

The Burden of Tobacco in Wisconsin

2015 Edition



Executive Summary

Introduction

The health and economic effects of cigarette smoking are well documented and include excessive rates of chronic diseases, substantial health care costs, reduced productivity, and premature death. The purpose of this report is to describe the health and economic burden associated with cigarette smoking in Wisconsin.

Methods

Data used for this report were accessed from numerous databases as well as using the most recently published data available. Estimates of the health and economic impact *directly* related to cigarette smoking were calculated using the most current version of the Centers for Disease Control and Prevention's Smoking Attributable Mortality, Morbidity and Economic Costs (SAMMEC) software program. Estimates of mortality associated with secondhand smoke exposure were obtained from recently published updates. Data published by the Centers for Medicare and Medicaid provided valuable information on the health care costs associated with smoking. (For detailed information on the data sources and methods used, refer to the Technical Notes provided at the end of the report.)

Findings*

During 2008-2012, an estimated 6,678 people died from illnesses directly related to smoking each year, constituting nearly 15% of all annual deaths in Wisconsin among persons aged 35 years and older. Another 678 people died from illnesses and fires indirectly related to smoking. Collectively, 7,356 Wisconsin deaths were associated with tobacco use each year. The annual economic toll of tobacco in Wisconsin was approximately \$3.0 billion paid in direct health care costs and \$1.6 billion in lost productivity.

Conclusions

Cigarette smoking continues to significantly impact the health and economic well-being of Wisconsin and its people. Nearly a million Wisconsinites were cigarette smokers during 2012, including approximately 43,000 youth. Thus, cigarette smoking continues to be both a health and economic burden for the state. Programs and policies aimed at preventing and reducing the number of people who smoke cigarettes are essential to the effective elimination of the burden associated with smoking.

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* Findings in the current report are not directly comparable to those released in previous reports. See the technical notes at the end of this report for methodological details.

The Burden of Tobacco in Wisconsin Over Time:

A Cautionary Note

Some of the information presented in *The Burden of Tobacco in Wisconsin* was derived from the use of the Centers for Disease Control and Prevention's software program called Smoking-Attributable Mortality, Morbidity, and Economic Costs (SAMMEC). This application allows the user to estimate the health and health-related economic consequences of smoking to adults and infants. SAMMEC is not intended, however, for use as a surveillance system.

Since 1987, the Centers for Disease Control and Prevention (CDC) has used the Smoking-Attributable Mortality, Morbidity, and Economic Costs (SAMMEC) application to estimate the disease impact of smoking for the nation, states, and large populations. The SAMMEC application has been used to estimate smoking-attributable mortality (SAM), years of potential life lost (YPLL), direct medical expenditures, and productivity losses. These estimates are based on an attributable-fraction methodology that applies current information on cigarette smoking prevalence to scientific data on the relative risk of death from diseases shown to be caused by smoking. Estimates are necessary in the absence of adequate information on death certificates about the smoking history of individuals (<https://apps.nccd.cdc.gov/sammeec/overview.asp>).

The Web-based SAMMEC software was first released in spring of 2002. Since that time, updated versions have been released. The updates reflect the utilization of more recent data and knowledge for the construction of estimates within the program.

Previous versions of the *Burden of Tobacco in Wisconsin* report have been written and released. However, it is important to note that the findings are not directly comparable across the reports. This is due to the nature of the software program used to calculate some of the data necessary to create the report, or more specifically, the incorporation of updated estimates within the program as new information becomes available.

For more information on the methodological details associated with the construction of this report, please see the technical notes at the end of this report, and visit the following website: <https://apps.nccd.cdc.gov/sammeec>.



The Burden of Tobacco in Wisconsin

Population 5,715,331¹

The Burden of Tobacco report is produced by the University of Wisconsin-Milwaukee Center for Urban Initiatives & Research in collaboration with the Wisconsin Division of Public Health's Tobacco Prevention and Control Program.

