-third of persons expressed that, despite someone quitting smoking, there remained a risk for developing the disease, but many more were uncertain (31%) or just did not know (24%). Persons at risk for COPD were asked about other exposures, and perceived that exposure to dust or chemicals (53% positive response), family history (43%) or personal history of asthma (40%) were more likely causes of COPD than exposure to marijuana smoke (17% positive response), wood smoke (34%) or occasional tobacco smoke (29%).

There was low awareness of personal responsibility for the risk of COPD. Although 36% of persons believed that if one had been a heavy smoker and quit, there still was a high risk for the disease, 35% disagreed or did not know and 29% expressed neutrality. Slightly less than one-half of persons at risk for COPD did not know or did not believe that there was an available treatment for COPD. Only 12% of responders believed that there was negative stigma associated with COPD, but a larger proportion did not know or expressed neutrality (33% and 28%, respectively).

#### Sleep apnea awareness

Of the 3036 eligible persons who completed the survey, 1174 were found to be at risk for sleep apnea. Individuals were identified as being at risk for sleep apnea if they had one or more of the following risk factors: snoring, family history, a thick neck or small jaw, obesity, swollen adenoids or tonsils, or a personal diagnosis of sleep apnea. A total of 155 persons with any form of tobacco or alternative smoke exposure as their only risk factor were also included in this sleep apnea cohort. More than one-half of those at risk for sleep apnea were identified because of snoring (58%). Fifty-eight per cent of those in this risk group experienced tobacco exposure. However, only 27% (99% CI 23.2% to 30.8%) of those at risk for sleep apnea believed that smoking was a risk factor for sleep apnea compared with 70% (99% CI 65.9% to 74.1%) and 62% (99% CI 57.6% to 66.4%) who believed that smoking was a cause of lung cancer or COPD, respectively. Twenty per cent of persons identified a positive family history, while 8% had a personal history of the

disease. Only 12% were obese, but 17% admitted to having a thick neck or small jaw, and 11% had swollen tonsils or adenoids. Twenty-seven per cent of persons had three or more risk factors for sleep apnea.

Knowledge of the disease, symptoms and treatment were expressed by 56% of those at risk for sleep apnea. Although men are at a greater risk for sleep apnea, women appeared to have more overall knowledge than men (women 64% [99% CI 58.7% to 69.3%] versus men 48% [99% CI 42.6% to 53.4%]), as were those who were older (99% CI 54.9% to 63.1%) or had more than two risk factors for sleep apnea (99% CI 45.9% to 56.1%). Greater than 60% of those at risk for sleep apnea identified the major symptoms associated with sleep apnea such as not feeling rested, heavy snoring, daytime sleepiness, or choking or gasping during sleep; however, other phenomena occasionally associated with sleep apnea, such as morning headaches, depression, high blood pressure or impotence, were less well recognized. While one-half of persons at risk for sleep apnea believed that being overweight or a heavy snorer were possible causes of the disease, many were unsure of other medical causes that may cause sleep apnea, and were more likely to believe that asthma was a potential cause compared with swollen tonsils, large neck size or an underdeveloped jaw.

Sixty-six per cent of persons at risk for sleep apnea believed that the disease was a serious condition that needed treatment. Forty per cent were aware that using a breathing machine at night would help treat the disease. A significant number of participants did not agree that sufferers were responsible for their disease symptoms because they were overweight (57%) or that they just needed to exercise more (46%).

### Tobacco exposure

All participants at risk for the three selected diseases were questioned about their attitudes toward smoking and tobacco exposure. Most respondents (77%) believed that smoking was an addiction rather than a habit (19%), and that it was very difficult to quit. This viewpoint was shared equally among smokers (80%), nonsmokers (75%) and ex-smokers (76%) (P value non-significant at 95% level of confidence). Older persons (95% CI 76.8% to 81.2%), higher income individuals (99% CI 76.1% to 89.1%), women (99% CI 75.7% to 82.3%) and nonsingle persons (99% CI 75.4% to 80.6%) shared this viewpoint more so than others.

Sixty-one per cent of those surveyed experienced current or previous tobacco exposure. Twenty-two per cent of the studied population were current cigarette smokers, 14% smoked regularly and 8% smoked intermittently. Thirty-nine per cent had previously smoked but had quit, while another 39% had never smoked cigarettes or other tobacco products. The highest prevalence of smoking was for individuals between the ages of 18 and 34 years (33% [95% CI 25.8% to 40.2%]), FNIMP (31% [95% CI 24.2% to 37.8%]) and single persons (30% [95% CI 25.9% to 34.1%]). Some regional differences were seen across the country, with Quebec, Ontario and Alberta having the highest reported prevalences of smoking compared with the other provinces.

