Appendix B: Risk Factors for Lung Cancer

- Tobacco remains the most significant cause of lung cancer; 55% of lung cancer deaths in women and over 70% of lung cancer deaths in men are due to smoking.[1] Smoking after a cancer diagnosis increases the risk of all-cause and cancer specific mortality, adverse effects on treatment outcomes, and increases the risk of recurrence or secondary cancers. Efforts should be focused on supporting patients to quit smoking and to reduce exposures to second-hand smoke.
- The following criteria should be considered when assessing risk for lung cancer **in individuals who had ever smoked**:[6]
  - Personal history of cancer
  - Family history of lung cancer
  - Chronic obstructive pulmonary disease
  - Smoking status (current vs. former)
  - Smoking quit time (3% risk reduction per year since stopped)
  - Ethnicity
- Radon is a colourless, odourless, tasteless and naturally occurring radioactive gas that is formed from the decay of the natural uranium found in soil and rocks. Radon is found in outdoor air in low concentrations. In indoor environments, radon levels can be much higher. Long-term exposure to high concentrations of radon is a risk factor for lung cancer. Radon from natural sources can accumulate in buildings, especially in confined areas such as basements.[7] Epidemiological studies show a causal relationship between occupational exposure to radon gas at high doses and an increased incidence of lung cancer, particularly in tobacco smokers.[28]
- Areas of B.C. known to have elevated radon in homes are areas east of the Coast Mountains, including the Kootenays, the Okanagan Valley, Northern Interior, North Thompson, and Peace River. Approximately 5% to 40% of these interior homes may have radon levels in excess of Canada's national guideline. Previous testing has shown that areas west of the Coast Mountains [e.g. Lower Mainland, Vancouver Island, Fraser Valley, Sunshine Coast, and Prince Rupert] tend to have low residential radon levels (i.e. below 200 Bq/m^3).[30]
- The risk of lung cancer in tobacco smokers exposed to radon as high as 400 Bq/m^3 is 25x greater (16 per 100 workers), when compared to non-smokers exposed to similar levels (0.7 per 100 workers).[10] Radon has been recognized as a significant lung cancer risk to workers in underground mining. Radon levels in B.C. workplaces are generally not high enough to exceed the maximum safe dose, but some workplaces in radon-prone areas of the province have moderately elevated levels.[31]
- **Regardless of source of exposure, risk of lung cancer in smokers exposed to radon is elevated**.[10]
- **For location specific information on incidence, radon-testing guidelines and testing kits, as well as mitigation strategies to reduce radon exposures, refer to Practitioner and Patient Resources section**.
- Lung cancer in non-smokers is also a significant cause of mortality, with estimates that 11% of men and 16% of women who die of lung cancer have never smoked.[2] Although smoking represents the largest risk factor, there is increasing recognition of the rise in number of cases of lung cancer in never-smokers.[2] Most cases are related to occupation and environmental exposure to carcinogens. Health care providers should be aware of potential bias based on assumptions about smoking history when communicating with patients with lung cancer. Regardless of the underlying cause, all cancer patients should be treated with the same level of compassion.
- Race and Ethnicity – Although there are no current Canadian data, studies from the US show it is highest among those of African descent, followed by Caucasian, Indigenous peoples, Pacific Islanders, Asian and South Asian descent.[11]
- The Occupational Cancer Research Centre has estimated the cancer burden for 44 occupational carcinogens, of which 12 contribute to the burden of lung cancer in Canada.[10] **The carcinogens in the order of magnitude of workers exposed are: asbestos, diesel engine exhaust, silica, welding fumes, nickel compounds, chromium (VI) compounds, radon, and second-hand smoke**.[10]

- The following occupations/exposure settings may have an increased risk of exposure to carcinogens and may contribute to an increased risk of lung cancer: miners, rubber industry workers (especially women), welders/metal workers, painters, or exposure to bis(chloromethyl)ether (textile industry prior to 1980), arsenic (manufacturing or construction industries), polycyclic aromatic hydrocarbons (accounts for 0.6% of all lung cancers; cooks, chefs and food and beverage servers, mechanics, firefighters, machinists, service station attendants and retail cashiers).[10,11]
- Long-term exposure to air pollutants (e.g., motor vehicle exhaust, residential fireplace, wood stoves, agricultural burning) significantly increased the risk of cancer mortality.[12]
- Pulmonary fibrosis and diseases that may cause pulmonary fibrosis (e.g., lupus, rheumatoid arthritis, systemic sclerosis [scleroderma]).[13]

The following factors are associated with the risk of lung cancer, but the association is less clear.

- Meta-analysis of the prevalence of HPV infection in tumour lung tissue compared to normal tissue showed a significant association (OR 5.38, CI 3.21-9.00).[15] As the frequency of occurrence of HPV in lung tumour tissue varies greatly, the causal role of HPV infection in lung cancer is currently unknown.[15]
- From a meta-analysis, coffee intake is associated with an increased risk of lung cancer in men (not in women), in American and Asian populations (not in European), and in smokers (not in non-smokers).[16] The role of coffee or any of its constituents in lung cancer is currently uncertain.[16]
- Pro-inflammatory/metabolic diseases (i.e., diabetes, periodontal disease, dyslipidemia).
- Asthma has been shown to be an associated risk factor for lung cancer after adjustment for smoking.[17]
- The evidence on the causal role of waist obesity versus BMI in non-smokers is currently uncertain, with a greater associated risk for waist obesity and a lower risk with higher BMI.[18,19]
- Vaping of substances other than tobacco/nicotine products (e.g., marijuana, e-cigarette) as well as the consequences of long-term or higher concentrations of use is currently unclear.[20]