Smokers in Wisconsin (2012)

	# of Smokers	Percent Smokers
Total Number of Smokers	940,702	
Adult (18+) ^{1,2}	897,259	20.4%
High School Youth ^{3,4}	38,131	13.1%
Middle School Youth ^{3,4}	5,312	2.5%
Smoking During Pregnancy ⁵	9,481	14.1%

Deaths Directly Related to Smoking (Averaged Annual, 2008-2012)

Cause of Death ⁶⁻⁸	Average Annual Deaths ^a	Due to Smoking	% Due to Smoking ^c
Lung Cancer	2,946	2,302	78%
Other Smoking-Related Cancers	2,322	767	33%
Cardiovascular Disease	13,646	1,861	14%
Respiratory Disease	3,025	1,748	58%
Other Causes (not associated with smoking)	22,833	0	0%
All Causes	44,772	6,678^b	15%

Deaths Indirectly Related to Smoking (Averaged Annual, 2008-2012) (Secondhand Smoke Exposure, Maternal Smoking, and Fires)⁹⁻¹¹

	Average Annual Deaths ^a	Associated with Indirect Exposure	% Associated with Indirect Exposure ^c
Ischemic Heart Disease	6,723	605 ^d	9%
Lung Cancer	2,946	59 ^d	2%
SIDS	33	6 ^e	18%
Fires	36	8 ^f	22%
Total Indirect		678	

Total Direct and Indirect Deaths 7,356^b

- Each year, approximately 15% of all deaths in Wisconsin are directly attributable to smoking. Cigarette smoking causes 78% of all lung cancer deaths and 14% of all deaths from heart disease in Wisconsin.⁶⁻⁸
- An estimated 6,678 people die annually from illnesses directly related to smoking and approximately 678 die from illnesses and fires indirectly related to smoking, for a total of 7,356 annual deaths in Wisconsin.⁶⁻¹¹

^a With the exception of SIDS, all average annual deaths include only persons aged 35 years and greater.

^b Totals may not add up due to rounding.

^c May not appear to be exact due to using decimals in the calculations.

^d Nonsmoker exposed to secondhand smoke.

^e Infant exposed to cigarette smoke in utero or postpartum.

^f Fire started as a result of improper disposal of a lit cigarette, cigar or pipe.

Years of Potential Life Lost Due to Smoking^{6-8,12,13}

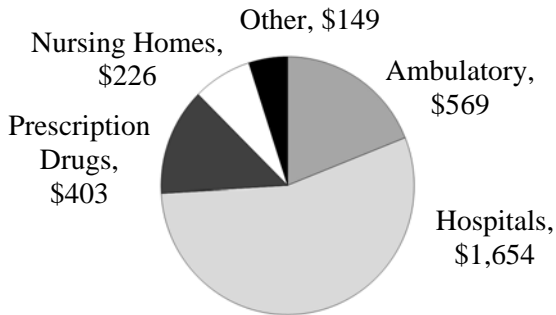
Cause of death

Smoking-Related Cancers	50,000 years
Cardiovascular Disease	28,500 years
Respiratory disease	21,500 years
All Causes	100,000 years

Economic Impact of Cigarette Smoking in Wisconsin

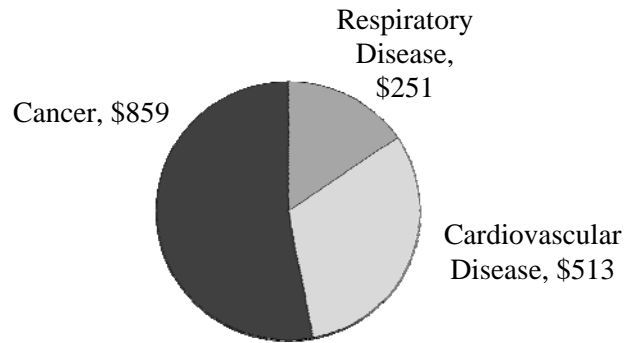
Health Care Costs ^{6-8,14}	\$3,001,000,000
Lost Productivity ^{6-8,12,15}	\$1,623,000,000
Total Costs	\$4,624,000,000

Smoking Attributable Health Care Costs in Wisconsin, 2009^{6-8,14}
(In millions of dollars)



Total: \$3.00 Billion*

Cost of Productivity Lost Due to Smoking in Wisconsin, Averaged Annual, 2008-2012^{6-8,12,15}
(In millions of dollars)