Of those admitting to smoking regularly or occasionally, almost all mentioned that they smoked cigarettes (98%). Almost one-half (45%) of persons between 18 and 34 years of age smoked cigarillos, with 7% responding that they were current cigarillo smokers. Smoking frequency increased directionally

**TABLE 5**  
**Smoking locations among smokers**

Smoking location	Smokers, %
Indoors when there is also a nonsmoking adult somewhere in the house	36
Indoors when there is also a child somewhere in the house	18
In a car when you are by yourself or with other people who smoke	61
In a car when you are with other people who do not smoke	21
In a car when you are with children	8
None of the above	31

with age. An average of 8.4 cigarettes per day were smoked in the group 18 to 34 years of age (95% CI 1.2 to 15.6 cigarettes per day) compared with a peak smoking frequency of 15.7 cigarettes per day (95% CI 7.1 to 24.3 cigarettes per day) in the group 55 to 64 years of age.

Seventy per cent of smokers have discussed smoking issues with their doctor more so than with friends or family. This tendency increased directionally with age (18 to 34 years, 99% CI 41.6% to 60.4% versus 35 years of age and older, 99% CI 69.3% to 80.7%). Women (95% CI 64.3% to 76.5%) or those who were currently or previously married (99% CI 66.3% to 77.7%) were more likely to speak to their doctor about smoking than men or single persons. The type of discussion mostly concerned options to help them quit (67%) or the health risks associated with smoking (50%). Attitudes regarding smoking reflected some guilt regarding the habit and the appreciation of the risks associated with it. One-third of respondents believed that they were judged unfavourably because of their smoking habit. Approximately 60% of respondents did not agree with the statement "my smoking is none of my doctor's business" or "I don't think smoking is as bad as people say". Only 10% were not responsive to a discussion about their habit with their doctor and did not want to quit.

### SHS

Six hundred eighty-five smokers were asked to indicate whether they smoked indoors or in a car, either in the presence of another adult who was a nonsmoker or a child. Thirty-five per cent smoked indoors when there was a nonsmoking adult present in the house, and 18% smoked in the house when a child was present (Table 5). Twenty-one per cent of respondents said they smoked in a car in the presence of an adult nonsmoker, and 8% smoked in cars with children on board. When asked whether they smoked in a car with other adults who smoked, 61% responded positively. Overall, 23% of the 3036 survey respondents reported that someone in their household smoked.

Thirty-six per cent of current smokers reported that other smokers they lived with usually smoked inside, 65% of nonsmokers said that smokers in their home usually smoked inside and 56% of past smokers indicated that smokers in their home smoked inside (Table 6). Twenty-one per cent of past smokers and 13% of those who never smoked said they were subjected to smoke in a car at least once per week. Overall, more than one-third of nonsmokers are subjected to smoke at home or in a car. Smokers in Quebec were more likely to expose nonsmokers, either adults (59%) or children (37%), to SHS (99% CI 73.9% to 92.1%) than in any other province.

**TABLE 6**  
**Secondhand smoke exposure**

	Smoking habit, %		
	Current	Past	Non
Always smoke outside	40*	20*	13
Usually smoke outside, sometimes smoke inside	24	25	22
Usually smoke inside	36	56*	65*

Question: 'Where do the smokers you live with usually smoke?' Base: n+705.

\*Denotes significance at  $P=0.01$

### Other risk factors experienced by Canadians

Nine per cent of Canadians surveyed smoked marijuana regularly or occasionally, while three in 10 smoked it daily. Twenty-one per cent of current marijuana smokers were also tobacco smokers. Forty per cent of the surveyed population experienced exposure to at least one of asbestos, radon, workplace dust, or chemicals in their present or previous job. Twenty-nine per cent of persons were exposed to indoor smoke caused by a wood stove or fireplace at least once per month. However, when asked about the cleanliness of the air where they lived, 81% of Canadians believed that the air they breathed was clean.

### FNIMP

One hundred fifty-five FNIMP were surveyed, with the results weighted to ensure a true representation within the Canadian population. A higher prevalence of smoking was seen among FNIMP compared with the general population across Canada (31% [95% CI 24.2% to 37.8%] versus 22% [95% CI 20.1% to 23.9%]). Analysis of the awareness of risk factors, symptoms and perceptions for the three studied lung diseases among FNIMP showed no significant difference when compared with the rest of the Canadian population. Attitudes toward health care also showed no statistical differences.

