



Chronic Disease Surveillance Report

The Burden of Smoking-Attributable Cancers in Montana

Tobacco use is the leading cause of preventable death and disease in Montana. Tobacco use causes many deadly diseases, including cardiovascular disease and cancer, the leading causes of death in Montana and the United States. An estimated 1,400 Montanans die from diseases caused by tobacco use every year.¹

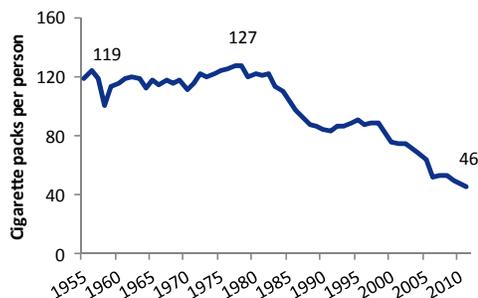
Smoking peaked in Montana in 1978 when approximately 127 cigarette packs were sold per person (Figure 1). Historically, there was a gender gap in smoking prevalence. In 1965, 52% of U.S. men were current smokers while 34% of U.S. women smoked.² This gender gap has since closed. In 2010, 19% of Montana adults were current smokers, with no statistical difference between men and women (20% and 18%, respectively).³

A relationship between smoking and lung cancer was proposed one hundred years ago this year.⁴ Evidence accumulated during the 20th Century firmly established that smoking causes lung cancer. But lung cancer is not the only cancer caused by smoking. Cigarette smoking causes at least ten different types of cancer located throughout the body.⁵ The percentage of cancer cases which can be attributed to cigarette smoking varies by cancer type and by gender. Smoking-related cancers include:

- Acute Myeloid Leukemia
- Bladder
- Cervix
- Esophagus
- Kidney
- Larynx
- Lung
- Oral
- Pancreas
- Stomach

This surveillance report quantifies the cancer incidence that could be attributable to cigarette smoking, and assesses the incidence trends of smoking-related cancers over the past 30 years.

Figure 1. Cigarette packs sold in Montana per adult, 1955-2011.⁶



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Annual Number of Smoking-Attributable Cancers

Quantifying the number of cancer cases that could be attributable to smoking can be done by two methods: calculated smoking-attributable cases and reported smoking-attributable cases identified in the Montana Central Tumor Registry (MCTR).

Calculated Incidence of Smoking-attributable Cancers

- From 2005-2009, an average of 911 cancer cases each year could be attributable to smoking (Table). This burden is estimated to be 580 cases among men and 331 cases among women (Table).
- Smoking-attributable cancers account for approximately 18% (n=911) of the 5,000 cancer cases diagnosed in Montana each year.

Reported Incidence of Smoking-attributable Cancers

- Based on the number of cases reported to have a history of tobacco use, an estimated 955 cases of cancer could be attributed to smoking each year between 2005 to 2009 (Table).
- The MCTR identified 582 cases among men that could be attributed to smoking each year (Table). This estimate is similar to the calculated estimate.
- The MCTR identified 373 cases among women that could be attributed to smoking each year (Table). This estimate is higher than the calculated estimate using smoking attributable fractions.

Table. Comparison of estimates of the number of cancer cases that could be attributable to smoking by two methods: the calculated smoking-attributable cases and the reported number of smoking-attributable cases identified in the Montana Central Tumor Registry (MCTR), Montana residents aged 35 years and older diagnosed between 2005-2009

Cancer Site	Men				Women				
	Cases (N)	Percent of cases that could be caused by smoking ^a (%)	Calculated smoking attributable cases (n)	Reported smoking attributable cases ^b (n)	Cases (N)	Percent of cases that could be caused by smoking ^a (%)	Calculated smoking attributable cases (n)	Reported smoking attributable cases ^b (n)	
Acute Myeloid Leukemia	103	21	21	44	75	11	8	27	
Bladder	951	43	413	505	291	31	90	140	
Cervix	--	--	--	--	129	12	15	62	
Esophagus	241	69	166	154	55	62	34	29	
Kidney	455	35	161	229	251	6	15	91	
Larynx	129	81	104	108	45	76	34	41	
Lung	1,865	87	1,614	1,351	1,722	74	1,281	1,247	
Oral	438	71	312	267	177	51	90	90	
Pancreas	320	21	68	148	279	26	74	104	
Stomach	173	25	43	105	110	13	14	35	
5-year total smoking-related cancer cases			2,901	2,911				1,656	1,866
Average annual smoking-related cancer cases			580	582				331	373

^a Percent of cases that could be caused by smoking (e.g. Smoking Attributable Fraction) were derived following SAMMEC methodology using sex-specific relative risk (RR) of death estimates for current and former smokers for each primary site and sex-specific current and former smoking prevalence from the Montana Behavioral Risk Factor Surveillance System.

^b Cases in the MCTR aged 35 years or older at diagnosis with a reported history of tobacco use were defined as smoking-attributable cancer cases.

Change in Smoking-Related Cancers Over Time

Cancer caused by cigarette smoking requires decades to develop. Therefore, decreases in the prevalence of cigarette smoking will take several decades to realize decreases in the incidence of smoking-related cancers.

All Smoking-related Cancers

- The age-adjusted incidence rate of smoking-related cancers has decreased by 1.24% per year among men and by 1.03% per year among women from 1998 to 2009 (Figure 2).