Total: \$1.62 Billion*

- In Wisconsin, approximately 100,000 years were lost from the potential lifespan of those who died of smoking-related illnesses, averaged annually across 2008-2012.^{6-8,12,13}
- In 2009, an estimated \$3.0 billion in health care costs were paid in Wisconsin as a result of diseases caused by smoking.^{6-8,14}
- Wisconsin lost \$1.6 billion in productivity costs because of illness and premature death from smoking-related illnesses, averaged annually across 2008-2012.^{6-8,12,15}
- In 2009, estimated health care costs of cigarette smoking were \$528 for every man, woman and child in Wisconsin.^{6-8,14,16}
- In 2012, residents spent \$1.7 billion on 234.9 million packs of cigarettes sold in Wisconsin.¹⁷

Note: Adult prevalence estimates from BRFSS, 2012; Youth estimates based on state level YTS, 2012; Maternal smoking estimates from WISH, 2012.
 Note: Wisconsin Health Impact and Years of Potential Life Lost estimates are based on an annual average mortality using 2008-2012 Wisconsin mortality data.
 Note: See technical notes for a detailed description of the data sources and methodologies used to construct this report.
 Note: Deaths indirectly related to smoking were not included in the years of potential life lost calculations or estimates of the economic impact.

Burden of Tobacco Report: Technical Notes

Smoking Prevalence and Number of Smokers

Statewide smoking prevalence estimates for adults are based on 2012 Behavioral Risk Factor Surveillance System (BRFSS) data.² Two questions were used to assess whether a respondent was a current smoker at the time of interview. A current smoker was defined as an individual who smoked at least 100 cigarettes in his or her lifetime and who reported currently smoking cigarettes on some days or every day. The number of adult smokers was estimated by multiplying the prevalence estimate of current smokers for the state by the 2012 population estimates of persons aged 18 years or older. Population estimates for the state were obtained from Wisconsin Interactive Statistics on Health (WISH).¹

Data on youth smoking are from the 2012 Wisconsin Youth Tobacco Survey (YTS).³ Youth were considered current smokers if they reported that they had smoked cigarettes at least once in the past 30 days. The number of middle and high school smokers was estimated by multiplying the prevalence estimates by the count of middle and high school students in each school district, available from the Wisconsin Department of Public Instruction (DPI) enrollment data for 2012⁴ for both public and private schools.

Maternal smoking data are from WISH.⁵ The prevalence of smoking during pregnancy for 2012 was multiplied by the number of live births for 2012 to get a total number of women that smoked during pregnancy.

Deaths Directly Related to Smoking / Years of Potential Life Lost Economic Impact of Smoking

Estimates of the ‘number of deaths directly related to smoking’ and ‘years of potential life lost’ are created by the Centers for Disease Control and Prevention’s Smoking Attributable Mortality, Morbidity and Economic Costs (SAMMEC) software program.⁶ The software program also estimates the economic costs of cigarette smoking in terms of direct health care costs and costs due to lost productivity. These estimates can be created by using either CDC data or user-supplied data. The following four inputs are required by the program in order to create the estimates: 1) Smoking prevalence, 2) Number of deaths, 3) Relative risk, and 4) Smoking-attributable fractions.

Smoking Prevalence

SAMMEC specifies that smoking prevalence for both current and former smokers be reported and broken out by sex and by age (35-64 years and 65+ years). These estimates were calculated for the state of Wisconsin by using the averaged prevalence of current and former smokers from 2010 BRFSS data.⁸ The definition of a current smoker was described in the Smoking Prevalence/Number of Smokers section of this report. A former smoker was defined in the BRFSS as an individual who smoked 100 cigarettes in his or her lifetime, but did not currently smoke at the time of interview.

Number of deaths

The number of deaths associated with 19 smoking-related disease categories was obtained directly from mortality data accessed through WISH⁷ and from the Wisconsin Department of Health Services for the years 2008-2012.⁷ The SAMMEC software program requires prevalence data be stratified into sex and age subgroups to account for differences in the risk of developing a smoking-related illness.⁶ Thus, data were grouped by sex and five-year age groups starting with age 35. (See Table A for the list of diseases and their corresponding International Classification of Diagnoses, 10th revision (ICD-10) codes included in the SAMMEC).

Relative Risks

SAMMEC software uses pre-populated relative risk estimates in several of the calculations. The relative risks in SAMMEC are unpublished age-adjusted estimates from the second wave of the American Cancer Society's Cancer Prevention Study.¹² These relative risks cannot be altered by the user.