### Health care attitudes and behavioural changes

Exposure to tobacco smoke was believed by at-risk Canadians to be the most causative risk factor for lung cancer (79% [99% CI 74.9% to 83.2%]), more so than for COPD (62% [99% CI 57.6% to 66.4%]) and significantly more so than for sleep apnea (27% [99% CI 23.2% to 30.8%]). There was very little stigma associated with any of these lung diseases. However, lung cancer had a somewhat more negative stigma than COPD or sleep apnea (21% versus 12% and 10%, respectively [99% CI]). More than 50% of Canadians were open to seeing their physician about health-related concerns. Only 15% would have preferentially asked their family or friends for health advice. Yet, less than one in five persons at risk for any of the lung diseases studied believed that they needed to take better care of themselves.

## DISCUSSION

### COPD

The results of the present survey suggest a disturbingly low level of awareness of COPD among Canadians most at risk for this disease. Only 39% of persons at risk believed they had at least some knowledge of the symptoms, causes or treatment of COPD, but 60% knew little or nothing at all. The present

survey also showed that the term 'chronic obstructive pulmonary disease' and the acronym 'COPD' are still completely unknown to 13% of the Canadian population at risk. Although awareness of COPD remains low among the general Canadian population, there has been an improvement in awareness for the term 'chronic obstructive pulmonary disease' (45% improving to 59%) and the acronym 'COPD' (17% improving to 33%) in survey results from 2005 compared with 2007 (2,6).

Canadians at risk for COPD were predominantly so because of cigarette smoke exposure, which is clearly identifiable as the most significant risk factor for the development of this condition. Sixty-one per cent of the total survey population experienced tobacco smoke exposure, with 69% of this particular at-risk subset being exposed. Although most of those surveyed in the present study were aware that cigarette smoke is a major risk factor for disease, 29% of persons at risk for developing COPD did not know or did not agree that the cause of COPD included tobacco smoke exposure. This lack of awareness may impair the motivation of at-risk individuals to consider smoking cessation. It is not yet clear how many smokers will develop COPD, but current studies (18) suggest that at least 20% of smokers or ex-smokers older than 40 years of age have airflow obstruction consistent with COPD, but only 30% were aware of a personal diagnosis of the disease. Study participants were even less aware of the risk of COPD from exposure to other factors such as marijuana smoke, wood smoke, dust and chemicals. Although less may be known about how significantly these exposures impact or add to the risk of tobacco on the development of COPD, they are likely contributors to the disease (19-21).

The present study revealed that persons at risk for COPD were neither confident nor aware that quitting smoking may help protect them from developing the disease. There is uncertainty about who else may get the disease such as young persons, those who are exposed to alternative tobacco products or SHS or ex-smokers. It is also uncertain whether exercise is protective. Furthermore, those at risk were largely unsure of treatment options for COPD. This lack of knowledge may, in fact, diminish the personal responsibility for making healthy lifestyle choices or reducing personal risk for development of the disease.

### Lung cancer

A significant number of respondents in our study were able to identify the main symptoms of lung cancer. The Special Cancer Behavioral Risk Factor Survey (22) asked adults older than 40 years of age in the general population of Michigan (USA) to name the symptoms associated with lung cancer. Compared with our study, a persistent cough, bloody spit/phlegm and difficulty breathing were reported by 53%, 27% and 55% of participants, respectively. Variations in risk perception for developing lung cancer among current smokers, former smokers and never smokers have been studied previously. Results from the National Lung Screening Trial (23) found that current smokers and former smokers had different risk perceptions, with the latter group having a lower perceived risk for lung cancer. Similar to the results of our survey, a large national telephone survey study of smokers in the United States (US) (24) found that participants underestimated their risk of lung cancer compared with nonsmokers. In another US national telephone survey (25), never smokers were more likely than current smokers to believe that early detection of lung cancer could improve their survival.

### Sleep apnea

Slightly more than 50% of persons with risk factors for sleep apnea believed that they had at least a little knowledge about the disease. Although they were aware of more common symptoms of the disease, they were less likely to link concentration problems, headaches, depression, high blood pressure or impotence with the disease. This result suggests that there is a need for improved education among the public and primary care physicians to be aware of other presenting signs or symptoms of sleep apnea so as to better screen for this potentially prevalent disease. Women appeared to know more about the disease, although men are at greater risk – our results do not explain why this was the case.