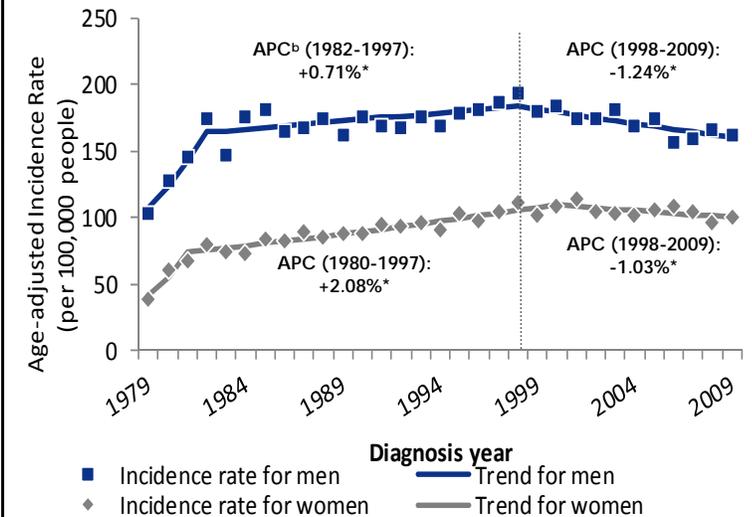
Lung Cancer

- Among males in Montana, lung cancer incidence has decreased by 1.24% per year from 1998 to 2009 (Figure 3).
- During this same time period, lung cancer incidence among women in Montana has not significantly decreased (Figure 3).
- These trends in Montana are similar to those in the United States (data not shown).⁷

Methods

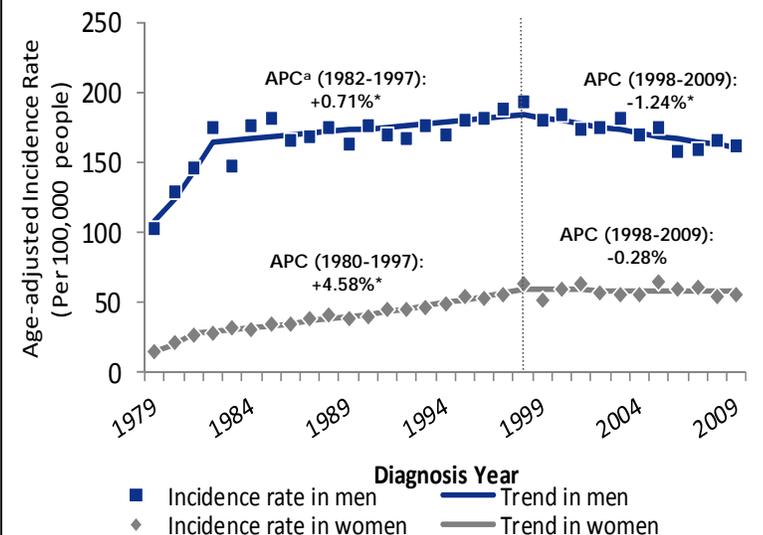
Cancer incidence in Montana was estimated from data in the Montana Central Tumor Registry (MCTR). The MCTR collects demographic, diagnosis, treatment, and tobacco and alcohol use history information. Two methods were used to estimate smoking-attributable cancer incidence: the calculated method and the reported method. Both methods include only the cancer sites known to be caused by smoking and cases aged 35 years or older at diagnosis.⁴ The first method calculated the smoking-attributable cancers by multiplying the number of cases for each site by the site and sex-specific smoking-attributable fraction (SAF). The SAFs were calculated following Smoking-Attributable Mortality, Morbidity, and Economic Costs (SAMMEC) methodology developed by the Centers for Disease Control and Prevention (CDC).¹ SAFs were derived using sex-specific relative risk (RR) of death estimates for current and former smokers compared to never smokers for each primary site and sex-specific current and former smoking prevalence from the Montana Behavioral Risk Factor Surveillance System (BRFSS). In the second method, cases in the MCTR of select cancer sites aged 35 years or older at diagnosis with a reported history of tobacco use were defined as smoking-attributable cancer cases. Estimating smoking-attributable cancer cases using these two methods are subject to limitations. The calculated method likely under-estimates the incidence of cancers caused by smoking while the reported method likely over-estimates the incidence of smoking-attributable cancers. To quantify the change in incidence rates over time, the annual percentage change (APC) was calculated using joinpoint regression.⁸ Joinpoint regression involves fitting a series of joined straight lines on a logarithmic scale to the trends of the annual age-adjusted incidence rates for males and females of selected cancers.

Figure 2. Trends in age-adjusted incidence rate of smoking-related cancers^a among Montana residents by diagnosis year and sex, 1979-2009, Montana Central Tumor Registry



^aAcute Myeloid Leukemia, Bladder, Cervix, Esophagus, Kidney, Larynx, Lung, Oral, Pancreas, and Stomach
^bAnnual Percent Change (APC)
^{*} Statistically significantly different than a rate of change of 0%
 Age-adjusted to the 2000 Standard Million Population

Figure 3. Trends in age-adjusted incidence rate of lung cancer among Montana residents by year of diagnosis and sex, 1979-2009, Montana Central Tumor Registry



^aAnnual Percent Change (APC)
^{*} Statistically significantly different than a rate of change of 0%
 Age-adjusted to the 2000 Standard Million Population

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Recommendations for Clinicians

Ask all patients about tobacco use
Advise to quit
Assess willingness to quit
Assist with quitting
Arrange for follow-up

- Refer patients who want to quit to the Montana Tobacco Quit Line (1-800-QUIT-NOW) and use the [fax referral system](#).
- Health care providers should recommend cancer screening to eligible patients at every visit.
- Free or reduced cost cancer screening tests are available to eligible adults who meet certain age and financial guidelines from the [Montana Cancer Screening Program](#).

- **Report Highlights**
 - Approximately 900 cancer cases diagnosed in Montana each year are caused by smoking. This accounts for about 18% of the 5,000 new cancer cases diagnosed each year in Montana.
 - The incidence of smoking-attributable cancers has decreased by approximately 1% per year from 1998 to 2009 among men and women.

References

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