Smoking-Attributable Fractions

A Smoking-Attributable Fraction (SAF) represents the percentage of deaths for a particular disease category that can be attributed to smoking.⁶ The SAMMEC software calculates the SAF's using the adult prevalence data and the relative risks. The equation that is used in SAMMEC to calculate the SAFs is provided below, where p0 is the percent of the study population that are never smokers, p1 is the percent that are current smokers, and p2 are former smokers.⁶ RR1 is the relative risk of death for current smokers compared to never smokers and RR2 is the relative risk of death for former smokers compared to never smokers.⁶

$$\text{SAF} = [(p_0 + p_1(\text{RR}_1) + p_2(\text{RR}_2)) - 1] / [p_0 + p_1(\text{RR}_1) + p_2(\text{RR}_2)]$$

Smoking-Attributable Mortality

The smoking-attributable mortality (SAM) is calculated by multiplying the SAF's by the number of deaths for each disease that occurred during 2008-2012.⁶⁻⁷ We divided the smoking-attributable mortality number produced by SAMMEC by five to obtain an annual average number of smoking-related deaths. If there was less than one death for a specific disease, smoking-attributable deaths were not reported. When calculating the average annual deaths for both deaths directly and indirectly related to smoking, only deaths of persons aged 35 years and greater were used. The reasoning for this was that in the SAMMEC, mortality used to calculate deaths due to smoking only takes ages 35 and greater into consideration.

Years of Potential Life Lost

The SAMMEC model calculates years of potential life lost based on the potential life expectancy of those who died. We used the pre-populated life expectancy of the United States population (2009), by sex and age categories, from the SAMMEC software.¹³ YPLL estimates are calculated in SAMMEC by multiplying the smoking attributable mortality by the remaining life expectancy of the people at the midpoint of each age range.⁶ The numbers for all age categories are then summed to acquire YPLL by sex. The total YPLL represents the sum of the male and female YPLL.

Smoking-Attributable Productivity Lost

Smoking-attributable productivity costs are the estimated costs of lost future earnings from paid market and unpaid household labor resulting from premature death due to smoking-related diseases.⁶ The productivity loss calculations use the value of future earnings for 2004, available in SAMMEC,¹⁵ along with the mortality data, smoking prevalence, and relative risks.⁶ The estimates are weighted by sex to minimize the effect of gender bias associated with income and occupation.

Smoking-Attributable Health Care Costs

The health-related economic impact of smoking includes estimates of smoking-attributable direct medical expenditures.⁶ Expenditures are categorized as follows: hospital care, ambulatory care, prescription drugs, nursing home care, and other care. Pre-calculated estimates of smoking-attributable expenditures are available from SAMMEC for the year 2004.⁶ However, we used the Custom Expenditure Computations tool to facilitate calculating estimates that take more recent increases in health care expenditures into account, as described below.

We started by using 2009 state-level expenditure data reported by the Centers for Medicare and Medicaid Services (CMS).^{14a} The CMS reports the data by the categories required for entry into the SAMMEC program, with the exception of the prescription drug category. Prescription drugs are combined with other goods in a category called “Drugs and Other Medical Nondurables”. Thus, we needed to develop a method by which to separate the other products from prescription drugs. To do this, we used CMS reports on *national* trends in expenditures^{14b} – which reports prescription drug expenditures separately from other medical nondurables products. Using six years of data (2007 through 2012), we calculated the percentage of the total that other medical nondurables represented for each year. These percentages were then averaged across the 6 years to arrive at an average annual estimate of other medical nondurable expenditures (16.78%).

National Health Expenditures for Prescription Drugs and Nondurable Medical Products, 2007-2012 (in billions of dollars)

Category	2007	2008	2009	2010	2011	2012
Prescription Drugs	235.9	242.6	254.5	255.7	262.2	263.3
Other Nondurable Medical Products	47.8	49.5	50.3	51.2	52.8	53.7
Total	283.7	292.1	304.8	306.9	315	317
Percent of total that nondurable medical products represent	16.85%	16.95%	16.50%	16.68%	16.76%	16.94%
Averaged annual percent of total that nondurable medical products represent	16.78%					

To arrive at a separate category for Wisconsin prescription drug expenditures, 16.78% of the amount included in the combined category was subtracted out. This 16.78% (representing the nondurable medical products) was included in our “Other” category.