Snoring and tobacco smoke exposure were the greatest risk factors for sleep apnea, with snoring being present in 58% of the cohort, many of whom had two or more risk factors. It is perhaps surprising to note that 51% of Canadians surveyed admitted that they snored loudly. This represents a large number of people who may be at risk for sleep apnea but, possibly, are not appreciated or diagnosed.

There is some uncertainty regarding all of the factors that may contribute to or cause sleep apnea, although being overweight was clearly identified as a risk. However, persons at risk for the condition did not believe that simply losing weight or exercising more would cure the problem. Therefore, this group was not sure how to reduce their risks or prevent this disease. However, persons at risk for sleep apnea recognized this as a serious disease that required treatment (72%), and many were aware of a potential treatment option.

Fifty-eight per cent of those at risk for sleep apnea were at risk due to smoking – the same proportion as for snoring. Smokers are almost three times more likely to have sleep apnea compared with former and never smokers (26). The mechanism by which smoking could predispose to sleep apnea is not clear. It has been postulated that inflammatory changes caused by cigarette smoke, together with negative effects of nicotine withdrawal at night, may be important factors (27).

### Smoking attitudes and behaviour

Canadians were, in large part, aware of the adverse role tobacco smoke may have on their health and their risk for developing certain diseases. They were less sure about the benefits that may result from smoking cessation. Furthermore, they were less aware of the risks associated with other tobacco products, or intermittent or SHS exposure. There is a continued necessity to prevent smoking, but there is also an opportunity to promote smoking cessation as a means of improving health and reducing risks factors for disease. This education still needs to permeate the general population. Seventy per cent of smokers have spoken to their family doctor about their habit, and the medical community appears to be more of a source of health advice than family and friends. Here, again, is an opportunity to educate and change behaviour.

### SHS

SHS is a significant risk to health and is a known carcinogen in humans. It is estimated that more than 1000 Canadians die each year from illnesses such as lung cancer, chronic respiratory diseases, coronary artery diseases and other disorders as a result of prolonged SHS exposure (28). Overall, our study showed

that more than one-third of nonsmokers were subjected to smoke at home or in a car. The 2009 Canadian Tobacco use Monitoring Survey (29) found that 20% of Canadians older than 15 years of age were exposed to SHS at least once per month. Children are more vulnerable to the adverse effects of SHS because of their higher breathing rate and higher absorption of pollutants from their lungs (30). Eighteen per cent of the smokers in the present survey admitted to smoking indoors when there was a child in the house. This result was similar to the finding from a recent study by researchers from the Harvard School of Public Health (31) in which 20% of children interviewed lived with a smoker.

Smoking in cars results in extremely high levels of tobacco smoke particles, even with full ventilation and airflow from opening all of the windows in a moving vehicle (32). Our survey showed that 21% of smokers smoked in cars with other nonsmokers present, and 8% smoked in the presence of children in the car. A Canadian survey from 2007 (33) demonstrated that 34% of smokers admit to smoking in cars with other nonsmokers. Surveys of Canadian children have shown that 28% of children in grades 5 to 12 are exposed to SHS in cars at least once per week (34). The high percentage of smokers who expose nonsmoking adults and children to SHS in Quebec found in this survey was consistent with the results from Statistics Canada in 2008 (35) that demonstrated that people living in Quebec were more likely to be exposed to SHS in the home than Canadians living in other provinces. This is especially true for children and teenagers zero to 17 years of age, in which 14.5% are regularly exposed to SHS as opposed to 8% for the rest of Canada (28). Quebec, together with Alberta, Saskatchewan and Newfoundland and Labrador, are the only jurisdictions without enforced provincial bylaws banning smoking in cars with child passengers.

### Study limitations

The results of the present study may have been influenced by whether respondents to the telephone or Internet survey were truly representative of the population to be investigated. Furthermore, differences seen in the awareness of risk for lung cancer, COPD and sleep apnea between those at risk and the general population may be due to the way the questions were posed, or variability in how the data were collected or measured. Finally, because of the design of our questions, respondents were able to provide a neutral answer, neither agreeing nor disagreeing. It was then difficult to know how these people really felt or whether their response meant they simply did not know an answer. An option of 'don't know' was offered; however, this may not have captured all those who fell into that category.

### SUMMARY

There needs to be a greater awareness of risk factors by those at risk for chronic lung diseases. The lack of awareness of COPD in the population most at risk is of particular concern given the prevalence and burden of this disease in our society.