Wisconsin Expenditures for Prescription Drugs and Nondurable Medical Products, 2009 (in millions of dollars)

Prescription Drugs + Other Nondurable Medical Products	\$5,096
Nondurable Medical Products (16.78% of 5,096)	\$855.1
Prescription Drug Category (5,096 minus 855.1)	\$4,240.9

To calculate smoking-attributable health care costs, the adjusted health care expenditures for the state (by health care category) and annual expenditure smoking-attributable fractions (SAF’s) were entered into the SAMMEC program. The expenditure SAF’s represent the percent of expenditures that could be avoided if smoking was eradicated from the population. We used the annual expenditure SAF’s listed for Wisconsin in SAMMEC by category.

Deaths Indirectly Related to Smoking

Estimates of deaths due to secondhand smoke were calculated for Wisconsin by multiplying the associated Population Attributable Risks (PAR) for Ischemic Heart Disease, Lung Cancer, and SIDS deaths by the five-year average number of deaths for each relevant category in Wisconsin. The PAR’s are available in the 2005 California EPA report⁹ for the United States. The number of deaths from Lung Cancer and Ischemic Heart Disease were obtained from mortality data provided by the Wisconsin Department of Health Services for the years 2008-2012. Deaths from SIDS and fires were based on the annual average number of cases reported in the 2008-2012 Wisconsin Interactive Statistics on Health (WISH) reports.⁵ The percent associated with indirect exposure was taken from the Home Structure Fires report by Marty Ahrens (2013) from the National Fire Protection Association.¹⁰

Cigarette Packs Sold and Cost

The estimate for the number of packs of cigarettes sold and average price per pack in Wisconsin in 2012 came from the Tax Burden on Tobacco, Volume 47.¹⁷ The total number of packs sold was multiplied by the average price per pack to estimate the amount of money Wisconsin residents spent on cigarettes in 2012.

Limitations

There are a number of limitations associated with the SAMMEC software and the methods that we used for estimates. For a full discussion of the limitations of SAMMEC go to <http://apps.nccd.cdc.gov/sammecc/methodology.asp#Limitations>. One limitation that may cause

the number of deaths associated with smoking to be underestimated is the use of the current prevalence of smoking in the calculations, because people are dying today from smoking behavior that occurred during previous decades when the prevalence of smoking was much higher. Also, the estimates for YPLL and the economic costs of smoking do not take into consideration deaths due to secondhand smoke, maternal smoking, and fires. A limitation associated with the use of mortality data is the possibility of misclassification of death on the death certificate. The estimates of the prevalence of smoking are limited by issues associated with the BRFSS. Because the BRFSS is a phone-based survey, low-income individuals without a phone may be missed. Under-representation of certain subgroups of the population may limit the degree to which the results are representative of the overall population. In addition, the survey may be affected by biases inherent in self-reporting and recall.

The SAMMEC software has been updated and slight changes have been made to the disease classification included in the calculations. Because of the software updates and changes in our methodology, this report should be cautiously compared to previous Burden of Tobacco Reports.

Despite the limitations associated with SAMMEC and the data available for use with the program, the information provided in this report provide useful estimates regarding the health and economic burdens associated with tobacco use in Wisconsin.

Table A: Diseases and Corresponding ICD-10 Codes

Cause of Death	ICD-10 Code
Lung Cancer	C33-C34
Other Tobacco-Related Cancers	
Lip, Oral Cavity, Pharynx	C00-C14
Esophagus	C15
Stomach	C16
Pancreas	C25
Larynx	C32
Cervix Uteri	C53
Urinary Bladder	C67
Kidney and Renal Pelvis	C64-C65
Acute Myeloid Leukemia	C92.0
Heart Disease and Stroke	
Ischemic Heart Disease	I20-I25
Other Heart Disease	I00-I09, I26-I51
Cerebrovascular Disease	I60-I69
Atherosclerosis	I70
Aortic Aneurysm	I71
Other Arterial Disease	I72-I78
Respiratory Diseases	
Pneumonia, Influenza	J10-J18
Bronchitis, Emphysema	J40-J42, J43
Chronic Airways Obstruction	J44