Increased public awareness of risk factors for common respiratory diseases might help populations understand the potential consequences of their lifestyle choices on their health, and assist them in making appropriate changes or to seek medical attention. Public health agencies and the medical community need to consider how best to educate the public at risk. The

results of the present survey may determine what gaps exist in awareness for prevalent lung diseases within the Canadian population, and lay the foundation to set targets to improve awareness of risk factors, symptoms and treatment among at-risk groups. The outcomes will help direct future health initiatives such as innovative prevention and treatment options, program delivery, and research and public awareness campaigns focused on these lung disease groups. The present research and analysis, and subsequent initiatives will help the CLA at both the national and provincial levels, and other stakeholders, to achieve a collective goal to improve and promote lung health in Canada.

**CLA ADVISORY COMMITTEE MEMBERSHIP:** Rosemary Colucci, Health Advocacy Consultant; Peter Mackenzie, Director, Lung Cancer Canada; Lesli Martin, Director of Research, Leger Marketing; Robert Ryan, Research Officer, First Nations Centre, on behalf of the National Aboriginal Health Organization; David Saltman, Chair and Professor of the Discipline of Oncology, Memorial University, St John's, Newfoundland and Labrador; Mary-Pat Shaw, VP, National Programs and Operations, CLA; Peter Vavougiou, Physiotherapist, St Mary's Hospital Health Centre, Montreal; Shannon Walker, Respiriologist, Canadian Thoracic Society representative; Chris Wigley, VP, COPD Canada Patient Network.

**ACKNOWLEDGEMENTS:** This project was funded by the Public Health Agency of Canada under the Lung Health Program in support of the National Lung Health Framework.

**DISCLOSURE:** The authors have no financial disclosures or conflicts of interest to declare.

## REFERENCES

- Life and Breath: Respiratory Disease in Canada. <[http://www.phac-aspc.gc.ca/cd-mc/crd-mrc/copd\\_figures-mpoc\\_figures-eng.php](http://www.phac-aspc.gc.ca/cd-mc/crd-mrc/copd_figures-mpoc_figures-eng.php)> (Accessed on May 26, 2010).
- Chronic Obstructive Pulmonary Disease (COPD) in Canada. <[http://www.lung.ca/media-medias/news-nouvelles\\_e.php?id=98](http://www.lung.ca/media-medias/news-nouvelles_e.php?id=98)> (Accessed on June 10, 2010).
- Buist AS, McBurnie MA, Vollmer WM, et al. International variation in the prevalence of COPD (The BOLD STUDY): A population-based prevalence study. *Lancet* 2007;37:741-50.
- Murray CJL, Lopez AD. Evidence based health policy: Lessons from global burdens of disease study. *Science* 1996;274:740-3.
- Health Indicators 2008. Canadian Institute for Health Information. <[http://secure.cihi.ca/cihiweb/products/HealthIndicators2008\\_Engweb.pdf](http://secure.cihi.ca/cihiweb/products/HealthIndicators2008_Engweb.pdf), <[http://secure.cihi.ca/cihiweb/products/HealthIndicators2008\\_Engweb.pdf](http://secure.cihi.ca/cihiweb/products/HealthIndicators2008_Engweb.pdf)> (Accessed February 2010).
- National COPD Report card 2005. <[www.lung.ca/\\_resources/2005\\_copd\\_reportcard.pdf](http://www.lung.ca/_resources/2005_copd_reportcard.pdf)> (Accessed on October 29, 2010).
- Lokk A, Lange P, Scharling H, et al. Developing COPD: A 25-year follow-up study of the general population. *Thorax* 2006;61:935-9.
- Rabe KF, Hurd S, Anzueto A, et al. Global Strategy for the diagnosis, management and prevention of chronic obstructive pulmonary disease: Gold Executive Summary. *Am J Respir Crit Care Med* 2007;176:532-55.
- Brunswick N, Wardle J, Jarvis MJ. Public awareness of signs for cancer in Britain. *Cancer Cause Control* 2001;12:33-7.
- Honda K, Neugut AI. Associations between perceived cancer risk and established risk factors in a national community sample. *Cancer Detect Prevent* 2004;28:1-7.
- Reeder A, Trevena J. Adults' perception of the causes and primary prevention of common fatal cancers in new Zealand. *N Z Med J* 2003;116:1-10.
- Inoue M, Iwasaki M, Otani T, et al. Public awareness of risk factors for cancer among the Japanese general population: A population-based survey. *BMC Public Health* 2006;6:2.
- Sanderson SC, Waller J, Jarvis MJ, et al. Awareness of lifestyle factors for cancer and heart disease among adults in the UK. *Patient Educ Couns* 2009;74:221-7.
- Manser RL, Irving LB, Stone C, et al. Screening for lung cancer. *Cochrane Database Syst Rev* 2004;(1):CD001991.
- Young T, Palta M, Dempsey J, et al. The occurrence of sleep-disordered breathing among middle-aged adults. *N Eng J Med* 1993;328:1230-5.
- Mulgrew AT, Nasvadi G, Butt A, et al. Risk and severity of motor vehicle crashes in patients with obstructive sleep apnea/hypopnoea. *Thorax* 2008;63:536-41.
- Marketing Research and Intelligence Association of Canada. <<http://www.mria-arim.ca/STANDARDS/PDF/MRIAConduct-Dec2007.pdf>> (Accessed on November 11, 2010).
- Hill K, Goldstein RS, Guyatt GH, et al. Prevalence and underdiagnosis of chronic obstructive pulmonary disease among patients at risk in primary care. *CMAJ* 2010;182:673-8.
- Wan C, Tan WC, Christine Lo C, et al. Marijuana and chronic obstructive lung disease: A population-based study. *CMAJ* 2009;180:814-20.
- Balmes J, Becklake M, Blanc P, et al. American Thoracic Society Statement: Occupational contribution to the burden of airway disease. *Am J Respir Crit Care Med* 2003;167:787-97.
- Sood A, Peterson H, Blanchette CM, et al. Wood smoke exposure and gene methylation are associated with increased risk for COPD in smokers. *Am J Crit Care Med* 2010; 182:1098-104.
- Michigan Department of Community Health and Michigan Public Health Institute. Special Cancer Behavior Risk Factor Survey, 2008. <[www.michigan-cancer.org/PDFs/MCCReports/SCBRFS\\_2008-042910.pdf](http://www.michigan-cancer.org/PDFs/MCCReports/SCBRFS_2008-042910.pdf)> (Accessed on November 10, 2010).
- Park ER, Ostroff JS, Rakowski W, Gareen IF, et al. Risk perceptions among participants undergoing lung cancer screening: Baseline results from the National Lung Screening Trial. *Ann Behav Med* 2009;37:268-79.
- Weinstein ND, Marcus SE, Moser RP. Smokers' unrealistic optimism about their risk. *Tob Control* 2005;14:55-9.
- Silvestri GA, Nietert PJ, Zoller J, et al. Attitudes towards screening for lung cancer among smokers and their non-smoking counterparts. *Thorax* 2007;62:105-6.
- Kashyap R, Hock LM, Bowman TJ. Higher prevalence of smoking in patients diagnosed as having obstructive sleep apnea. *Sleep Breath* 2001;5:167-72.
- Speizer FE. Occupational and environmental lung diseases: An overview. *Environ Health Perspect* 2000;104(Suppl 4):603-4.
- Vzoris N, Loughheed MD. Secondhand smoke exposure in Canada: Prevalence, risk factors, and association with respiratory and cardiovascular diseases. *Can Respir J* 2008;15:263-9.
- Canadian Tobacco Use Monitoring Survey (CTUMS). <<http://www.hc-sc.gc.ca/hc-ps/tobac-tabac/research-recherche/stat/index-eng.php>> (Accessed on February 8, 2010).
- Bearer CF. Environmental health hazards: How children are different from adults. *Future Child* 2005;5:11-26.
- Dove MS, Dockery DW, Connolly GN. Smoke-free air laws and secondhand smoke exposure among nonsmoking youth, NHANES 1999-2006. *Pediatrics* 2010;126:80-7.
- Sendzik T, Fong GT, Travers M, et al. An experimental investigation of tobacco smoke pollution in cars. *Nicotine Tob Res* 2009;11:627-34.
- Hitchman SC, Fong GT, Borland R, et al. Predictors of smoking in cars with non-smokers: Findings from 2007 Wave of the International Tobacco Control Four Country Survey. *Nicotine Tob Res* 2010;12:374-80.
- Leatherdale ST, Ahmed R. Second-hand smoke exposure in homes and in cars among Canadian youth: Current prevalence, beliefs about exposure, and change between 2004 and 2006. *Cancer Causes Control* 2009;20:855-65.
- Statistics Canada. Second-hand smoke. <<http://www.statcan.gc.ca/pub/82-229-x/2009001/envir/shs-eng.htm>> (Accessed on January 14, 2010).