Burden of Tobacco Report: Data Sources

1. Adult population estimates for 2012 are from Wisconsin Interactive Statistics on Health (WISH), available at <http://dhs.wisconsin.gov/wish/>.
2. Wisconsin adult smoking prevalence is from the 2012 Wisconsin Behavioral Risk Factor Surveillance System (BRFSS) data. Data were provided by the Wisconsin Department of Health Services, Division of Public Health.
3. High school and middle school smoking prevalences are from the 2012 Youth Tobacco Survey. Data were provided by the Wisconsin Department of Health Services, Division of Public Health.
4. Youth population estimates are from the Wisconsin Department of Public Instruction's public and private enrollment data for 2012.
5. The number of maternal smokers and maternal smoking prevalence are from Wisconsin Interactive Statistics on Health (WISH), 2012, available at <http://dhs.wisconsin.gov/wish/>.
6. Centers for Disease Control and Prevention. Smoking Attributable Morbidity, Mortality and Economic Costs (SAMMEC): Adult SAMMEC software. Calculations were conducted during the summer of 2014.
7. State mortality data are from Wisconsin Interactive Statistics on Health (WISH), 2008-2012, available at <http://dhs.wisconsin.gov/wish/>.
8. Wisconsin adult smoking prevalences for input into SAMMEC are from the Wisconsin Behavioral Risk Factor Surveillance System, 2010. Data were provided by the Wisconsin Department of Health Services, Division of Public Health.
9. Estimates of deaths associated with indirect exposure to tobacco smoke. Source: *Proposed Identification of Environmental Tobacco Smoke as a Toxic Air Contaminant. Part B: Health Effects*. Executive Summary. California Environmental Protection Agency; 2005.
10. Deaths from household fires associated with improper disposal of a lit cigarette, cigar or pipe. Source: Ahrens, M. *Home Structure Fires*. Quincy, MA: National Fire Protection Association; 2013. Available at www.nfpa.org. Accessed 3/20/14.
11. The average annual number of deaths due to SIDS and fires are from Wisconsin Interactive Statistics on Health, 2008-2012, available at <http://dhs.wisconsin.gov/wish/>.
12. Pre-populated relative risk estimates from SAMMEC software. Source: Unpublished estimates provided by the American Cancer Society (ACS). See Thun MJ, Day-Lally C, Myers DG, et al. Trends in tobacco smoking and mortality from cigarette use in Cancer Prevention Studies I (1959 through 1965) and II (1982 through 1988). In: *Changes in cigarette-related disease risks and their implication for prevention and control. Smoking and Tobacco Control Monograph 8*. Bethesda, MD: US Department of Health and Human Services, Public Health Service, National Institutes of Health, National Cancer Institute, 1997; 305-382. NIH Publication no. 97-1213.
13. Pre-populated life expectancy of the United States, 2009, by sex and age categories, from the SAMMEC software program. Source: Arias E. *United States Life Tables, 2009*. National vital statistics reports; vol. 62, no. 7. Hyattsville, MD: National Center for Health Statistics; 2014.

14. Direct health care costs associated with smoking were calculated using Wisconsin personal health care expenditure data and national percent change in expenditures from the Centers for Medicare and Medicaid Services, Office of the Actuary, National Health Statistics Group.
 - a. 2009 expenditures for Wisconsin are from the table: Wisconsin Personal Health Care Expenditures (PHCE), All Payers, State of Residence, 1991-2009.
 - b. National trends in expenditures on prescription drugs and other nondurable medical products are from: Table 4. National Health Expenditures, by Source of Funds and Type of Expenditure: Calendar Years 2006-2012.
15. Pre-populated present value of future earnings, United States, 2004, from the SAMMEC software program. Source: Haddix AC, Teutsch SM, Corso PS, eds. *Prevention Effectiveness: A Guide to Decision Analysis and Economic Evaluation*. 2nd edition. New York, NY: Oxford University Press; 2003.
16. Adult population estimates for 2009 are from Wisconsin Interactive Statistics on Health (WISH), available at <http://dhs.wisconsin.gov/wish/>.
17. Orzechowski and Walker. *The Tax Burden on Tobacco: Historical Compilation*, Volume 47, 2012. Available at: http://www.taxadmin.org/fta/tobacco/papers/tax_burden_2012.pdf. Accessed 4/22/14.